



**Project design document form for
small-scale CDM project activities
(Version 06.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for small-scale CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	"Methane Gas Capture and Electricity Production at Kubratovo Wastewater Treatment Plant, Sofia, Bulgaria"
Version number of the PDD	04
Completion date of the PDD	02/02/2016
Project participant(s)	Sofiyska Voda AD (Project owner)
Host party	Bulgaria
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral scope 01: Energy Industries – Renewable Energy Sources and AMS-I.C./Version 20: Thermal energy production with or without electricity, dated 01 June 2014; Sectoral scope 13: Waste handling and disposal; AMS-III.H/Version 17: Methane recovery in wastewater treatment, dated 28 Nov 2014; AMS-I.D/Version 18 "Grid connected renewable electricity generation", dated 28/11/2014
Estimated amount of annual average GHG emission reductions	61,769 tCO _{2e}

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The developer of the project Sofiyska Voda AD was established in October 2000 by a 25-year Concession Agreement. Under it the Municipality of Sofia granted to the Company the operation and maintenance of Sofia's WSS system. The shareholding capital is divided between the Municipality of Sofia (22.9 %) and the French company Veolia Water (77.1 %). Sofiyska Voda AD is not the owner, but rather the Concessionaire of the WSS assets – which are public state property. All new facilities constructed with the Company's funds are also the property of the City.

"Methane Gas Capture and Electricity Production at Kubratovo Wastewater Treatment Plant, Sofia, Bulgaria" will apply for registration as a Gold Standard Voluntary Emission Reduction (GS-VER) project. Due to its significant contribution to climate change mitigation and sustainable development in the region, this project is expected to fulfil the requirements of the Gold Standard rigorously.

The project is both a methane emissions reduction and energy production project.

Methane produced in Kubratovo wastewater treatment plant is captured in common methane tanks serving as a buffer and then supplied to the newly installed CHP gas engines for electricity and heat production, which in turn will substitute both the plant's electricity purchases from the grid and diesel fuel usage. Excess electricity is supplied to the grid.

The main purpose of the project is to transform the existing low tech sludge treatment process at Kubratovo that existed before implementation of the project into a modern advanced treatment process matching the best sludge treatment practice available in Western Europe. This transformation has a major effect on the environment through dramatically reducing the existing methane gas emissions at the plant while also reducing the volume of sludge (to as much as 50%) that needs to be transported, hence reducing GHG emissions from transportation as well (not included in GHG abatement calculations).

The overall objective of the project is to provide an environmentally friendly sludge treatment process reducing methane and carbon dioxide emissions that – under a business-as-usual scenario – would have continued.

Other objectives are:

- replace the traditional sludge drying beds and landfill options with mesophilic digestion of all primary and secondary sludge followed by mechanical dewatering in order to reduce GHG emissions;
- effectively mitigate odour problems from the existing treatment of sludge and sludge liquors through introduction of digestion;
- production of fertiliser by mechanical dewatering of the digested stabilised sludge;
- production of electricity from utilisation of the biogas in CHP gas engines thereby reducing GHG emissions from electricity production by the grid.

The project delivers the following key results:

- all primary and secondary sludge thickened and digested as per EU recommendations and guidelines;
- all biogas produced within the digestion process used for power and heat generation via CHP gas engines thus reducing on-site electricity purchases from the national grid; reduction in on-site fossil fuel usage as all site-heating requirements will be met by the CHP gas engines;
- all sludge is stabilised and pathogen free.

Long term strategic reductions of GHG emissions include:

- reduction in open release of CH₄ from open anaerobic sludge tanks and drying beds;
- reduction in open release of CH₄ from landfill disposal site;
- reduction in CO₂ emissions due to replacement of electricity production from fossil fuels;

- reduction in CO₂ emissions due to replacement of heat generation from fossil fuels.

The project had been implemented in two stages:

- Erection of a new digester system consisting of 4 digesters, 7,000 m³ each, designed, supplied and erected by PASSAVANT ROEDIGER Anlagenbau.
For destroying of the excess methane in case of emergency a flaring system have been implemented, consisting of 2 x DN150 flares, type ZA1-F2-0/N0 designed and manufactured by HEGWEIN GmbH, Germany.
- Erection of 3 new co-generation sets GE JMS 320 GS-B.LC with 1,063 kW electric capacity each and 1,088 kW thermal capacity, for generation of electric and thermal energy by combusting biogas from digesters.

The digesters were commissioned at the end of 2006 and started operation on 01 January 2007 but due to some technical problems in the adjustment of the biological process the generation of biogas was interrupted in the end of June 2007 and resumed on 01 May 2008, so the first industrial quantities of biogas were registered in May, 2008.

The CHP was commissioned and started generating electricity and thermal energy for plant's needs in November, 2009.

The project was initially developed and registered as a Joint Implementation (JI) project with the support of the European Bank for Reconstruction & Development (EBRD) and started operation in 2007. The project was determined positively by TUEV SUD with Determination Report No 743 691¹, dated 25 Jan 2006 and received a Letter of Approval by the Ministry of Environment and Water of Bulgaria dated 01 Aug 2007².

Since 01 Jan 2007 the plant that was built under the project has been in regular operation. For the period until the end of the first Kyoto period (31 Dec 2012) the project has undertaken 4 verifications and been issued emission reductions equal to a total of 572,372 tCO₂e.

The JI crediting period of the project was as follows:

Start of the crediting period – 01/01/2007

End of the crediting period – 31/12/2012

During that period the quantity of emission reductions verified and issued to the project have been as follows:

For the period 01/01/2007 – 31/12/2007 (Early Credits) – 36,212 tCO₂e

For the Kyoto period 01/01/2008 – 31/12/2012 (ERUs) - 536,186 tCO₂e

On 24 June 2010 the project was registered under UNFCCC Track 1 procedure with project ID BG1000166³.

The first crediting period of the Kyoto Protocol ended on 31 Dec 2012 and the Doha amendment to the Kyoto Protocol still has not been signed into force. At 11 April 2014, 8 out of the required 144 instruments of acceptance had been submitted to the UNFCCC.

As a result, countries have not yet received Assigned Amount Units which make transaction under the JI mechanism possible. Existing JI projects can no longer receive JI carbon credits for their verified emission reductions.

That is why the project owner has decided to pursue registration of the project under the Gold Standard (GS) in order to monetize the emission reductions from the installation. In future the

¹ <http://ji.unfccc.int/UserManagement/FileStorage/AY829537NMFZCB0ROTQGXDIV1LE4PS>

² <http://ji.unfccc.int/UserManagement/FileStorage/MTDX4KFZNGO7J2SI60WEHCY83VPL5Q>

³ <http://ji.unfccc.int/JIILProject/DB/XJ4JK5GTVPT7EE9KERYMNS8SIHUMYS/details>

project will be able to claim voluntary carbon credits (Verified Emission Reductions – VER) and trade them on the voluntary market.

A.2. Location of project activity

A.2.1. Host Party

The host party is the Republic of Bulgaria.

Bulgaria has ratified the Kyoto Protocol⁴ on 17/07/2002 and it entered into force on 25/07/2002. Bulgarian National Focal Point to the UNFCCC is the Ministry of Environment and Water⁵.

A.2.2. Region/State/Province etc.

The project activity is situated at the site of Sofia central waste-water treatment plant near the village of Kubratovo.

A.2.3. City/Town/Community etc.

The village of Kubratovo is located some 20 km outside the centre of Sofia, the capital of Bulgaria, near the Iskar river.

A.2.4. Physical/Geographical location

The geographic coordinates of the project site are as follows:

Table 1: Geographic coordinates of the project.

Latitude	Longitude
42°45'10.70"N	23°22'11.56"E

Fig.1: Location of the project site.

⁴ <http://www.moew.government.bg/?show=top&cid=356&lang=en>

⁵ http://ji.unfccc.int/JI_Parties/DB/5EH2UF1UOGCEO6HKKAKY8PHE4I9WX6/viewDFP



The site is clearly visible in GOOGLE Earth as shown on Fig.1.

Fig.2: Location of the town of Sofia in Bulgaria



A.3. Technologies and/or measures

The project will supply Kubratovo waste-water treatment plant with thermal and electrical energy. The project falls under Type III - AMS-III.H: Methane recovery in wastewater treatment (Version 17)⁶ and Type I – AMS-I.C, “Thermal energy production with or without electricity”, Version 20.

“Methane Gas Capture and Electricity Production at Kubratovo Wastewater Treatment Plant, Sofia, Bulgaria” project falls in the “Waste Handling&Disposal Category”, according to the Gold Standard Toolkit.

The following overall measures have been implemented by the project in order to achieve its goals:

- **Primary settling tanks**

The digesters are fed with a mixed sludge from the primary settling tanks and the secondary sludge (surplus sludge) from the biological treatment unit. Mixing of the two types of sludge is realised in the sludge mixing chamber where the mixing produce a homogenised mixed sludge, which then is pumped into the digesters.

Fig.3: Primary settling tanks



- **Digesters for anaerobic sludge treatment**

The project activity aimed the erection of a new digester system consisting of 4 digesters, 7,000 m³ each, designed, supplied and erected by PASSAVANT ROEDIGER Anlagenbau.

The anaerobic sludge treatment plant stabilises the sludge anaerobically. With this procedure the organic part of the sludge is reduced which also effects a reduction on the dry solid mass of the total sludge. This process has a positive influence on the sizing of the sludge treatment units following digestion and also on the properties of sludge regarding the ability to dewater and elimination of odour nuisance. The goal of anaerobic digestion is the stabilization of the sewage sludge in order to prevent odour nuisance and improve dewatering.

After the process of digestion the sludge is dewatered and afterwards transported to the temporary pits and then transported for land use as fertiliser.

The maximal biogas generating capacity of the digesters is 1,816 Nm³/h.

⁶ <http://cdm.unfccc.int/methodologies/DB/0VAXUEJCAFN54BBE98CARMZU2TPMPJ>

Fig.4: Digesters and raw sludge pumping house



- **Raw Sludge Pumping Station**

As part of the project 5 new raw sludge pumps have been installed in the existing raw sludge pumping station.

- **Sludge Circulation System**

For heating up the raw sludge and maintaining the process temperature at mesophilic conditions (35°C), a new combined heating and sludge circulation system is provided within the basement of the new service building. 6 volute-casing pumps for dry-well installation have been installed, whereas 4 pumps are in operation and 2 are standby for emergency cases.

Fig.5: Dewatering house



- **Heat Exchanger**

The anaerobic digestion process takes place under mesophilic conditions, which means within a temperature range of about 33 to 37°C. The fresh incoming raw sludge has to be heated up to

the required temperature conditions. Also the heat loss of the digester has to be compensated. For this purposes a double tube heat exchanger is installed for each digester.

The mixture of raw sludge and seeding sludge is transported from the seeding mixer via the heat exchanger where the sludge is indirectly heated in the counter-current flow with hot water. The heated sludge mixture is transported via the feeding line back into the digester.

- **Combined Heat and Power Plant**

The CHP comprises of 3 new co-generation sets GE JMS 320 GS-B.LC with 1,063 kW electric capacity and 1,088 kW thermal capacity each, for generation of electric and thermal energy by combusting biogas from digesters. The electric energy generated is used to cover the plant's need of electricity and replaces the energy supplied from the grid in the baseline. The thermal energy generated by the CHP is also used for internal needs and replaces the thermal energy that would have been generated by the on-site fossil fuelled hot water boilers.

- **Emergency flare system**

An emergency flaring system have been implemented, consisting of 2 x DN150 flares, type Passavant-Roediger FAVAE.

Capacity – 1,000 Nm³/h each flare.

Fig.6: Sludge drying beds



Fig.7: Non-hazardous waste landfill at Kremikovtzi



A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Bulgaria (host)	Sofiyska voda AD (joint venture between Sofia Municipality and Veolia)	No

A.5. Public funding of project activity

There is no public funding used for the financing of the project

A.6. Debundling for project activity

According to Annex 13 of the EB 54 Report, "Guidelines on assessment of debundling for SSC project activities; version 03", 7 a proposed SSC PA is eligible to use the simplified modalities and procedures for SSC PAs if there is not a registered SSC PA with the same project participants as the proposed SSC PA.

There is not any registered SSC PA with the same project participants as the proposed SSC PA. Therefore, the proposed project activity is not a debundled component of a large scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline**B.1. Reference of methodology and standardized baseline**

For determination of the baseline, the methodology AMS-III.H: Methane recovery in wastewater treatment (Version 17) and AMS-I.C, "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories – I.C. Thermal energy production with or without electricity", Version 20⁸, approved by the CDM Executive Board, are applied, using conservative options and data as presented in the following section.

To prove additionality, the official methodologies: "Guidelines on the Demonstration of Additionality of Small-scale Project Activities", Ver.09.0 (previously known as "Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities version 08")⁹ is used.

In addition, the following methodological tools are applied in this PDD:

- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

Version 01¹⁰;

- "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" Version 02¹¹;
- "Emissions from solid waste disposal site", Version 7.0.1¹²;
- "Project emissions from flaring", Version 2.0.0;

⁷ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

⁸ http://cdm.unfccc.int/filestorage/5/6/2/562YSVP78HIG4DQ3F9JLBT0RKAMZW1/EB79_repan14_AMS-I.C_ver20.0.pdf?t=R3l8bnc1bGNofDCLYgwhm-m9unmPkXbUTtGy

⁹ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf

¹⁰ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf/history_view

¹¹ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view

¹² http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v6.0.1.pdf/history_view

- “Tool to calculate the emission factor for an electricity system”, Version 04.0.0¹³;
- “Tool to determine the remaining lifetime of equipment”, Version 1¹⁴;
- “Project and leakage emissions from anaerobic digesters”, Version 1¹⁵;

The completion date of the baseline study is 18/12/2014.

B.2. Project activity eligibility

The key elements of the applied methodology AMS-III.H (version 17) which define its applicability are as follows:

1. Recovery of biogas resulting from anaerobic decay of organic matter in wastewaters through introduction of an anaerobic treatment system for wastewater and/or sludge treatment with biogas recovery. The present project completely satisfies this condition because it is designed to treat the sludge that is contained in the wastewater generated by the Municipality of Sofia in anaerobic reactors with biogas recovery. The process is organised on the territory of Kubratovo waste-water treatment plant which is the only municipal wastewater treatment installation at the territory of Sofia Municipality. The content of the organic matter in the wastewater and the organic sludge is measured continuously by an accredited laboratory. The resulting protocols are archived by the project owner and are at disposal for inspection by DOE at any time.

2. Destruction of methane emissions. This condition is also completely satisfied. The biogas recovered from the anaerobic bio-reactors is destroyed by combusting in co-generation units and hot water boilers. In case of emergency a biogas flaring system is provided for the destruction of the methane.

Applicability condition in the AMS-III.H. / Version 17	Compliance of the condition
1. The methodology is applied in general to projects for “Recovery of biogas resulting from anaerobic decay of organic matter in wastewater through introduction of an anaerobic treatment system for wastewater and/or sludge treatment with biogas recovery.	The project is aimed to replace the traditional sludge drying beds and landfill options with mesophilic digestion of all primary and secondary sludge followed by mechanical dewatering in order to reduce GHG emissions. The proposed project therefore complies with this applicability condition.
2. This methodology comprises measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options: (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (c) Introduction of biogas recovery and combustion to a sludge treatment	The project activity satisfies the applicability condition (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; The project is designed to: • replace the traditional sludge drying beds and landfill options with mesophilic digestion of all primary and secondary sludge followed by mechanical dewatering in order to reduce GHG emissions; • effectively mitigate odour problems from the existing treatment of sludge and sludge liquors through introduction of digestion;

¹³ http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v4.0.pdf/history_view

¹⁴ http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-10-v1.pdf/history_view

¹⁵ http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-14-v1.pdf/history_view

system; (d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on-site industrial plant;¹⁶ (e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).	• production of fertiliser by mechanical dewatering of the digested stabilised sludge;
3. In cases where baseline system is anaerobic lagoon the methodology is applicable if: (a) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (b) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (c) The minimum interval between two consecutive sludge removal events shall be 30 days.	Not applicable. The baseline system does not apply anaerobic lagoons. The sludge in the baseline is stored in pits and after 1 year is transferred to a landfill.
4. The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or mechanical, electrical energy generation directly;	The project activity satisfies condition (a) Thermal or mechanical, electrical energy generation directly; The recovered biogas generated by the anaerobic digesters is directed for combined generation of thermal and electric energy in

¹⁶ Other technologies in Table 6.3 of Chapter 6: Wastewater Treatment and Discharge of 2006 IPCC Guidelines for National Greenhouse Gas Inventories are included.

(b) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas, in this case additional guidance provided in Annex 1 shall be followed; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (iii) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (d) Hydrogen production; (e) Use as fuel in transportation applications after upgrading.	gas engines and for generation of peak thermal energy in boilers.
5. If the recovered biogas is used for project activities covered under paragraph 4 (a) of AMS-III.H, that component of the project activity can use a corresponding methodology under Type I.	The project activity satisfies condition 3(a) above. The component of the project that accounts for the activities under paragraph 3(a) of the methodology uses SSC methodology AMS-I.C. "Thermal energy production with or without electricity", Version 20 as stated in Section B.1
6. For project activities covered under paragraph 4 (b) of AMS-III.H, if bottles with upgraded biogas are sold outside the project boundary, the end-use of the biogas shall be ensured via a contract between the bottled biogas vendor and the end-user. No emission reductions may be claimed from the displacement of fuels from the end use of bottled biogas in such situations. If however the end use of the bottled biogas is included in the project boundary and is monitored during the crediting period CO₂ emissions avoided by the displacement of fossil fuel can be claimed under the corresponding Type I methodology, e.g. AMS-I.C "Thermal energy production with or	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.

without electricity”.	
7. For project activities covered under paragraph 4 (c) (i) of AMS-III.H, emission reductions from the displacement of the use of natural gas are eligible under this methodology, provided the geographical extent of the natural gas distribution grid is within the host country boundaries.	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal energy in co-generation units and for generation of peak thermal energy in boilers.
8. For project activities covered under paragraph 4 (c) (ii) of AMS-III.H, emission reductions for the displacement of the use of fuels can be claimed following the provision in the corresponding Type I methodology, e.g. AMS-I.C.	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.
9. In particular, for the case of 4 (b) and (c) (iii) of AMS-III.H, the physical leakage during storage and transportation of upgraded biogas, as well as the emissions from fossil fuel consumed by vehicles for transporting biogas shall be considered. Relevant procedures in paragraph 11 of Annex 1 of AMS-III.H “Methane recovery in wastewater treatment” shall be followed in this regard.	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.
10. For project activities covered under paragraph 4 (b) and (c) of AMS-III.H, this methodology is applicable if the upgraded methane content of the biogas is in accordance with relevant national regulations (where these exist) or, in the absence of national regulations, a minimum of 96% (by volume).	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.
11. If the recovered biogas is utilized for the production of hydrogen (project activities covered under paragraph 4 (d) of AMS-III.H, that component of the project activity shall use the corresponding methodology AMS-III.O “Hydrogen production using methane extracted from biogas”.	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.
12. If the recovered biogas is used for project activities covered under paragraph 4 (e) of AMS-III.H, that component of the project activity shall use corresponding methodology AMS-III.AQ “Introduction of Bio-CNG in road transportation”.	Not applicable. The project activity satisfies condition 3(a) as mentioned above. The biogas generated will be used for cogeneration of electric and thermal engines in co-generation units and for generation of peak thermal energy in boilers.
13. New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity	The project activity is a new facility and is implemented in an existing facility for treatment of municipal wastewaters and

addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	affects the sludge treatment system only. The project replaces the baseline sludge drying beds and landfill options with mesophilic digestion of all primary and secondary sludge followed by mechanical dewatering in order to reduce GHG emissions. The waste-water treatment system is not affected hence the capacity of the primary waste-water treatment system remains the same as in the baseline and there is no capacity addition.
14. The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	The exact location of the Wastewater treatment plant is given in Section A.2. The source of the wastewater is the complete Sofia Municipality which is evident from the Concession Agreement ¹⁷ between Sofiyska voda AD (owner of the Wastewater Treatment Plant in Kubratovo) and the Municipality of Sofia.
15. Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO ₂ equivalent annually from all Type III components of the project activity.	The emission reductions from the Type III component of the project activity are less than 60 kt CO ₂ as demonstrated further in the PDD.

Applicability condition in the AMS-I.C. / Version 20	Compliance of the condition
1. This methodology comprises renewable energy technologies that supply users ¹⁸ with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	The project activity supplies the waste-water treatment plant with electric energy that would be imported in the baseline from the National grid and with thermal energy that would be generated by local boilers using fossil fuel. The project utilises as fuel the biogas generated in anaerobic digesters by treatment of sludge which is considered a renewable energy source.
2. Biomass-based cogeneration and trigeneration systems are included in this category.	The proposed project is a biomass-based co-generation system because it generates thermal and electric energy by the use of 3 new co-generation sets GE JMS 320 GS-B.LC with 1,063 kW electric capacity each and 1,088 kW thermal capacity.
3. Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (a) Electricity supply to a grid;	The proposed project is a biomass-based co-generation system because it generates thermal and electric energy. The electric energy in the baseline has been imported from the grid. The thermal energy has been

¹⁷ http://www.sofiyskavoda.bg/SVDocuments/Dogovor_zh_Koncesia.pdf

¹⁸ These are residential, industrial or commercial facilities.

(b) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (c) Combination of (a) and (b).	generated by on-site fossil-fuel boilers. In this particular project the activity is under (c).
4. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	Not applicable. The proposed project is a new facility.
5. In the case of new facilities (Greenfield projects) and project activities involving capacity additions the relevant requirements related to determination of baseline scenario provided in the "General guidelines for SSC CDM methodologies" for Type-II and Type-III Greenfield/capacity expansion project activities also apply.	The present part of the project activity falls under Type I - "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories – I.C. Thermal energy production with or without electricity".
6. The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal (see paragraph 9 for the applicable limits for cogeneration and trigeneration project activities).	The project activity utilises 3 new co-generation sets GE JMS 320 GS-B.LC with 1.063 kW electric capacity each (total 3.189 kWe) and 1,088 kW thermal capacity (total 3.264 kWth).
7. For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal (see paragraph 9 for the applicable limits for cogeneration project activities).	Not applicable. The proposed project is not a co-fired system. The co-generators use gas-fuelled engines GE JMS 320. Light oil is used as fuel only in emergency cases when biogas is not generated. The eventual use of light oil for thermal energy generation in the back-up (peak) boilers is monitored on yearly basis and accounted for in the calculation of the project emissions.
8. The following capacity limits apply for biomass cogeneration and trigeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not	The total installed energy generation capacity (thermal and electrical) of the project activity is 6.453 kW which is far below the limit of 45 MW.

exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	
9. The capacity limits specified in paragraphs 7 to 9 above apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 7 to 9, and should be physically distinct from the existing units.	The proposed project activity is a new facility built to replace the energy supplied in the baseline by the grid and by the on-site fossil fuelled boilers. The installed capacity of the biomass boiler in the project is 6.453 MW (thermal+electric) as specified in Section A above and satisfies the capacity limits set by the methodology.
10. If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.	Not applicable. The project uses biogas generated in anaerobic digesters that treat the sludge from the municipal waste-water.
11. Where the project participant is not the producer of the processed solid biomass fuel, the project participant and	Not applicable. The project activity does not use solid biomass.

the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	
12. If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	The energy generated by the project activity is used by the project owner to supply its own waste-water treatment plant with thermal and electric energy. The excess electric energy is delivered to the National grid. In order to avoid any double-counting an adequate quantity of AAUs corresponding to the amount of emission reductions generated by the project by substitution of electric energy generated by the grid will be retired from Bulgarian National GHG Registry as stated in the letter issued by the Bulgarian Ministry of Environment and Water¹⁹.
13. If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand-alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	Not applicable. The project activity uses AMS-III.H methodology in order to account for baseline and project emissions due to the generation of biogas.
14. If project equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	Not applicable. The project activity is not a trigeneration installation and does not contain refrigerants.
15. Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided: (a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the	Not applicable. The project activity does not use charcoal but directly combusts biogas.

¹⁹ Attached to this PDD as Annex 1

production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology AMS-III.K. Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.	
16. In cases where the project activity utilizes biomass, sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply.	Not applicable. The project activity utilises biogas.

The applicability of the project against the requirements of Gold Standard V.2.2- Annex C²⁰ is demonstrated below:

Project Type: Biogas (Landfill gas and biogas from agro-processing, wastewater and other residues).

Applicability condition According Gold Standard V.2.2 Annex C	Compliance of the condition
1. The following types of projects are eligible for registration by Gold Standard: - Renewable energy supply - End-use energy efficiency - Waste handling and disposal	The proposed project activity is eligible for registration by GS because it falls under the definition of Type 3. Waste handling and disposal because it makes use of the biogas recovered from the sludge digesters to generate electric and thermal energy. The sludge is generated as a result from the mechanical treatment of the municipal wastewater of the city of Sofia, Bulgaria.
2. Methane recovery activities shall be eligible for emission reductions from both methane avoidance (including from the flared biogas fraction) and non-renewable fuel substitution as long as evidence is provided on time for validation to demonstrate that the system was designed in a way to at least make use of some of the biogas recovered for the delivery of energy services (e.g. electricity, heat).	The project is designed to make use of the biogas recovered from the sludge digesters to substitute the fossil fuel (Natural gas or light oil) in the generation of thermal energy and for generation of electric energy. The process is combined in special CHP units installed on-site. The design documents and drawings are available on request by DOE during validation.

²⁰ Available at: <http://www.goldstandard.org/energy/rules-requirements>

3. Methane recovery activities at wastewater treatment plants related to Palm Oil production shall comply with all rules provided for palm oil related activities in the section Electricity and/or heat, and liquid biofuels from biomass resources..	N/A. The project activity treats sludge from municipal wastewater.
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The conclusion of the above assessment is that the project satisfies the requirements of Gold Standard V.2.2- Annex C and is eligible for registration by Gold Standard.

The overall conclusion of this assessment is that the project activity is eligible under the chosen SSC methodologies AMS-III.H and AMS-I.C.

B.3. Project boundary

The project boundary is the physical, geographical site where the wastewater and sludge treatment takes place, in the baseline and project situations. It covers all facilities affected by the project activity including sites where processing, transportation and application or disposal of waste products as well as biogas takes place.

The project activity affects only the sludge-treatment system of the plant. The wastewater system is not affected by the project activity and operates in the project scenario under the same operational conditions as in the baseline scenario (e.g. wastewater inflow and COD content, temperature, retention time, etc.) It is described in the PDD, but the emissions from that section are not accounted for in the baseline and project emission calculations (since the same emissions would occur in both baseline and project scenarios). The assessment and identification of the systems affected by the project activity will be undertaken *ex ante*, and the PDD justifies the exclusion of sections or components of the system.

The greenhouse gasses and emission sources are defined for the project activity and the baseline scenario. As a result, the project boundary for “Methane Gas Capture and Electricity Production at Kubratovo Wastewater Treatment Plant, Sofia, Bulgaria” is as demonstrated in the figure below:

As per AMS-I.C which is used to account for the thermal and electric energy generated by the project the project boundary encompasses:

- a. All plants generating electricity and/or thermal energy located at the project site, whether fired with biomass, fossil fuels or a combination of both;
- b. All power plants connected physically to the electricity system (grid) that the project plant is connected to;
- c. Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity;
- d. The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions or are part of an independently registered CDM project;
- e. The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions;

- f. The site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for producing electricity and/or thermal energy and applies this methodology on a standalone basis, i.e. without using a Type III component of a SSC methodology.

Paragraphs (d) and (e) are not relevant to the project activity.

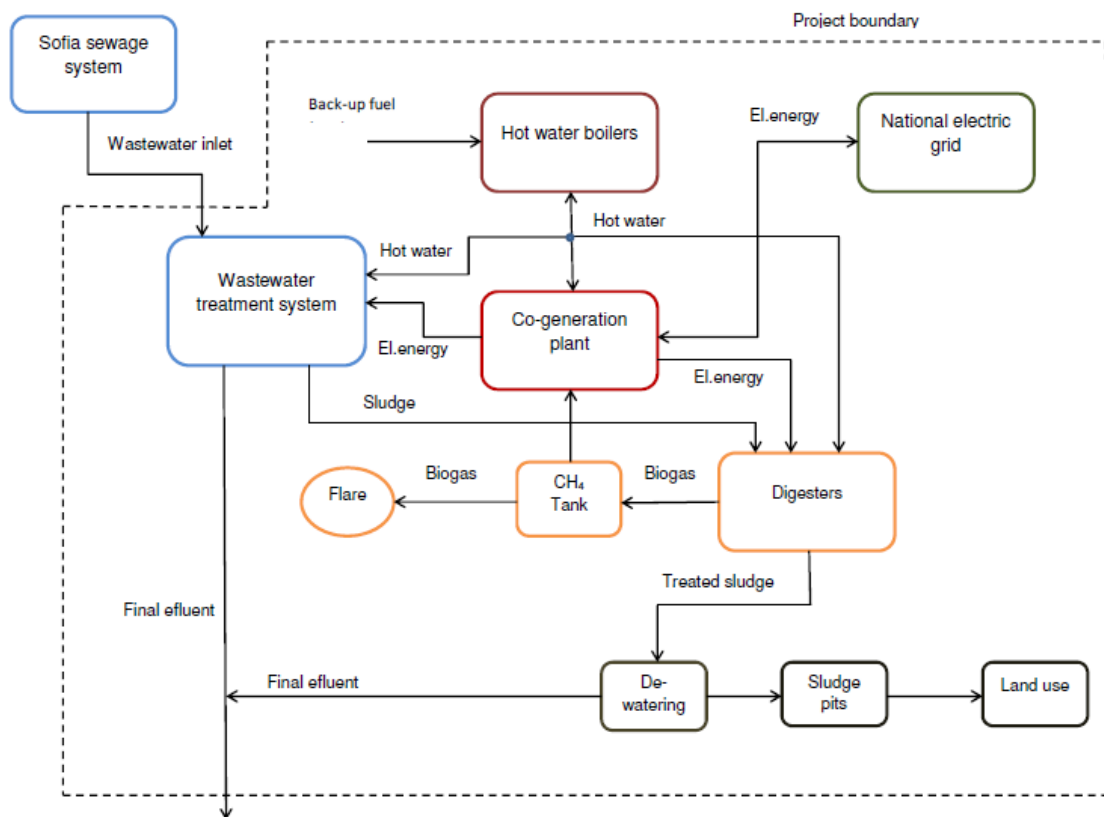
Based on the project boundary and operation of the project activity, the greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below:

Table 6: Emissions sources included in or excluded from the project boundary

	Source	Gas	Included	Justification/Explanation
Baseline	Sludge treatment process	CO ₂	No	CO ₂ emissions from the decomposition of organic sludge are not accounted for.
		CH ₄	Yes	Major source of emissions in the baseline from sludge pits and landfill (decay of organic matter in anaerobic conditions)
		N ₂ O	No	Minor emission source and excluded by the methodology.
	Electricity consumption/ Electricity generation	CO ₂	Yes	AMS.I.C component: The project activity involves the installation of a new grid-connected renewable power unit, whereas the baseline scenario is the electricity delivered to / consumed from the grid that, in the absence of the project, would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
	Thermal energy generation	CO ₂	Yes	AMS.I.C component: The thermal energy would have been generated by using light oil in the thermal boiler in the baseline scenario in the absence of a cogeneration plant and using biogas as a fuel.
		CH ₄	No	Excluded for simplification. This is conservative.
		N ₂ O	No	Excluded for simplification. This is conservative.
Project Activity	Sludge treatment process	CO ₂	No	Minor emission source and excluded by the methodology.
		CH ₄	Yes	Main source of emissions. The treatment of wastewater under the project activity may cause different emissions: (i) Methane emissions from sludge pits (ii) Fugitive emissions due to inefficiencies in

				capture systems (iii) Methane emissions from incomplete flaring
		N ₂ O	No	Minor emission source and excluded by the methodology.
	On-site electricity use	CO ₂	Yes	If the biogas reactor uses electricity generated from the biogas fired gas engine, this will be excluded. However, if the electricity is sourced from the grid, this will be included.
		CH ₄	No	Minor emission source and excluded by the methodology.
		N ₂ O	No	Minor emission source and excluded by the methodology.
	On-site fossil fuel consumption	CO ₂	Yes	Fossil fuel used in the dual-fuel boiler for thermal energy generation shall be monitored and considered in emission reduction calculations.
		CH ₄	No	Minor emission source and excluded by the methodology.
		N ₂ O	No	Minor emission source and excluded by the methodology.

Fig.8: Project boundary diagram



B.4. Establishment and description of baseline scenario

According to the JI PDD (registered under UNFCCC Track 1 procedure with project ID BG1000166²¹) the baseline of the project in its type III component is described as follows:

The raw sludge is pumped for chemical conditioning followed by belt pressing with the resulting sludge cake being transported to the on-site drying beds and left for a period of 15 to 18 months to dry. The dry sludge cake is then transported some 18 km. to the landfill site, Kremikovtzi (Fig.6).

The main source of baseline CH₄ emissions is the sludge deposited in the sludge drying beds and the landfill to decompose in anaerobic conditions.

The baseline of the type I component of the initial project has also been described as “business as usual”, i.e. generation of thermal energy in the on-site boilers using light oil as a fuel and import of electric energy from the grid. The project activity displaces thermal energy from the boilers and electric energy from the grid by using the biogas for combustion in co-generating modules.

The baselines both of the type I and type III components have been validated positively by TUEV SUD with Determination Report No 743 691, dated 04 Oct 2002²².

The project applies for a renewal of the crediting period under the requirements of The Gold Standard Foundation so the Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, Version 03.0.1²³ will be applied to demonstrate that the baseline of the project is still valid.

The Tool consists of two steps:

Step 1: The “Procedures for the renewal of the crediting period of a registered CDM project activity” approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline. The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies.

As a member of the European Union Bulgaria is a subject to all EU legislation and has changed its local laws and regulations correspondingly. The major regulation adopted in Bulgaria in respect to the EU requirements is the “Regulation on the way of recovery of sludge from wastewater treatment through its use in agriculture”²⁴ in force from 08.04.2011.

The Regulation transposes into Bulgarian legislation the requirement of Directive 86/278/EU all sludge from wastewater treatment to be treated prior to applying for agricultural use. The Regulation, as well as the Directive does not specify the type of treatment.

The way of treatment of the waste in Bulgaria is defined by the Law for Management of the Waste²⁵ but this law is not applicable for sludge from domestic waste-water treatment plants. According to paragraph 43 (6) of the law the management of the sludge is defined by a special regulation issued by the Council of Ministers. Such Regulation however is not available still. In this respect the relevant European Directives could be regarded in order to assess the EU policy in the treatment of waste-water and sludge.

²¹ <http://ji.unfccc.int/JIITLProject/DB/XJ4JK5GTVPT7EE9KERYMNS8SIHUMYS/details>

²² <http://ji.unfccc.int/UserManagement/FileStorage/AY829537NMFZCB0ROTQGXDIV1LE4PS>

²³ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-11-v3.0.1.pdf>

²⁴

http://www.moew.government.bg/files/file/Water/Mineralnivodi/Zakonodatelstvo/NAREDBA_za_reda_i_nachina_za_opolzotvorqvanе_na_utajki_ot_prechistvaneto_na_otpadachni_vodi_chrez_upotrebatim_v_zemedeliето.rtf

²⁵ <http://www3.moew.government.bg/files/file/Waste/Legislation/Zakoni/ZUO.pdf>

Another European Directive relevant to the treatment of wastewater is Directive 91/271²⁶ which sets the requirements for urban wastewater treatment. A special Report²⁷ issued by the Bulgarian Ministry of Environment and Water in 2011 analysis the implementation of that Directive in Bulgaria. According to that Report Bulgaria continues the effort to comply with the requirements of the Directive while the quantities and types of final sludge utilization will be as given in the following table:

Table 7: Final sludge utilization

Utilization/ Neutralization year	Utilization of sludge		Neutralization of sludge		
	In agriculture	Other	At landfill	Burning	Other
	Tons dry matter	Tons dry matter	Tons dry matter	Tons dry matter	Tons dry matter
2010	13,644	11,850	12,863	0	20,508
2014	43,587	0	34,863	8,718	0
2015	47,546	0	38,030	9,509	0

The table demonstrates that depositing of sludge at landfills will still be a legal option in the future.

Before the implementation of the project the de-watered sludge had been stabilised by depositing in sludge drying beds (pits) for 15 to 18 months and then transported to the nearby landfill at Kremikovtzi village in which the bio-active components decompose months in anaerobic conditions emitting CH₄ in the atmosphere.

Based on the above information it can be concluded that though rather low tech of sludge treatment existed before the implementation of the project it complied with all EU Directives and Bulgarian legislation and there were no legal barriers for the continuation of the baseline scenario in the future crediting period. Hence the original baseline validated prior the registration of the project as JI project is still valid and will be valid for the next crediting period.

The baseline of the type I component of the project activity also complies with the current laws and regulations in the area of energy generation. The main law that regulates the energy generation in Bulgaria is the Energy Act²⁸, in force from 09.12.2003. The Act does not prohibit the use of fossil fuels (light fuel in particular) for the generation of thermal and electric energy. From the other hand the National electric grid of Bulgaria is highly developed and with large capacity so there is no problem whatsoever to supply the wastewater treatment plant with electric energy for indefinite future. The Act does not oblige the investors to implement co-generating units and that is left on project owners to decide based on the economic effectiveness of the installations.

The conclusion is that the baseline of the type I component of the project activity complies and will continue to comply with the laws and regulations in the sector for the next crediting period.

²⁶ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31991L0271>

²⁷

http://www3.moew.government.bg/files/docs/presscentre/aktualno_2011/Doklad_za_prilagane_na_Direktiva_91_271.pdf

²⁸ http://dker.bg/files/DOWNLOAD/energy_act_en.pdf

Step 1.2: Assess the impact of circumstances.

The present circumstances do not influence the calculation of the current baseline emissions from anaerobic decomposition of the sludge compared to the initial baseline emissions. The emissions from decomposition of the final stabilized sludge in the landfill have not been taken into account in the calculation of the baseline emissions which is conservative.

The quantity of sludge treated depends on the quantity of wastewater generated by the city of Sofia and the content of biological degradable substances and do not depend much on circumstances.

The quantities have been monitored and recorded constantly on monthly and yearly bases.

The yearly quantities of wastewater are demonstrated in the table below:

Table 8: Yearly quantities of wastewater to Kubratovo WwTP

Year	2007	2008	2009	2010	2011	2012
Quantity of wastewater, m ³	140,004	141,410	142,096	147,408	122,635	~150,000

Source: Plant records

It can be seen that the quantity of wastewater and respectively sludge generated is more or less steady throughout the years. The trend is to slightly increase due to the increase of the population and the connection of nearby villages to the central sewage system.

As the quantity of electric and thermal energy consumed by the plant depends mainly on the quantity of wastewater and sludge treated it can be concluded that the emissions related to the displacement of thermal and electric energy generated using fossil fuel will not vary considerably in the future and during the new crediting period respectively.

It can be concluded that the conditions used to determine the baseline emissions in the previous crediting period are still valid.

As the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment the Tool requires an assessment of the changes in market conditions.

The main income for covering the cost of Sofia's wastewater treatment comes from taxes for the service paid by the citizens and determined by the State Energy and Water Regulatory Commission (SEWRC)²⁹. The taxes do not depend on the market hence it is not possible to determine correctly the market influence on the operation of the wastewater treatment plant. So far the prices of services connected to the wastewater treatment are artificially kept low which strongly hinders the investment programme of the concessioner Sofiyska voda.

The same circumstances are valid for the price of electric energy. That is also regulated and determined by SEWRC. There is no indication that the electricity market in Bulgaria will go free in the near future which could eventually lead to decrease or at least determine energy prices on market principles.

Substep 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

²⁹ <http://dker.bg/pagebg.php?P=401&SP=405>

The project activity uses the same auxiliary equipment as in the baseline. There is no change in the process of sludge pumping and de-watering. The same drying beds that have been used in the baseline scenario for stabilizing of the sludge are used for storage of the final sludge after treatment in bioreactors. All that equipment is auxiliary and do not require substantial investment apart from routine maintenance.

The on-site boilers have been put in operation in 1980. According to the "Tool to determine the remaining lifetime of equipment", Version 1³⁰, the default lifetime of the boilers is 25 years which means that the on-site boilers had to be refurbished or replaced in the year 2005. In the absence of the project activity the project proponent would have to make an investment for the refurbishment or replacement of the boilers before the end of the crediting period which means that the baseline for the generation of thermal energy have to be updated for the new crediting period correspondingly.

From the other hand the only change of technology or fuel that could affect the baseline generation of thermal energy is the fuel change from light fuel oil to natural gas. That option is quite possible due to the fact that the natural gas supply system in the region of Sofia is well developed and it would present no problem to organize the supply of the Wastewater treatment plant with natural gas. The on-site boilers that supplied the plant with thermal energy prior to the implementation of the project activity have been put in operation in 1980 and having in mind the default value of 25 years for boilers lifetime defined by the Tool to determine the remaining lifetime of the equipment, version 01, the boilers should be replaced or overhauled after 2005 in the absence of the project activity and most probably the light oil would be replaced with natural gas. In fact the boilers have been refurbished in 2009 during the implementation of the project activity in order to be used for covering of peak loads and back-up. New dual-fuel burners have been installed for combustion of biogas and light oil.

The main equipment and source of greenhouse gasses (CH₄) are the drying beds and they do not require any investment for maintenance or would ever need replacement. There is no problem whatsoever of the baseline scenario to continue operating without any investment until the end of the new crediting period eventually in 2020.

Step 1.4: Assessment of the validity of the data and parameters

The original baseline have been validated in 2006 and the parameters not monitored had been fixed based on the data available at that time and need to be updated.

The emission factors and values for the calculation of the baseline emissions have been determined for the whole crediting period and not monitored and also need to be updated.

The initial baseline for the displacement of electricity used the grid emission factor of the Bulgarian grid developed by the National electric Company which was valid until the end of 2012.

In general the baseline of the type I and type III components needs to be updated in respect of data and parameters validity. A new grid emission factor of the Bulgarian grid will be calculated for the new crediting period.

Step 2: Update the current baseline and the data and parameters.

Step 2.1: Update the current baseline

As demonstrated in the assessment above the baseline of the type III component of the project remains the same and does not need to be updated. The baseline emissions are due to decomposition of the final sludge stored in the drying beds and emissions of CH₄ in the atmosphere.

The methodology for calculation of the emission reductions from the project activity is CDM SSC AMS-III.H, version 17. According to paragraph 5 of that methodology: "If the recovered biogas

³⁰ http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-10-v1.pdf/history_view

is used for project activities covered under paragraph 4 (a), that component of the project activity can use a corresponding methodology under Type I.

The biogas generated by the project is used for thermal and electrical energy generation directly which falls exactly under the definition in paragraph 4(a) so for the calculation of the emissions due to the type I component of the project the methodology AMS-I.C, version 20 will be applied.

The baseline of the type I component will be updated following the requirements of the CDM SSC Methodology AMS-I.C, version 20. This methodology will also be used for the calculation of the CO₂ emissions due to the displacement of fossil fuel with renewable fuel (biogas) and for the displacement of electricity from the grid.

According to paragraph 28 of the methodology AMS-I.C applied:

Project activities producing both electricity and thermal energy shall use one of the following baseline scenarios:

- (a) Electricity is imported from a grid and thermal energy is produced using fossil fuel;
- (b) Electricity is produced in an on-site captive power plant using fossil fuel (with a possibility of export to the grid) and thermal energy is produced using fossil fuel;
- (c) A combination of (a) and (b);
- (d) Electricity and thermal energy are produced in a cogeneration or trigeneration unit using fossil fuel (with a possibility of export of electricity to a grid/other facilities and/or thermal energy to other facilities);
- (e) Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuels (with a possibility of export to the grid); thermal energy is produced using biomass;
- (f) Electricity is produced in an on-site captive power plant using biomass (with a possibility of export to a grid) and/or imported from a grid; thermal energy is produced using fossil fuel;
- (g) Electricity and thermal energy are produced in a biomass fired cogeneration or trigeneration unit (without a possibility of export of electricity either to a grid or to other facilities and without a possibility of export of thermal energy to other facilities);
- (h) Electricity and/or thermal energy produced in a co-fired system;
- (i) Electricity is imported from a grid and/or produced in a biomass fired cogeneration or trigeneration unit (without a possibility of export of electricity either to the grid or to other facilities); thermal energy is produced in a biomass fired cogeneration or trigeneration unit and/or a biomass fired boiler (without a possibility of export of thermal energy to other facilities);
- (j) Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuel and thermal energy is produced using electricity.

Prior to the implementation of the project activity the thermal energy has been generated by on-site fossil fuel (natural gas for the new crediting period) boilers and the electric energy has been imported from the National grid.

That means that the type I of the project activity falls under paragraph 28(a) of the methodology. As discussed in Step 1.3 the conclusion of this assessment is that in the baseline the on-site boilers would be replaced/refurbished before the start of the new crediting period. In order to follow a conservative approach the emission reductions due to the generation of thermal energy by the on-site boilers will not be taken into account but the combustion of biogas and fossil fuel will be monitored and recorded.

The PDD assumes that the baseline fuel for the new crediting period will be natural gas.

Step 2.2: Update the data and parameters.

All data and parameters not monitored will be revised below and up-dated following the requirements of the latest version of the CDM SSC methodology AMS-III.H, version 17 and AMS-I.C, version 20.

According to the methodology AMS-III.H, ver.17 which is used by the project, wastewater and treatment systems equipped with a biogas recovery facility in the baseline shall be excluded from the baseline emission calculations. Prior to the implementation of the project activity Kubratovo Wastewater Treatment Plant did not possess any systems for generation and recovery of biogas. The sludge resulting from the wastewater treatment system has been dewatered and deposited in special sludge drying beds to stabilise for 15 to 18 months period and after that has been deposited to a landfill.

The project activity is designed to replace the traditional sludge drying beds and landfill options with mesophilic digestion of all primary and secondary sludge followed by mechanical dewatering, in order to reduce GHG emissions that have been generated by the anaerobic decomposition of the organic components of the sludge in the drying beds. The biogas produced and recovered by the project activity is used to generate thermal and electric energy and to replace the electricity imported from the grid and the combustion of fossil fuel (light oil) to generate thermal energy. The project activity affects only the treatment of the sludge while the wastewater treatment system remains the same as in the baseline.

According to paragraph 1 of methodology AMS-III.H, version 17:

1. This methodology comprises measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options:

- (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion;
- (b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment;
- (c) Introduction of biogas recovery and combustion to a sludge treatment system;
- (d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant;
- (e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream;
- (f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).

The project activity is related to the aerobic sludge treatment system which existed in the plant prior to the implementation of the project, hence it falls under the definition of paragraph 1 (a): Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion.

Also the project activity is classified as per the definition of paragraph 4(a) of the methodology:

The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: Thermal or mechanical, electrical energy generation directly

According to paragraph 27:

Baseline emissions for the systems affected by the project activity may consist of:

- (a) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);
- (b) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);
- (c) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);
- (d) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);
- (e) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

$$BE_y = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}\} \quad (1)$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO ₂ e) Will be calculated following the requirements of AMS-I.C, version 20.
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO ₂ e) These emissions will not be taken into account because the project activity does not concern the wastewater treatment system.
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO ₂ e) These emissions will not be taken into account because the project activity does not concern this part of the sludge treatment system.
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO ₂ e). The value of this term is zero for the case 1 (b) These source of baseline emissions will not be accounted for simplicity and conservativeness
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO ₂ e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected This emission source is the main in the baseline. The dewatered sludge is stored for 15 to 18 months in drying beds and then transported to a landfill without biogas recovery. The emissions from the landfill are not taken into account for simplicity and conservativeness.

Applied to the baseline defined, formula (1) is reduced to the following:

$$BE_y = \{BE_{power,y} + BE_{s,final,y}\}$$

(2)

Where:

BE_y	Baseline emissions in year y (tCO ₂ e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO ₂ e)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO ₂ e)

Explanation and justification of key assumptions for baseline scenario:

The project activity applies for registration of a new crediting period under the requirements of The Gold Standard Foundation (GS) and has been in operation from 2007. Substantial and detailed information and data for the operation of the project have been recorded for that time and is available at the plant. For the calculation of the baseline emissions for the new crediting period the procedure described in paragraph 38 of AMS-III.H, ver. 17 will be used.

According that paragraph "In determining baseline emissions using equation 1, historical records of at least one year prior to the project implementation shall be used". This shall include for example the COD removal efficiency of the wastewater treatment systems, the amount of dry matter in sludge, power and electricity consumption per m³ of wastewater treated the amount of final sludge generated per tonne of COD removed, and all other parameters required for determination of baseline emissions.

The new crediting period is expected to start from 01 January 2013 so the data collected for the year 2012 will be used for the calculation of the baseline emissions.

Default values of parameters from AMS-III.H will also be used for that purpose.

The type I component of the project will be accounted as stated above according to the requirements of AMS-I.C, version 20. Paragraph 25 states that for project activities implemented in existing facilities, baseline calculations shall be based on operational data on energy use (e.g. electricity, fossil fuel) and plant output (e.g. thermal and/or electrical energy) using:

- (a) Most recent three years operational data immediately prior to the start date of the project activity in case of existing facilities which has more than three years of operation history;
- (b) A minimum of most recent one year data in case of existing facilities which has more than three years of operation history but do not have three years operational data; or
- (c) A performance test/measurement campaign carried out prior to the implementation of the project activity in case of existing facilities which has more than three years of operation history but do not have operational data/information such as efficiency, energy consumption and output or the available data is not reliable due to various factors such as the use of imprecise or non-calibrated measuring equipment. The project proponent may follow the relevant provisions from the "Tool to determine baseline efficiency of thermal and electricity systems".

Option (a) will be used to calculate ex-ante the baseline emissions of the project due to thermal and electric energy from fossil fuel used in the plant displacement.

Methane emissions component

According to AMS-III.H, version 17:

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

$$BE_{s,final,y} = S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_F * F * 16 / 12 * GWP_{CH4} \quad (3)$$

Where:

$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t). The baseline wastewater treating system is not different from the project system so no correction of the monitored amount of dry matter in the final sludge generated is required.
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge shall be used
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
GWP_{CH4}	Global Warming Potential for methane (value of 21)

Thermal and electricity displacement component

As discussed in Section B.4, Step 2.1 above the project activity falls under paragraph 28(a) of the methodology AMS-I.C, version 20: Electricity is imported from a grid and thermal energy is produced using fossil fuel.

Baseline emissions for electricity production

Baseline emissions for supply of electricity to and/or displacement of electricity from a grid shall be calculated as follows:

(4)

$$BE_{grid,y} = EG_{grid,y} \times EF_{grid,y}$$

Where:

$BE_{grid,y}$ = Baseline emissions for the grid electricity displaced by the project in year y (t CO₂e)

$EG_{grid,y}$ = Amount of grid electricity displaced by project in year y (MWh)

$EF_{grid,y}$ = Emission factor of the grid (t CO₂e/MWh)

According to paragraph 34 of the methodology for cases 28(a), (b) and (c), baseline emissions shall be calculated as the sum of emissions from the production of electricity and thermal energy considering most recent historical records (average of the data from a minimum of the three most recent years excluding abnormal years is required).

Determination of emission factor for electricity

As per paragraph 36 of AMS-I.C for project activities that do not displace captive electricity generated by an existing plant but displace grid electricity import and/or supply electricity to a grid, the emission factor of the grid shall be calculated as per the procedures detailed in “AMS-I.D: Grid connected renewable electricity generation” or “AMS-I.F: Renewable electricity generation for captive use and mini-grid”.

For the purpose of this document the emission factor of the grid will be calculated as per the requirements of AMS-I.D, ver.18³¹ which is the latest version of this methodology.

According paragraph 23 of the methodology:

The emission factor can be calculated in a transparent and conservative manner as follows:

- (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the Emission Factor for an electricity system”;
- or
- (b) The weighted average emissions (in t CO₂/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations shall be based on data from an official source (where available) and made publicly available.

For the needs of this document option (a) is selected and the combined margin (CM) will be calculated according to the procedures prescribed in the “Tool to calculate the Emission Factor for an electricity system”, version 04³² in 6 steps:

STEP 1. Identify the relevant electric power system.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

STEP 3. Select a method to determine the operating margin (OM).

STEP 4. Calculate the operating margin emission factor according to the selected method.

STEP 5. Calculate the build margin (BM) emission factor.

STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity system

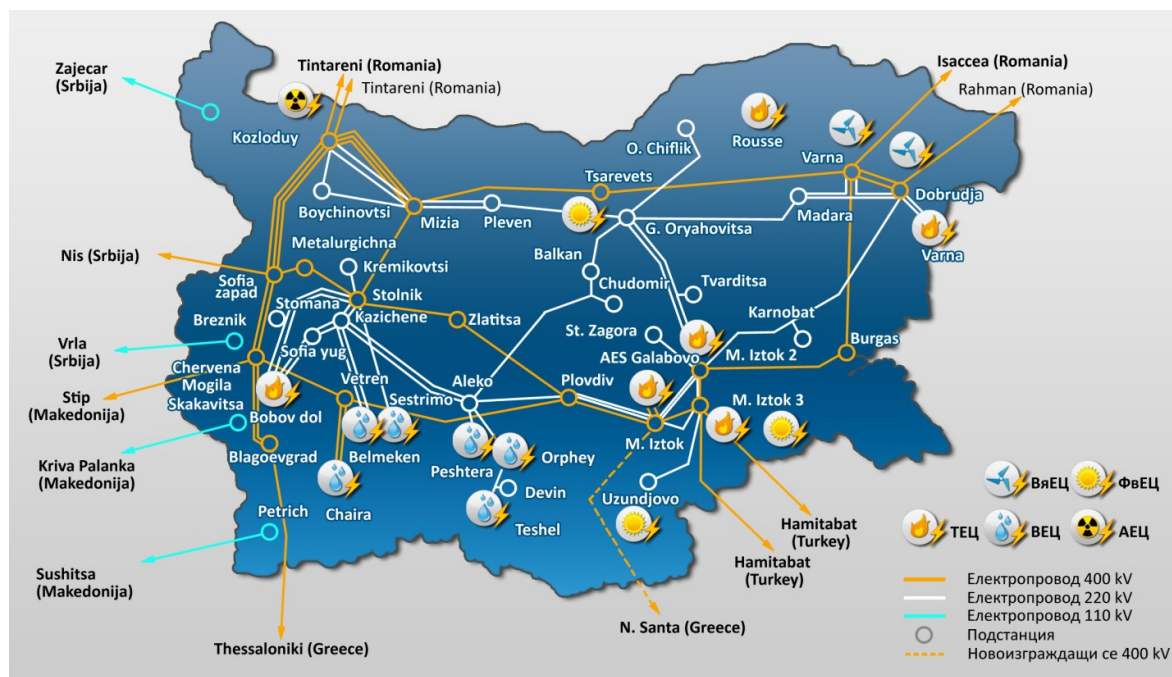
³¹

http://cdm.unfccc.int/filestorage/2/P/7/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC/EB81_repan24_AMS-I.D_ver18.pdf?t=clJ8bnc1bHA4fDA9Ld3VftODqj47dvo89XXh

³² <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>

The project electricity system consists of 3 co-generating units that produce thermal and electrical energy using biogas. The electric energy is used to cover the on-site needs of the wastewater treatment plant. The excess electricity is supplied to the grid. For that purpose the project grid is connected to the Bulgarian national electric grid via transformer sub-station.

Fig.8: Bulgarian national grid



Bulgaria is a major exporter of electric energy in the region and has well developed connections to the neighbouring countries. Of these Romania and Greece are Annex 1 countries so the emission factors of their grids will be considered zero. The delineation is officially published at the site of the Bulgarian Electric System Operator (ESO)³³, the operator of the national grid. The project electricity system does not cover the national grids of the interconnected countries. The Bulgarian DNA (Designated National entity) has published the delineation of connected electricity system. The electricity transmission system of Bulgaria is considered as a single system since the transmission lines are networked throughout the country and owned by the Electric System Operator of Bulgaria (ESO). ESO is the authority that controls electricity generation and distribution in Bulgaria, whereas the local distribution companies (CEZ, EVN & EnergoPro) are the bodies that supply the low voltage electricity to the users in different regions.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Only grid-connected power plants are included in the calculation, as per Option I of the “Tool to calculate the emission factor for an electricity system”, version 04.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor (EF_{grid,OM,y}) is based on one of the following methods:

- 1) Simple OM
- 2) Simple adjusted OM

³³ <http://www.tso.bg/default.aspx/electricity-grid-115/en>

3) Dispatch data analysis OM

4) Average OM

According to the Tool to calculate the emission factor for an electricity system, ver.04.0, paragraph 10(g):

Low-cost/must-run resources are defined as power plants with low marginal generation cost or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. The simple OM method (Option a of the Tool) can only be used if low-cost/must-run resources constitute less than 50 per cent of the total grid generation in average of the five most recent years.

Information about the power generation from different sources is available in the annual reports of the Bulgarian Electric System Operator (ESO) that is controlling the generation and distribution of the electric energy over the National electric grid³⁴ National Statistics Institute. The most recent five years that adequate information is available for are 2008, 2009, 2010, 2011 & 2012.

The following table presents the power generation from low-cost/must-run resources and the total generation for the assessed period:

Table 9: Low-cost/must-run resources

Source	Unit	2008	2009	2010	2011	2012
Nuclear ^{35,36}	MWh	15,765,105	15,255,798	15,248,626	16,314,190	15,784,796
Hydro PP	MWh	4,442,300 ³⁷	4,835,157	5,523,189	3,687,051	3,974,387
Wind farms	MWh			658,181	833,484	1,217,884
Photovoltaic	MWh			14,320	100,770	800,684
Biomass	MWh			0	1,571	31,657
Total generation		44,423,000	42,789,000	46,259,801	50,701,070	47,195,341
Average	%	45.45	46.95	46.36	41.30	46.21
Average for the period	%	45.25				

The low-cost/must-run resources constitute less than 50 per cent of total grid generation in Bulgaria so Simple OM method is applicable.

For the purpose of this document the OM will be calculated using method 1: Simple OM.

According to paragraph 40 of the Tool the Simple OM emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all power plants serving the system, not including the low-cost/must-run power plants.

According to paragraph 36 of the Tool the Simple OM will be calculated using Option (a):

Ex ante option: the emission factor will be determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period will be required. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PDD to the DOE for validation will be used.

Step 4: Calculate the operating margin emission factor according to the selected method

The simple OM may be calculated by one of the following two options:

³⁴ <http://tso.bg/default.aspx/otcheti/bg>

³⁵ http://www.kznpp.org/uf/pa/2009/PA_br1_2009.pdf

³⁶ http://www.kznpp.org/uf//anual_reports/bg/Annual_Report_2009_bg_KozloduyNPP.pdf

³⁷ <http://www.nsi.bg/en/content/5062/electricity-generated-renewable-sources> - (the percentage of electric energy generated from RES is reported 10% for 2008 and 11.3% for 2009)

(a) **Option A:** Based on the net electricity generation and a CO₂ emission factor of each power unit, or

(b) **Option B:** Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

As no detailed information about the net electricity generation and CO₂ emission factor of each power plant connected to the grid is available publicly, Option B will be used for the calculation of the OM of the grid. The information required by Option B is publicly available at the web-site of ESO in the Annual reports³⁸ of the company. The latest report published to-date is for 2012 and for the ex-ante calculation of the OM the 3-year generation-weighted average of years 2010, 2011 and 2012 will be used..

Option B: Calculation based on total fuel consumption and electricity generation of the system

Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, excluding low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \quad (5)$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$FC_{i,y}$	Amount of fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fuel type i in year y (GJ/mass or volume unit)
$EF_{CO_2,i,y}$	CO ₂ emission factor of fuel type i in year y (t CO ₂ /GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
i	All fuel types combusted in power sources in the project electricity system in year y
y	The relevant year as per the data vintage chosen in Step 3 (2010, 2011 & 2012)

The information about the electricity generation in the three most recent years is given in the tables below. The information is based on the latest available annual reports for 2010, 2011 and 2012 of the Bulgarian Electric System Operator (ESO) that is controlling the generation and distribution of the electric energy over the National electric grid³⁹.

Table 10: 2010 yearly electric energy generation

Power plant type	Generation, MWh (gross)	Parasitic load (PL), MWh	% PL	Generation, MWh (net)
Lignite TPP	18,084,160	2,115,847	11.7	15,968,313
Hard coal TPP	4,883,548	571,375	11.7	4,312,173
Natural gas TPP	1,847,777	216,190	11.7	1,631,587
Total:	24,815,485			21,912,073

³⁸ <http://tso.bg/default.aspx/otcheti/bg>

³⁹ <http://tso.bg/default.aspx/otcheti/bg>

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Import				1,168,000
Total generation for 2010:	46,259,801			42,740,300

Source: ESO annual report 2010-<http://tso.bg/default.aspx/otcheti/bg>

According to the Report the power plants consumption and auxiliary services (parasitic load) are 4,689 GWh. The report does not give details on the own consumption of each type of power plant that is why the own consumption of all renewable energy sources is considered 0 in order to follow a conservative approach. The calculations do not account for the physical import which is given as net value. In this case the percentage of the own consumption for the power plants using fossil fuels and nuclear energy will be 11.7%. The net electricity generation from the different type of power plants is given in Table 10 above. The same approach is applied to the data in 2011 and 2012.

Table 11: 2011 yearly electric energy generation

Power plant type	Generation, MWh (gross)	Parasitic load (PL), MWh	% PL	Generation, MWh (net)
Lignite TPP	22,943,006	3,280,850	14.3	19,662,156
Hard coal TPP	4,724,044	675,538	14.3	4,048,506
Natural gas TPP	2,095,504	299,657	14.3	1,795,847
Total:	29,762,554			25,506,509
Import				1,450,000
Total generation for 2011:	50,701,070			45,560,646

Source: ESO annual report 2011-<http://tso.bg/default.aspx/otcheti/bg>

According to the Report the power plants consumption and auxiliary services (parasitic load) are 6,587 GWh. The report does not give details on the own consumption of each type of power plant that is why the own consumption of all renewable energy sources is considered 0 in order to follow a conservative approach. The calculations do not account for the physical import which is given as net value. In this case the percentage of the own consumption for the power plants using fossil fuels and nuclear energy will be 14.3%. The net electricity generation from the different type of power plants is given in Table 11 above.

Table 12: 2012 yearly electric energy generation

Power plant type	Generation, MWh (gross)	Parasitic load (PL), MWh	% PL	Generation, MWh (net)
Lignite TPP	19,944,550	3,225,034	16.17	16,719,516
Hard coal TPP	3,103,498	501,836	16.17	2,601,662
Natural gas TPP	2,337,885	378,036	16.17	1,959,849
Total:	25,385,933			21,281,027
Import				2,353,000
Total generation for 2012:	47,195,341			42,891,034

Source: ESO annual report 2012-<http://tso.bg/default.aspx/otcheti/bg>

According to the Report the power plants consumption and auxiliary services for 2012 are 6,658 GWh or 16.17% average (renewable sources and physical import excluded).

The most reliable information publicly available about the consumption of fossil fuels for the generation of electric energy is published by the Bulgarian National Statistical Institute⁴⁰. The yearly data are shown in the following table:

Table 13: Yearly consumption of fossil fuels for electric energy generation

2010

Type of fuel	Quantity, 1000t/1000m ³	Energy content, TJ	Net Calorific Value (NCV) TJ/1000t(1000m ³)
Lignite	27,461	195,569	7.122
Hard coal	2,272	53,598	22.97
Natural gas	925,580	30,981	0.03347

2011

Type of fuel	Quantity, 1000t/1000m ³	Energy content, TJ	Net Calorific Value (NCV) TJ/1000t(1000m ³)
Lignite	34,350	246,211	7.168
Hard coal	2,385	56,789	23.81
Natural gas	1,060,532	35,496	0.03347

2012

Type of fuel	Quantity, 1000t/1000m ³	Energy content, TJ	Net Calorific Value (NCV) TJ/1000t(1000m ³)
Lignite	31,657	248,395	7.846
Hard coal	1,474	35,847	24.32
Natural gas	1,211,294	40,542	0.03347

Source of data for 2010,2011 & 2012: <http://www.nsi.bg/sites/default/files/files/data/timeseries/Energy-1.4.Electricity>;

Source of data for NCV of N.gas: 2006IPCC, Volume 2: Energy

The Simple OM emission factor of the Bulgarian national grid is calculated based on the above sources and data using the calculation “Table to calculate the emission factor for an electricity system (version 03.0.0)” published at the web-site of UNFCCC⁴¹ and attached to this document.

The OM emission factor calculated is equal to 1.1824 tCO₂/MWh.

Step 5: Calculate the build margin (BM) emission factor

For the purpose of the project Option 1 of paragraph 68 of the “Tool to calculate the emission factor for an electricity grid “ will be applied and the BM will be calculated ex ante based on the most recent information available on units already built for sample group m.

The last several years are characterized with a boom in the construction of renewable energy source generation facilities. However there is no exact information for the commissioning date of those plants. That is why for the purpose pf BM emission factor calculation and for conservativeness all RES plants (wind and photovoltaic) are considered most recently built and

⁴⁰ <http://www.nsi.bg/sites/default/files/files/data/timeseries/Energy-1.4.Electricity.xls>

⁴¹ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf/history_view

the whole 2013 generation from RES is considered as generated by one plant. This is very conservative because the emission factor of RES units is zero.

Several fossil fuel power plants have also been commissioned in the last ten years as well as one hydro power station (Tsankov kamak) which is registered as JI project and will not be considered at the beginning.

The following table demonstrates the 2013 generation of electric energy by the first 5 most recently built power plants, excluding JI registered projects:

Table 14: List of 5 most recently built power plants⁴²:

No	Name	Commissioning date	Net generation, MWh
1	HEPP "Maverik-Gurkovo"	19/11/2013	26
2	PhPP "Boboraci"	29/11/2013	2
3	BioThPP "Slivata"	13/12/2013	110
4	PhPP "Sunshine" – Bratya Daskalovi	9/12/2013	2
5	PhPP "Veliki Preslav"	4/11/2013	8
	Total generation of the set		148

The above list does not include power plants implemented as JI projects⁴³.

The total net quantity of electric energy generated in 2013 is stated in the Report "Calculation of the GHG Emission Factor of the Bulgarian national Grid" published by the Ministry of Environment and Water (MOSV)⁴⁴ as 39,672,000 MWh. The net energy generated by all JI projects in 2013 is 1,416,678 MWh which results in a total net energy generation for 2013, accountable for the determination of the BM factor of 38,255,383 MWh.

The the "Tool to calculate the Emission Factor for an electricity system", version 04⁴⁵ requires a set of most recently built power plant that generate at least 20% of the annual electricity production to be determined in order to calculate the BM emission factor. In this case the set determined has to have generated at least 7,651,076 MWh in 2013.

As per the Report by MOSV (p.41) the power plants built most recently (in the period 2010 – 2013) have generated 8,724,534 MWh (net) in 2013. This includes RES plants which have a zero emission factor.

The set of most recently built power plants that represent at least 20% of the total generation for 2013 is given in the next table which is taken from the Report, published by MOSV (p.62, Table 23 and Annex VI, p.71e):

Table 15: List of most recently built power plants representing at least 20% of the total generation:

No	Name	Net generation, MWh	GHG emissions	Emission factor of the
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⁴²

http://www.moew.government.bg/files/file/Climate/Climate_Change_Policy_Directorate/IECCP/AKTUA_LNO/Bulgaria_EGEF_2014.pdf

⁴³ http://ji.unfccc.int/JI_Parties/DB/5EH2UF1UOGCEO6HKKAKY8PHE4I9WX6/viewDFP

⁴⁴

http://www.moew.government.bg/files/file/Climate/Climate_Change_Policy_Directorate/IECCP/AKTUA_LNO/Bulgaria_EGEF_2014.pdf

⁴⁵ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>

			for 2013, tCO ₂	Plant, kgCO ₂ /MWh
	Total net generation for 2013(physical import excluded)	38,255,383		
1	TPP "Marica-east 2"-block 5	892,455	1,230,647	1,378.945
2	TPP "Marica-east 2"-block 6	985,951	1,359,572	1,378.945
3	TPP "Marica-east 2"-block 8	985,951	1,359,572	1,378.945
4	TPP "Marica-east 1"-block 1	1,306,967	1,609,041	1,231.126
5	TPP "Marica-east 1"-block 2	1,306,967	1,609,041	1,231.126
6	Renewable (NEK-HEPP excluded)	2,916,460	0	0
	Total generation of the set:	8,394,751	7,286,910	
	Percentage from the total yearly generation	21.94%		

Source of data: DKEWR – Annual verified GHG emissions Reports:
<http://eea.government.bg/eea/main-site/bg/rr/r-te/dokladi-3r.html>

=The BM emission factor is calculated based on the above >20% set of power plants using the CDM Emission factor calculation table (version 03.0.0) attached to the PDD.

The BM emission factor is calculated as 0.8539 tCO₂/MWh.

Step 6: Calculate the combined margin emission factor

The calculation of the CM emission factor is based on option (a) of paragraph 77 of the Tool using the Default weighted average of 0.5 for W_{OM} and W_{BM}.

$$CM = 0.5OM + 0.5BM = 0.5 \times 1.1824 + 0.5 \times 0.8539 = 1.0190$$

The CM is calculated by the CDM Calculation table at 1.0190 tCO₂/MWh.

Baseline emissions for heat production

As per paragraph 33 of AMS-I.C, version 20:

for thermal energy produced using fossil fuels and/or grid electricity the baseline emissions are calculated as follows:

(5)

$$BE_{thermal,CO2,y} = \left(\frac{EG_{thermal,y}}{\eta_{BL,thermal}} \right) \times EF_{FF,CO2}$$

Where:

$BE_{thermal,CO2,y}$ = Baseline emissions from thermal energy displaced by the project activity during the year y (t CO₂)

$EG_{thermal,y}$ = Net quantity of thermal energy supplied by the project activity during the year y (TJ)

EF_{FF,CO_2}	= CO ₂ emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (t CO ₂ /TJ)
$\eta_{BL,thermal}$	= Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 39 or 40

B.5. Demonstration of additionality

The project was initially developed and registered as a Joint Implementation (JI) project with the support of the European Bank for Reconstruction & Development (EBRD). The additionality of the project was determined positively by TUEV SUD with Determination Report No 743 691⁴⁶, dated 04 Oct 2002. It was registered under UNFCCC Track 1 procedure with project ID BG1000166⁴⁷.

Nevertheless the project owner will demonstrate its additionality again, having in mind the newest versions of the tools and guidelines on additionality.

In accordance with the "Guidelines on the Demonstration of Additionality of Small-scale Project Activities", Ver.09.0 (previously known as "Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities version 08")⁴⁸ and "Non-binding best practice examples to demonstrate additionality for SSC project activities"⁴⁹, Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

- (a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
- (b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
- (c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
- (d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

For demonstration of additionality, option (a): Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions, has been selected and investment analysis has been carried out.

The history of the project illustrates how the lack of financing had influenced the development of the project activity.

At first it was initiated by the municipality of Sofia in 1993. Unfortunately the Municipality was not able to complete the project due to lack of financing. The idea of recommencing the project came about following the award of the water and wastewater concession to the international operator in 2000. The new concession company Sofijska voda AD started to seek more efficient ways to recommence the project. In 2002 Sofiyska voda AD tried to restart the project but once again, due to financing difficulties, the project had to be postponed again.

⁴⁶ <http://ji.unfccc.int/UserManagement/FileStorage/AY829537NMFZCB0ROTQGXDIV1LE4PS>

⁴⁷ <http://ji.unfccc.int/JIITLProject/DB/XJ4JK5GTVPT7EE9KERYMNS8SIHUMYS/details>

⁴⁸ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf

⁴⁹ http://cdm.unfccc.int/EB/035/eb35_repan34.pdf

In the middle of 2004 Sofiyska voda AD was approached by several Carbon trading companies, all authorized by their respective governments to negotiate transactions on their behalf and to trade Carbon emission reductions as described in Article 6 of the Kyoto Protocol.

The potential opportunity placed Sofiyska voda in a new and improved position in relation to the implementation of the project for reconstruction of the sludge treatment plant. In the light of the Kyoto protocol, completion of the project including the installation of a combined heat and power unit would enable the project to generate emission reductions and to be eligible for carbon credits under the Joint implementation mechanism of the Kyoto Protocol.

The reconstruction of the sludge plant became financially more attractive, including the installation of a combined heat and power unit for both power and heat generation. The project was further elaborated with one of its main financiers, the European Bank for Reconstruction and Development – Carbon Fund (for the account of the Kingdom of the Netherlands).

Work on the project commenced on 07 September 2004. The project has been realised in two phases:

Phase I:

- Rehabilitation of 4 digesters 7,000 m3;
- Provision of New Raw Sludge Pumping Station;
- Biogas Withdrawal System;
- Provision of new sludge recirculation unit;
- Provision of biogas utilisation and mixing system;
- Refurbishment of gas holder;
- Refurbishment of heating and boiler system.

Phase II:

- Provision of 3 CHP modules with gas engines for combustion of biogas.

The first phase of the project was completed at the end of 2006 and the installation started operation on 01/01/2007. However the realisation of the second phase which envisaged provision of a co-generation plant depended on the generation of biogas from the digesters and a loan from the United Bulgarian Bank so the Project Proponent stopped the project until the capacity of the digesters to generate biogas were clear and the future benefits from the project could be estimated properly.

The decision to proceed with the project has been taken in April, 2008 after receiving a special Report named Rational Energy Utilisation Plan No. 129, Sofiyska Voda Renewable Energy Project, Construction of CHP for Biogas Utilization, prepared by DAI and EnCon, dated April, 2008⁵⁰.

For the proposed project Option (a) Investment barrier is chosen to demonstrate additionality.

Proposed project is also considered as “first of its kind” as per the guidelines published by CDM EB⁵¹ since there is no similar plant operational at time of project start however due to the limitation of crediting period to 10 years, option c was not used.

Investment analysis according to the latest “Tool for the demonstration and assessment of additionality”, version 07⁵² is chosen to illustrate that the proposed project activity is unattractive from economic point of view, not taking into account the opportunity to monetise the value of the carbon credits. In that way the additionality of the project will be re-assessed and will be demonstrated following the latest requirements of the CDM mechanism regarding the additionality of a project activity.

⁵⁰ Available on request by DOE

⁵¹ http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid43.pdf

⁵² <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

The Investment analysis will be performed using data available at the time of the decision to recommence the construction of the 2nd phase in April, 2008 and because the only financial benefit apart from selling emission reductions (in this case VER), comes from the CHP plant.

Step 2: Investment analysis

The purpose of 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 revenue from the sale of emission reductions. The latest version of the "Guidelines on the assessment of investment analysis", ver.05.0⁵³, available on the UNFCCC website, will be taken into account when applying this step.

Substep 2a: Determine appropriate analysis method

The project activity generates indirect (the on-site generated electric energy replaces one supplied from the grid and no fossil fuel will be purchased for the generation of heat, other than estimated VER related income. Hence, Option I: Simple cost analysis is not applicable.

The "Business as usual" scenario presents the continuation of the current situation and does not generate any financial or economic benefit.

From the remaining options the Project Proponent has chosen Option III-Benchmark analysis.

Substep 2b: Option III: Apply benchmark analysis

This step recommends the identification of a financial indicator, such as IRR, most suitable for the project type and decision-making context. The project proponent has chosen the IRR of the project as the most suitable financial indicator because it gives the best idea of the profitability of an investment or project. IRR of the project will be calculated after taxes. From the other hand the other alternative to the project is in fact not to invest and according to the Guidelines on the investment analysis the recommended indicator in this case is the IRR. It will be calculated as equity IRR after taxes..

The benchmark will be defined according to the Guidelines which suggest using the government bond rates, increased by a suitable risk premium. In relation to this, the benchmark rate is calculated in line with the Capital Asset Pricing Model (CAPM)⁵⁴ which represents the expected return without (before) taxes. The CAPM suggests below formula to calculate the discount rate (in other words benchmark rate):

$$E(R_i) = R_f + \beta_i (E(R_m) - R_f)$$

Where

$E(R_i)$ is the expected return on the capital asset;

R_f is the risk-free free rate of interest such as interest arising from government bonds;

β_i (the beta coefficient is the sensitivity of the asset returns to market returns

$E(R_m) - R_f$ is known as the market premium or risk premium (the difference between the expected market rate of return and the risk-free rate of return).

Risk Free Rate (R_f)

⁵³ http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

⁵⁴ http://en.wikipedia.org/wiki/Capital_asset_pricing_model

The Risk free rate is derived from the Bulgarian government treasury bonds with longest maturity at the time of the investment decision taking to recommence the project development which is defined as May,2008.

The government bonds Issue number BG 20 400 08 216 (in BGN) with the longest maturity of 10 years (11.10.2018) have been issued on the primary market in January,2008⁵⁵ and reached 5.18% in its third opening on 21.05.2008 which can be considered as the value of the risk free rate.

The Beta Coefficient (β)

In 2008 the companies trading on the Sofia stock exchange have been quite a few and it is not quite possible to calculate the beta coefficient properly. That is why this coefficient is taken from the studies of prof Aswath Damodaran for power industry. The study gives an average value for Beta of 1.65⁵⁶.

Market risk premium ($E(R_m) - R_f$)

To estimate the “Market risk premium” of Bulgaria, the data of the World Bank for 2008⁵⁷ was used. The World Bank document quotes a Risk premium on lending (lending rate minus treasury bill rate) of 6.8% for 2008.

All in all the relevant discount rate (the benchmark) is calculated as:

$$5.18\% + 6.8\% * 1.65 = 16.40\%$$

The above benchmark can be assumed as conservative because, for example, the equity IRR value after taxes defined by World Bank for similar project types in Turkey has been given as 20%⁵⁸ by a report generated in 2009. The example is acceptable because Bulgaria and Turkey had same long-term ratings at the time of the investment decision in 2008.

Substep 2c: Calculation and comparison of financial indicators

The project proponent will use available data and projections for the period 2008 – 2027 in order to calculate and compare the equity IRR of the project for a period of 17 years and to demonstrate that the project activity is not financially attractive without the incentive of generating income by selling VERs. The calculations are based on the “Guidelines on the assessment of investment analysis”, version 05. The length of the investment analysis period is set at 17 years due to the fact that the technical lifetime of the project in its CHP part is confirmed as 16 years in the JI PDD ID BG1000166, validated by TUEV SUD with Determination Report No 743 691⁵⁹, dated 04 Oct 2002.

Table 16:Input parameters

Parameter		Value	Reference
Investment costs			

⁵⁵ http://www.bnb.bg/bnbweb/groups/public/documents/bnb_publication/public_bnb_p_gssm_200806_en.pdf

⁵⁶

<https://www.google.bg/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB4QFjAAahUKEwjR1vWAZNDIAhXMCCwKHZv1A8c&url=http%3A%2F%2Fwww.stern.nyu.edu%2F~adamodar%2Fpc%2Farchives%2Fbetas08.xls&usg=AFQjCNG7SmjG5Jo3gRXA0GE2zTvEo0cG6w>

⁵⁷ <http://data.worldbank.org/indicator/FR.INR.RISK?page=1>

⁵⁸ <http://www.wds.org>

[worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/05/11/000333037_20090511030724/Rendored/PDF/468080PAD0P112101Official0Use0Only1.pdf](http://www.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/05/11/000333037_20090511030724/Rendored/PDF/468080PAD0P112101Official0Use0Only1.pdf) (page 81)

⁵⁹ <http://ji.unfccc.int/UserManagement/FileStorage/AY829537NMFZCB0ROTQGXDIV1LE4PS>

1st phase expenses	Eur	7,020,432	Sofiyska voda accounting records ⁶⁰
2nd phase investment costs	Eur	2,270,810	
Design	Eur	12,026	Feasibility Report REUP ⁶¹
Equipment	Eur	2,200,063	Feasibility Report REUP
Construction works	Eur	58,721	Feasibility Report REUP
Total project costs	Eur	9,291,242	
O&M expenses			
O&M expenses for 1 st phase equipment	Eur/year	37,335	Sofiyska voda accounting records
O&M expenses for 2 nd phase equipment	Eur/year	52,600	Feasibility Report REUP
Total O&M expenses	Eur/year	89,935	
Total installed capacity (electrical)	MW _{el}	3.189	Feasibility Report REUP
Total installed capacity (thermal)	MW _{th}	3.264	Feasibility Report REUP
Annual el.energy generation amount net to plant	MW _{el}	15,348	Feasibility Report REUP
Annual thermal energy generation amount net to plant	MW _{th}	15,249	Feasibility Report REUP
Plant load factor	-	0.55	Feasibility Report REUP
Lifetime of the project	years	25 (16 for CHP)	JI PDD ID BG1000166; Tool to determine the remaining lifetime of equipment, ver. 01
Investment analysis period	years	17	Guidelines on the Assessment of the Investment Analysis, (Version 05)
Installed electric capacity (gross)	MW	3.189	GS PDD; supplier technical specifications; Feasibility Report REUP
Electric energy price	Eur/MWh _{el}	33.65	Feasibility Report REUP
Light fuel oil (LFO) price	Eur/t	798.00	Feasibility Report REUP
Grant KIDFS	Eur	200,000	Feasibility Report REUP
Equity	Eur	8,291,242	Feasibility Report REUP
Loan amount	Eur	1,000,000	Feasibility Report REUP
Depreciation rate (II category-equipment)	%/year	30	Depreciation rates in Bulgaria ⁶²

The equity IRR before taxes is calculated as 12.354% which is lower than the benchmark. The fair value of the equipment is estimated at 5% of the value of the equipment and is added to the cash-flow at the last year of the investment analysis. The equipment is totally depreciated at that time as the depreciation rate is 30% per year and the fair value envisages an estimation of the value of the residual metal.

The depreciation is not included in the IRR calculation sheet because as per the Guidelines on the assessment of the investment analysis, ver.05, paragraph 5 it is a non-cash item and if deducted in estimating gross profits on which tax is calculated, should be added back to net profits for the purpose of calculating the financial indicator (e.g. IRR, NPV). In this case the IRR is calculated before taxes.

⁶⁰ Available at request by DOE

⁶¹ Available at request by DOE

⁶²

<http://plusminus.com/bg/tutorials/accounting/%D0%B0%D0%BC%D0%BE%D1%80%D1%82%D0%B8%D0%B7%D0%B0%D1%86%D0%B8%D1%8F-%D0%BD%D0%B0-%D0%94%D0%90>

The Value added tax (VAT) has not been considered in the calculation of the equity IRR.

As a result of the investment analysis it can be concluded that the project activity is not economically or financially feasible, without the revenue from the sale of emission reductions.

Substep 2d. Sensitivity analysis

The following parameters have been chosen for varying that contribute to more than 20% of the expenses or income of the project activity:

- Total investment
- O&M expenses
- Energy savings

Applying variations on investment costs, the range was considered to be in a bandwidth of +/- 10% as advised by "Tool for the demonstration and assessment of additionality (Version 07.0.0)."

The results of the analysis are given in the following tables:

Equity IRR sensitivity to Investment costs

Parameter	Investment Cost		
Variance	-10%	0%	10%
Equity IRR before tax (for 17 years)	14.03%	12.35%	10.76%

As demonstrated in the table above a 10% decrease of the investment costs leave the equity IRR still below the benchmark of 16.40%.

In order to hit the benchmark the Investment costs have to be decreased by more than 25% to reach an equity IRR of 16.40%. This is highly improbable because at the beginning of 2008 the equipment for phase 1 had already been contracted and mostly paid. The price of the CHP has also been available and a 25% discount at delivery has not been possible.

Equity IRR sensitivity to Operating expenses

Parameter	Operating expenses		
Variance	-10%	0%	10%
Equity IRR before tax (for 17 years)	12.48%	12.35%	12.22%

The table demonstrates that the operating expenses have a very little influence on the IRR. Even if we estimate O&M expenses at 0 the IRR will still be 13.61% which is lower than the benchmark.

Equity IRR sensitivity to Energy savings

Parameter	Energy savings		
Variance	-10%	0%	10%
Equity IRR before tax (for 17 years)	10.32%	12.35%	14.31%

As demonstrated by the table the energy savings have the strongest effect on the IRR but even a 10% increase in the generation of electricity and thermal energy still leaves the IRR below the benchmark of 16.40%. In order to hit the benchmark the energy generation has to increase with more than 25%. This is highly improbable due to the fact that the savings depend on several parameters like:

- Price of electricity – it is defined by the state committee for energy and water and the general tendency, as the past years show is to keep price unchanged or lower;
- Price of Light Fuel Oil (LFO) – it defines in general the thermal energy savings and represents about 50% as a share from the savings. In this respect the price of LFO has to increase with about 40% to compensate the constant price of electric energy which is quite unrealistic though the oil prices tend to increase after 2008.

- Energy generation – this parameter depends only on the generation of bio-gas by the digesters which, from its side depend on the quantity of waste water and sludge. The latter are quite constant throughout the years as demonstrated in Section B.4 of the present document.

The above benchmark and accompanying sensitivity analysis reveal the fact that no alternative scenario can make the project surpass the benchmark IRR expectation. Therefore, the project is not financially attractive without VER revenues.

Step 3: Barrier analysis

This step is optional and is omitted in the demonstration of the additionality of the project activity.

Step 4: Common practice analysis

The proposed project activity is defined as a Small Scale and according to Gold Standard guidance performing a common practice analysis is not required.

Prior consideration

As per the requirements for demonstration of the additionality (PDD_form07_ver.06)⁶³:

“If the start date of the project activity is prior to the date of publication of the PDD for the global stakeholder consultation, provide evidence of the prior consideration of the CDM in accordance with applicable provisions related to the demonstration of prior consideration of the CDM in the Project standard”.

The project applies for retroactive registration under the Gold Standard but the initial JI project's starting date is defined as of 07 September 2004. The start of the JI crediting period is on 01 January 2007.

The opportunity to generate additional revenues from the project's GHG emission reductions to render the project economically attractive was investigated in the beginning of 2004. In the middle of 2004 Sofiyska voda AD had been approached by several carbon trading companies, all authorised by their respective governments to negotiate transactions on their behalf. The aim of these companies had been to trade with Carbon emission reductions as described in article 6 of the Kyoto protocol. That potential opportunity had placed Sofiyska voda AD in a new and improved position in relation to the implementation of the project. In the light of the Kyoto Protocol completion of the project had become more financially viable. Following the evaluation of suitable offers a choice had been made to work with the Netherlands EBRD Carbon Fund.

The project was further elaborated with one of its main financiers, the European Bank for Reconstruction and Development (for the account of the Netherlands).

Based on the positive outcome of the project's evaluation (based on the opportunity to generate carbon credit revenues), a tender procedure was instigated and work on the project commenced on 07 September 2004.

In order to get institutional support for the project in its GHG reduction part a request have been sent to the Mayor of Serdika District in Sofia with a letter dated OB-5/8 of 21.03.2005, informing that the project will be implemented under the Kyoto mechanisms with the support of EBRD Carbon Fund⁶⁴.

⁶³

https://cdm.unfccc.int/filestorage/e/x/t/extfile-20150401152843066-PDD_form07.pdf/PDD_form07.pdf?t=WW58bnN2MzU5fDCND5OHYKb2Qdz8ViQOwp68

⁶⁴ The letter is available at request by DOE.

A request (letter CB 57/12.01.2005) for issuing of Letter of Endorsement of the project has been sent to the Ministry of Environment and Water of Bulgaria. As a result such letter has been received in February, 2005 (Letter No 26/February 2005)⁶⁵.

Finally an Emission Reductions Purchase Agreement (ERPA) has been signed on 21 September 2007 with EBRD on the account of the Netherlands - Emission Reduction Cooperation Fund. This document and the Feasibility Report REUP prepared in April 2008 which showed the possibility to receive a 1,000,000 EUR loan from United Bulgarian Bank on behalf of EBRD allowed the management to recommence the implementation of the project and to start the IInd phase – implementation of the CHP plant.

Table 17: Major dates concerning project implementation

Date (DD/MM/YYYY)	Activity
16/03/2004	Agreement between UBB and the EBRD for qualifying RES projects. The source of financing the current project as stated in the REUP Report.
May-July/2004	Consultations with carbon trading companies and EBRD for possibilities of carbon revenues.
July-October 2004	Correspondence with EBRD for signing of ERPA ⁶⁶
07/09/2004	Start date of the project (I st phase) – opening of the construction site (Appendix 7).
26/02/2005	Letter of Endorsement of the JI project received from the Bulgarian Government
07/2005	Preparation of the PDD for the JI project
25/01/2006	Issuing of positive determination report by TUEV SUED
20/07/2007	Declaration of approval of the JI project, issued by the Dutch government.
01/01/2007	Start of the JI crediting period
01/08/2007	Letter of Approval for the project received by the Bulgarian Government.
21/09/2007	ERPA signed with the EBRD on the account of the Netherlands.
01/01/2008	Start of the First Kyoto period
April/2008	Issuing of REUP Report (Investment decision taking date to recommence the project implementation with the II nd phase).
November/2009	CHP operation start
01/07/2007- 31/10/2012	The JI project undergoes 3 successful verifications.
31/12/2012	End of the First Kyoto period

⁶⁵ The LoE is available at request by DOE.

⁶⁶ E-mail attached to Appendix 7

B.6. Emission reductions**B.6.1. Explanation of methodological choices**

The present project activity follows mainly two approved small scale project methodologies:

1. The AMS-III.H small scale methodology for Methane Recovery in Wastewater Treatment, Version 17;
2. The AMS-I.C small scale methodology for Thermal energy production with or without electricity, Version 20 (refers to AMS-I.D, Version 18 Grid connected renewable electricity generation).
3. AMS-I.D/Version 18 "Grid connected renewable electricity generation", dated 28/11/2014

The application of the methodology is explained in details below.

B.6.1.1. Baseline Emissions:

Baseline emission from wastewater treatment (AMS-III. H)

According to the methodology III.H, para.27 the baseline emissions may consist of:

$$BE_y = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}\} \quad (1)$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO ₂ e) Will be calculated following the requirements of AMS-I.C, version 20.
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO ₂ e) These emissions will not be taken into account because the project activity does not concern the wastewater treatment system.
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO ₂ e) These emissions will not be taken into account because the project activity does not concern this part of the sludge treatment system. The baseline
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO ₂ e). The value of this term is zero for the case 1 (b) These source of baseline emissions will not be accounted for simplicity and conservativeness
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO ₂ e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected This emission source is the main in the baseline. The dewatered sludge is stored for 15 to 18 months in drying beds and then transported to a landfill without biogas recovery. The emissions from the landfill are not taken into account for simplicity and conservativeness.

Applied to the baseline defined formula (1) is reduced to the following:

$$BE_y = \{BE_{power,y} + BE_{s,final,y}\} \quad (2)$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO ₂ e)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO ₂ e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected

$BE_{power,y}$ will be calculated as per AMS-I.C.

According to AMS-III.H, version 17, para.37:

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

$$BE_{s,final,y} = S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_F * F * 16 / 12 * GWP_{CH4} \quad (3)$$

Where:

$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t). The baseline wastewater treating system is not different from the project system so no correction of the monitored amount of dry matter in the final sludge generated is required.
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge shall be used
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH ₄ in biogas (IPCC default of 0.5)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
GWP_{CH4}	Global Warming Potential for methane (value of 21)

The methane correction factor of the disposal site (in this case the drying beds and the landfill) is determined as per the latest version of the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”, Version 07⁶⁷.

For conservativeness the lowest default value of MCF of 0.4 for unmanaged shallow solid waste disposal sites (SWDP) with depth less than 5 m. is used. Neither the drying beds nor the landfill at Kremikovtzi could be classified as “managed”.

Thermal and electricity displacement component

As discussed in Section B.4, Step 2.1 above the project activity falls under paragraph 28(a) of the methodology AMS-I.C, version 20: Electricity is imported from a grid and thermal energy is produced using fossil fuel.

Baseline emissions for electricity production

Baseline emissions for supply of electricity to and/or displacement of electricity from a grid shall be calculated as follows:

$$BE_{grid,y} = EG_{grid,y} \times EF_{grid,y} \quad (4)$$

Where:

$BE_{grid,y}$	Baseline emissions for the grid electricity displaced by the project in year y (t CO ₂ e)
$EG_{grid,y}$	Amount of grid electricity displaced by project in year y (MWh)
$EF_{grid,y}$	Emission factor of the grid (t CO ₂ e/MWh)

Baseline emissions for heat production

As per paragraph 33 of AMS-I.C, version 20:

For thermal energy produced using fossil fuels and/or grid electricity the baseline emissions are calculated as follows:

$$BE_{thermal,CO_2,y} = \left(\frac{EG_{thermal,y}}{\eta_{EL,thermal}} \right) \times EF_{FF,CO_2} \quad (5)$$

Where:

$BE_{thermal,CO_2,y}$	= Baseline emissions from thermal energy displaced by the project activity during the year y (t CO ₂)
$EG_{thermal,y}$	= Net quantity of thermal energy supplied by the project activity during the year y (TJ)

⁶⁷ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-04-v7.pdf>

- EF_{FF,CO_2} = CO₂ emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used (t CO₂/TJ)
- $\eta_{BL,thermal}$ = Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 39 or 40

According to paragraph 34 of the methodology for cases 28(a), (b) and (c), baseline emissions shall be calculated as the sum of emissions from the production of electricity and thermal energy considering most recent historical records (average of the data from a minimum of the three most recent years excluding abnormal years is required).

B.6.1.2. Project emissions

According to AMS-III.H, Version 17, para.41 the project emissions from the systems affected by the project activity are:

- (a) CO₂ emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);
- (b) Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);
- (c) Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);
- (d) Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);
- (e) Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);
- (f) Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);
- (g) Methane emissions due to incomplete flaring ($PE_{flaring,y}$);
- (h) Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).

$$PE_y = \left\{ \begin{array}{l} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + \\ PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \end{array} \right\} \quad (6)$$

Where

PE_y Project activity emissions in the year y , (tCO₂e)

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year y , (tCO₂e).

$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y , (tCO ₂ e).
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y , (tCO ₂ e).
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y , (tCO ₂ e).
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year y , (tCO ₂ e).
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y , calculated as per paragraph 42 of the AMS-III.H, version 17 (tCO ₂ e)
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y , (tCO ₂ e).
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions.

The project activity involves some project emissions as below:

$PE_{power,y}$	Project emissions from combustion of fossil fuel (naphta) in case of emergency will be accounted ex- post for the calculation of the project emissions. According to the methodology «Tool to calculate baseline, project and/or leakage emissions from electricity consumption», version 01, page 2 which is applied for calculation of project emissions ⁶⁸ : «This tool is <u>not</u> applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage.». As this is the case with the discussed project no project emissions from eventual consumption of grid electricity are accounted.
$PE_{fugitive,y}$	Methane emissions from the capturing systems will be accounted for in the proposed project as the project activity involves capture of biogas for power generation.
$PE_{flaring,y}$	Methane emissions due to incomplete flaring will be accounted for in the proposed project as flaring will occur in case of emergency.

The project activity does not involve in the project emissions as below:

$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems will not be accounted for the project because the project activity involves methane recovery for energy generation. The escape methane emissions from the system will be treated as fugitive emissions.
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems will not be accounted for in the proposed project as the project activity does not involve the wastewater treatment system.
$PE_{ww, discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater will not be accounted for the project because the treated wastewater in the project activity is the same as in the baseline.
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge will not be accounted for the project because the final sludge from sludge treatment system will be used as fertilizer.
$PE_{biomass,y}$	Methane emissions from biomass stored will not be accounted for the project because the project activity does not involves the storing of biomass.

The project emissions calculation is shown below.

⁶⁸ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf>

i. Project Emission from power (thermal energy) consumption

As per the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”, (Version 02) CO₂ emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum FC_{i,j,y} \times COEF_{i,y} \quad (7)$$

Where:

$PE_{FC,j,y}$	Are the CO ₂ emissions from fossil fuel combustion in process j during the year y (tCO ₂ /yr);
$FC_{i,j,y}$	Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);
$COEF_{i,y}$	Is the CO ₂ emission coefficient of fuel type i in year y (tCO ₂ /mass or volume unit)
i	Are the fuel types combusted in process j during the year y

For the purpose of this project for the calculation of the project emissions from fossil fuel combustion the CO₂ emission coefficient $COEF_{i,y}$ is determined using Option B of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”:

Option B: The CO₂ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO₂ emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (8)$$

Where:

$COEF_{i,y}$	Is the CO ₂ emission coefficient of fuel type i in year y, (tCO ₂ /mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type i in year y, (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO ₂ emission factor of fuel type i in year y, (tCO ₂ /GJ)
i	Are the fuel types combusted in process j during the year y

The project activity uses only light oil (naphta) as an emergency fuel. The emergency consumption of fossil fuel will be monitored ex-post and accounted for in the calculation of the project emissions.

ii. Methane emissions from biogas release in capture system

As per paragraph 42 of the AMS-III.H, version 17⁶⁹ fugitive emissions from the capture system are estimated in this component.

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y} \quad (9)$$

Where,

$PE_{fugitive,y}$	Emissions from biogas release in capture system in year y, (tCO ₂ e)
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⁶⁹

http://cdm.unfccc.int/filestorage/5/K/M/5KM0FCI23WA714SGBU8D6YXTZNOJQL/EB81_repan34_AMS-III.H_ver17.0.pdf?t=dUx8bnc1bTJpfDBY5bbVKyYYPJv28V7xRFx8

- $PE_{fugitive,ww,y}$ Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment system in the year y , (tCO₂e)
- $PE_{fugitive,s,y}$ Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y , (tCO₂e)

Since there will be no anaerobic wastewater treatment,

$$PE_{fugitive,y} = PE_{fugitive,s,y} \quad (10)$$

The fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y will be determined as per paragraph 42 (b) of AMS-III.H: a default value of 0.05 m³ biogas leaked/m³ biogas produced will be used as an alternative.

iii. Emissions due to incomplete flaring

For ex-ante calculations, baseline emission calculation for final sludge treatment (equation 3 of this document) will be used but without the consideration of GWP for CH₄ (as per AMS-III.H, paragraph 41).

For ex-post calculations the tool "Project emissions from flaring", ver.2.0.0⁷⁰ by using actual monitored data will be applied.

An enclosed flare is used in project activity, therefore the abovementioned tool is applicable.

The calculation procedure in this tool determines the project emissions from flaring the residual gas ($PE_{flare,y}$) based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH_4,RG,m}$). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

The project emissions calculation procedure is given in the following steps:

STEP 1: Determination of the methane mass flow of the residual gas;

STEP 2: Determination of the flare efficiency;

STEP 3: Calculation of project emissions from flaring.

Step 1: Determination of the methane mass flow in the residual gas

The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", version 02.0.0⁷¹ will be used to determine the following parameter:

Parameter	SI unit	Description
$F_{CH_4,m}$	kg	Mass flow of methane in the residual gaseous stream in the minute m

According to the requirement of that tool the methodology will be applied to:

- (a) The biogas stream fed to the flares in case of emergency;
- (b) The mass flow of methane contained in the biogas will be determined;
- (c) The flow of the biogas will be measured continuously;
- (d) The biogas is composed predominantly of methane so the simplification offered for calculating the molecular mass of the gaseous stream is not valid.

The mass flow of the methane in the stream $F_{CH_4,m}$ will be determined through measurement of the flow and volumetric fraction of the stream as per Option A of the tool:

⁷⁰ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf>

⁷¹ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf>

Flow of gaseous stream – dry basis
Volumetric fraction – dry basis

Option A is applicable because the source of the stream is a biogas generated in anaerobic digesters where the temperature is constantly kept at 35 °C and the temperature of the biogas generated is the same at the flow measurement point. This satisfies requirement (b) of Option A which requires to demonstrate that the temperature of the gaseous system (T_1) is less than 60°C at the flow measurement point.

The mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{CH_4,t} = V_{t,db} * v_{CH_4,t,db} * \rho_{CH_4,t} \quad (11)$$

With

Where:

$F_{CH_4,t}$	Mass flow of the methane in the gaseous stream in time interval t (kg CH ₄ /h)
$V_{t,db}$	Volumetric flow of the gaseous stream in time interval t on a dry basis (m ³ CH ₄ /h)
$v_{CH_4,t,db}$	Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m ³ CH ₄ /m ³ dry gas)
$\rho_{CH_4,t}$	Density of CH ₄ in the gaseous stream in time interval t (kg CH ₄ /m ³ CH ₄)

The current project uses multiple methodologies and tools which give different designations to one and the same parameter. This fact may cause certain confusion during the monitoring process that is why for the needs of the project some parameters will be unified as designation and will be applied for the definition of the mass flow of methane in the flared biogas, namely:

- $v_{CH_4,t,db}$ will be replaced in the formula (11) with $w_{CH_4,y}$ which is in fact the methane content at the outlet of the digesters measured continuously at normal conditions;
- $\rho_{CH_4,t}$ will be replaced in the formula (11) with D_{CH_4} which is the methane density at normal conditions. This parameter is defined in the corresponding table in Section B.6.2 of this PDD. This approach is conservative because the temperature of the biogas coming out of the digesters is constant at about 35 °C and the methane density is lower than at normal conditions (20 °C and 1 bar) and will result in higher project emissions.

In this case formula (11) will take the following outlook:

$$F_{CH_4,t} = V_{t,db} * w_{CH_4,y} * D_{CH_4} \quad (12)$$

Step 2: Determination of flare efficiency (enclosed flare)

For the determination of the flare efficiency Option A of the “Tool to determine project emissions from flaring”, version 02.0.0⁷² will be applied:

The flare efficiency for the minute m ($\eta_{flare,m}$) is 90% when the following two conditions are met to demonstrate that the flare is operating:

- (1) The temperature of the flare ($T_{EG,m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer’s specification for the flare ($SPEC_{flare}$) in minute m ; and
- (2) The flame is detected in minute m ($Flame_m$).

Otherwise $\eta_{flare,m}$ is 0%.

Step 3: Calculation of project emissions from flaring

⁷² <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-06-v2.0.pdf>

Project emissions from flaring are calculated as the sum of emissions for each minute m in year y , based on the methane mass flow in the residual gas ($F_{CH_4, RG, m}$) and the flare efficiency ($\eta_{flare, m}$), as follows:

$$PE_{flare, y} = GWP_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4, RG, m} \times (1 - \eta_{flare, m}) \times 10^{-3} \quad (13)$$

Where:

$PE_{flare, y}$	Project emissions from flaring of the residual gas in year y (tCO ₂ e)
GWP_{CH_4}	Global warming potential of methane valid for the commitment period (tCO ₂ e/tCH ₄)
$F_{CH_4, RG, m}$	Mass flow of methane in the residual gas in the minute m (kg)
$\eta_{flare, m}$	Flare efficiency in minute m

B.6.2. Leakage

There is no leakage from the project activity. There is no equipment transferred from another activity.

B.6.1.3. Emission reductions

The emission reductions will be estimated *ex ante* in the PDD using the equations provided in the baseline, project and leakage emissions sections above. Emission reductions will be estimated *ex ante* as follows:

$$ER_{y, ex\ ante} = BE_{y, ex\ ante} - (PE_{y, ex\ ante} + LE_{y, ex\ ante}) \quad (14)$$

Where:

$ER_{y, ex\ ante}$	Ex ante emission reduction in year y (tCO ₂ e)
$LE_{y, ex\ ante}$	Ex ante leakage emission in year y (tCO ₂ e)
$PE_{y, ex\ ante}$	Ex ante project emission in year y (tCO ₂ e)
$BE_{y, ex\ ante}$	Ex ante baseline emission in year y (tCO ₂ e)

The project activity is classified under paragraph 2(a) of AMS-III.H so the *ex post* calculation of the emission reductions will, be performed as per paragraph 48 of the methodology.

The emission reduction achieved by the project activity (*ex post*) will be the difference between the baseline emissions and the sum of the project emissions and leakage.

$$ER_y = BE_{y, ex\ post} - (PE_{y, ex\ post} + LE_{y, ex\ post}) \quad (15)$$

The historical records of electricity and fuel consumption and the quantity of sludge produced by the replaced units will be used for the baseline calculation. Project emissions from fugitive emissions and incomplete flaring ($PE_{fugitive, y}$, $PE_{flaring, y}$) will also be considered in the calculation of the emission reductions, however the emissions from the wastewater outflow and sludge ($PE_{ww, discharge, y}$, $PE_{s, final, y}$) will be disregarded.

B.6.2. Data and parameters fixed *ex ante*

(Copy this table for each piece of data and parameter.)

Data / Parameter	EF _{EL,y}
Unit	tCO ₂ /MWh
Description	Emission factor of the national power grid of Bulgaria
Source of data	Calculated value
Value(s) applied	1.0190
Choice of data or Measurement methods and procedures	The project activity involves displacement of grid electricity. As per the AMS-I.D, version 18 methodology, the EF _{CO₂,grid} of the grid is calculated based on a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculates the Emission Factor for an electricity system"
Purpose of data	Calculation of baseline emissions
Additional comment	This parameter has been fixed ex-ante for the whole crediting period.

Data / Parameter	MCF _{s,BL,final}
Unit	
Description	Methane correction factor of the disposal site that receives the final sludge in the baseline situation,
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.4
Choice of data or Measurement methods and procedures	CDM Tool "Emissions from solid waste disposal sites", Version 07
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	DOC _s
Unit	
Description	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	DOC _F
Unit	
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	F
Unit	-
Description	Fraction of CH ₄ in biogas
Source of data	IPCC 2006 Guidelines for national Greenhouse Gas Inventories
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	UF _{BL}
Unit	
Description	Model correction factor to account for model uncertainties
Source of data	AMS-III.H
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	Default value from AMS-III.H
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	GWP_{CH_4}
Unit	
Description	Global Warming Potential for methane
Source of data	IPCC
Value(s) applied	21
Choice of data or Measurement methods and procedures	Default value from IPCC is used as per the applied methodology
Purpose of data	Baseline/project emissions calculation
Additional comment	

Data / Parameter	η_{flare}
Unit	%
Description	Flare efficiency
Source of data	"Project emissions from flaring" , Version 02.0.0
Value(s) applied	80%
Choice of data or Measurement methods and procedures	Default value from "Project emissions from flaring" , Version 02.0.0. The flare efficiency for the minute m ($\eta_{flare,m}$) is 80% when the following two conditions are met to demonstrate that the flare is operating: (1) The temperature of the flare ($T_{EG,m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute m ; and (2) The flame is detected in minute m ($Flame_m$). Otherwise $\eta_{flare,m}$ is 0%.
Purpose of data	Project emissions calculation
Additional comment	The value is 10% less the default value for conservativeness.

Data / Parameter	$\eta_{BL,thermal}$
Unit	%
Description	Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity determined as per paragraph 39 or 40
Source of data	Manufacturer's specifications ⁷³
Value(s) applied	92%
Choice of data or Measurement methods and procedures	The value is presented in the specifications provided by the manufacturer of the boilers. The baseline fuel is changed from light oil to natural gas.
Purpose of data	Baseline emissions calculation
Additional comment	The baseline fuel is changed from light oil to natural gas. The standard efficiency of newly built natural gas boilers is 90%.

⁷³ <http://www.kotlostroene.com/kotliKV>

Data / Parameter	EF _{FF,CO2}
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor of the fossil fuel that would have been used in the baseline plant obtained from reliable local or national data if available, alternatively, IPCC default emission factors can be used
Source of data	2006 IPCC Guidelines for national Greenhouse Gas Inventories, Volume 2.2 Stationary Combustion, Table 2.2
Value(s) applied	54.30
Choice of data or Measurement methods and procedures	Lower value at 95% confidence interval
Purpose of data	Baseline emissions calculation
Additional comment	The baseline fuel is changed from light oil (naphta) to natural gas

Data / Parameter	NCV _{i,y}
Unit	GJ/t
Description	Net calorific value of the light oil used for emergency cases in year y
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	46.50
Choice of data or Measurement methods and procedures	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of data	Project emissions calculation
Additional comment	

Data / Parameter	EF _{CO2,i,y}
Unit	tCO ₂ /GJ
Description	CO ₂ emission factor of the light oil (naphta) used for emergency cases in year y
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	76.30
Choice of data or Measurement methods and procedures	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Purpose of data	Project emissions calculation
Additional comment	

Data / Parameter	PE _{fugitive,s,y}
Unit	Nm ³ leaked/Nm ³ produced
Description	
Source of data	AMS-III.H, paragraph 42(b)
Value(s) applied	0.05
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Project emissions calculation
Additional comment	

Data / Parameter	D _{CH₄}
Unit	Kg/m ³
Description	Density of methane
Source of data	AMS-III.D ⁷⁴
Value(s) applied	0.670
Choice of data or Measurement methods and procedures	0.670 kg/m ³ at 20 °C and 1 atm pressure
Purpose of data	Project emissions calculation including emissions from incomplete flaring.
Additional comment	

B.6.3. Ex ante calculation of emission reductions

Baseline emissions

The baseline emissions are calculated according to formula (2):

$$BE_y = \{BE_{power,y} + BE_{s,final,y}\}$$

Methane emissions from anaerobic decay of the final sludge produced are determined as per formula (3):

$$BE_{s,final,y} = S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_F * F * 16 / 12 * GWP_{CH4}$$

The data used for the calculation is taken from plants records for year 2012 and is presented in the following table:

Table 18: Quantity of sludge and dry matter in the sludge generated in 2012

⁷⁴

http://cdm.unfccc.int/filestorage/F/J/S/FJS698M3YVDGXR4UOL1NPQTHW0CKZ5/Methodology%20%28SSC%29_AMS-III%20D_EB86a15%28ver20.0%2C%2016Oct15%29.pdf?t=MmF8bndvZGV5fDDC2QPwEh8AwE8LvfdKTNje

Month/Year	Quantity of sludge entering the digesters	Quantity of dry substance in the sludge
	Q_DGs_inlet	S _{final,BL,y}
	[m ³]	[t]
Jan 2012	55,175	2,781
Feb 2012	53,360	2,577
Mar 2012	56,401	2,665
Apr 2012	56,160	3,656
May 2012	57,040	4,252
Jun 2012	54,900	4,669
Jul 2012	57,040	3,833
Aug 2012	57,480	3,501
Sep 2012	52,440	2,808
Oct 2012	54,560	2,750
Nov 2012	54,360	2,854
Dec 2012	57,040	3,414
Total for 2012	665,956	39,760

Source: Plant records (Appendix 4)

The baseline emission reductions are as follows:

$$BE_{s,final,y} = 39,760 * 0.4 * 0.5 * 0.89 * 0.5 * 0.5 * (16/12) * 21 = 49,540 \text{ tCO}_2/\text{y}$$

Baseline emissions for supply of electricity to and/or displacement of electricity from a grid shall be calculated as per formula (4):

$$BE_{grid,y} = EG_{grid,y} \times EF_{grid,y}$$

The electric energy generated by the CHP and displaced from the grid is taken from plants records for years 2010, 2011 and 2012 and is presented in the following table:

Table 19: Electric energy displaced from the grid and thermal energy supplied to the project in the last 3 years before start of the new crediting period

Month/year	El. energy generated (net)	Thermal energy generated	Thermal energy generated
	EG _{grid}	EG _{thermal}	EG _{thermal}
	[MWh _{el}]	[MWh _{th}]	[GJ]
Jan 2010	1,346	1,378	4,961
Feb 2010	1,040	1,065	3,835
Mar 2010	1,067	1,093	3,934
Apr 2010	1,191	1,220	4,392
May 2010	1,036	1,061	3,821
Jun 2010	1,277	1,308	4,709
Jul 2010	1,323	1,355	4,877
Aug 2010	1,190	1,218	4,385
Sep 2010	1,258	1,288	4,637

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Oct 2010	1,515	1,551	5,584
Nov 2010	1,526	1,563	5,625
Dec 2010	1,518	1,555	5,597
Jan 2011	282	288	1,038
Feb 2011	2	2	8
Mar 2011	200	205	737
Apr 2011	1,027	1,051	3,785
May 2011	1,299	1,330	4,789
Jun 2011	1,422	1,456	5,240
Jul 2011	1,573	1,611	5,799
Aug 2011	1,745	1,787	6,432
Sep 2011	1,637	1,676	6,034
Oct 2011	1,702	1,742	6,273
Nov 2011	1,669	1,709	6,151
Dec 2011	1,359	1,392	5,011
Jan 2012	1,307	1,338	4,817
Feb 2012	918	940	3,386
Mar 2012	1,067	1,093	3,934
Apr 2012	1,394	1,427	5,137
May 2012	1,378	1,411	5,081
Jun 2012	1,665	1,705	6,136
Jul 2012	1,721	1,762	6,344
Aug 2012	1,705	1,746	6,286
Sep 2012	1,426	1,460	5,258
Oct 2012	1,728	1,769	6,369
Nov 2012	1,809	1,853	6,669
Dec 2012	1,916	1,962	7,062
Total for 3 years	47,236	48,370	174,132
Yearly average	15,745	16,123	58,044

1 MWh = 3.6 GJ

Source: Plant records (Appendix 4)

$$BE_{\text{grid},y} = 15,745 \times 1.0190 = 16,044 \text{ tCO}_2/\text{y}$$

For thermal energy produced using fossil fuels and/or grid electricity the baseline emissions are calculated as per formula (5):

$$BE_{\text{thermal},\text{CO}_2,y} = \left(\frac{EG_{\text{thermal},y}}{\eta_{\text{EL},\text{thermal}}} \right) \times EF_{\text{FF},\text{CO}_2}$$

$$BE_{\text{thermal},\text{CO}_2,y} = ((58,044/0.92) \times 54.3)/1000 = 3,426 \text{ tCO}_2/\text{y}$$

The total baseline emissions estimated for the project are:

$$BE_y = 49,540 + 16,044 + 3,426 = 69,010 \text{ tCO}_2/\text{y}$$

Project emissions

The project emissions are estimated for the project ex-ante according to the adjusted formula (6):

$$PE_y = PE_{\text{power},y} + PE_{\text{fugitive},y} + PE_{\text{flare},y}$$

For the ex-ante calculations the Project emissions from emergency fossil fuel combustion is estimated as zero because usually there is no need of using emergency fuel:

$$PE_{\text{power},y} = 0$$

The fugitive project emissions are estimated for the needs of the ex-ante calculations at 0.05 of the total methane content in the biogas generated by the anaerobic digesters in the year 2012 which is the last year before start of the new crediting period:

The production of biogas and the methane content in it (at normal conditions) is taken from the plant's records and is presented in Table 19 below:

Table 20: Generation of biogas and methane content for 2012:

Month/year	Biogas captured and combusted	CH ₄ concentration	CH ₄ content in the biogas	Density of CH ₄ (normal conditions)	CH ₄ captured and combusted
	BG _{burnt,y}	W _{CH₄,y}	CH _{4burnt}	D _{CH₄}	CH _{4burnt}
	[m3]	[%]	[m3]	[kg/m3]	[kg]
Jan 2012	892,260	65	579,969	0.670	388,579
Feb 2012	815,280	64	521,185	0.670	349,194
Mar 2012	717,790	65	466,564	0.670	312,598
Apr 2012	862,550	65	560,658	0.670	375,641
May 2012	931,030	65	605,170	0.670	405,464
Jun 2012	870,730	64	557,267	0.670	373,369
Jul 2012	1,000,920	64	640,589	0.670	429,194
Aug 2012	902,850	64	577,824	0.670	387,142
Sep 2012	755,042	64	483,227	0.670	323,762
Oct 2012	1,060,533	63	668,136	0.670	447,651
Nov 2012	985,467	62	610,990	0.670	409,363
Dec 2012	1,078,295	62	668,543	0.670	447,924
Total	10,872,747		6,940,120		4,649,880

$$PE_{\text{fugitive},y} = 4,649,880 \cdot 0.05 / 1000 \cdot 21 = 4,882 \text{ tCO}_2$$

The Project emissions from un-efficient flares are calculated ex ante according to formula (3) omitting the factor GWP_{CH₄}.

$$PE_{\text{flare},y} = 39,760 \cdot 0.4 \cdot 0.5 \cdot 0.89 \cdot 0.5 \cdot 0.5 \cdot (16/12) = 2,359 \text{ tCO}_2/y$$

The total project emissions estimated ex ante are:

$$PE_y = 4,882 + 2,359 = 7,241 \text{ tCO}_2/y$$

Leakage emissions

$$LE_y = 0$$

Emission reductions

$$ER_y = 69,010 - 7,241 = 61,769 \text{ tCO}_2/\text{year}$$

B.6.4. Summary of ex-ante estimates of emission reductions

Year	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage (tCO ₂ e)	Emission reductions (tCO ₂ e)
2013	69,010	7,241	0	61,769
2014	69,010	7,241	0	61,769
2015	69,010	7,241	0	61,769
2016	69,010	7,241	0	61,769
2017	69,010	7,241	0	61,769
2018	69,010	7,241	0	61,769
2019	69,010	7,241	0	61,769
Total	483,070	50,687	0	432,380
Total number of crediting years	7 years 0 months			
Annual average over the crediting period	69,010	7,241	0	61,769

B.7. Monitoring plan**B.7.1. Data and parameters to be monitored**

(Copy this table for each piece of data and parameter.)

Data / Parameter	S_{final,PJ,y}
Unit	t/y
Description	Amount of dry matter in the sludge in the year y
Source of data	Plant's records
Value(s) applied	39,760 (Value for 2012, for ex-ante calculations)
Measurement methods and procedures	Measure the total quantity of sludge entering the digesters on a wet basis. The volume (m3) and density or direct weighing will be used to determine the sludge amount (wet basis). Representative samples will be taken to determine the moisture content to calculate the total sludge amount on dry basis.
Monitoring frequency	The baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a drying beds and landfill without methane recovery. The baseline disposal site is clearly defined, and will be verified by the DOE.
QA/QC procedures	Calculation of baseline emissions
Purpose of data	Baseline calculations
Additional comment	The quantity of sludge delivered to the digesters is equal to the quantity of sludge delivered for dewatering in the baseline.

Data / Parameter	EG_{thermal,y}
Unit	TJ/year
Description	The net quantity of heat supplied by the project activity during the year y
Source of data	Plant records
Value(s) applied	58.044 (For ex-ante calculations)
Choice of data or Measurement methods and procedures	Data Archiving: Paper/ Electronic Monitoring Procedure: Steam thermal energy meter would be used to measure the quantity of heat generated by the boiler Records will be kept for at least 2 years after the last transfer of VERs from the project.
Monitoring frequency	Continuous monitoring, integrated hourly and recorded monthly and yearly
QA/QC procedures	The QA/QC procedures for the measurement devices are described separately for each measurement device (flow meter) in their manufacture instructions. The measurement QA/QC procedures are described in Chapter B.7.3. Quality system ISO 9001:2008 is implemented in the factory and all measurement processes, as device technical descriptions and documentation, position, QA/QC procedures, calibrations, training, temporally replacing procedures etc. are included. The thermal energy meter will undergo maintenance/calibration subject to appropriate industry/country standards.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	EG_{grid,y}
Unit	MWh/year
Description	Electricity generated by the CHP in the year y
Source of data	Installation electricity meters
Value(s) applied	15,745 (For ex-ante calculations)
Measurement methods and procedures	Will be measured ex-post and recorded monthly. Records will be kept for at least 2 years after the last transfer of VERs from the project.
Monitoring frequency	Continuous monitoring. Monthly and yearly recording.
QA/QC procedures	Electricity meters will undergo maintenance/calibration subject to appropriate industry/country standards.
Purpose of data	Baseline emissions calculation
Additional comment	In case records are missing due to meters failure or replacement the electricity consumption for that period and that part of the installation will be estimated by multiplying the installed capacity of the electric motors and devices involved times the working hours of the installation as per plant's records.

Data / Parameter	BG_{burnt,y}
Unit	m ³ /year
Description	Quantity of biogas generated by the anaerobic digesters
Source of data	Plant's records
Value(s) applied	10,872,747 (For ex-ante calculations)
Measurement methods and procedures	The biogas flow is monitored by integrated digital gas-flow meter taking into account the temperature and pressure of the gas. The final result is normalised.
Monitoring frequency	Measured continuously, recorded monthly and yearly.
QA/QC procedures	The gas-flow meter is calibrated every year.
Purpose of data	Project emissions calculations
Additional comment	

Data / Parameter	Q_DGs_inlet
Unit	m ³ /year
Description	Quantity of sludge entering the anaerobic digesters
Source of data	Plant's records
Value(s) applied	665,956 (For ex-ante calculations)
Measurement methods and procedures	Measured by liquid flowmeter. Results are integrated hourly, recorded monthly and yearly
Monitoring frequency	Measured continuously. Results are integrated hourly, recorded monthly and yearly
QA/QC procedures	The flowmeter is calibrated according local regulations.
Purpose of data	Baseline emissions calculation.
Additional comment	

Data / Parameter	ρ_{sludge}
Unit	t/m ³
Description	Dry substance content in the sludge
Source of data	Plant's records
Value(s) applied	0.0596 (Value for 2012, for ex-ante calculations)
Measurement methods and procedures	Laboratory samples. Results are recorded hourly, monthly and yearly
Monitoring frequency	Every hour
QA/QC procedures	The tests are made by an accredited laboratory on-site the plant.
Purpose of data	Baselines emissions calculation.
Additional comment	

Data / Parameter	W_{CH4,y}
Unit	%
Description	Methane content in biogas in the year y
Source of data	Plant's records
Value(s) applied	63.83 (For ex-ante calculations)
Measurement methods and procedures	The fraction of methane in the gas should be measured with a continuous analyser using equipment that can directly measure methane content in the biogas.
Monitoring frequency	Continuously. Aggregated hourly and recorded monthly and yearly.
QA/QC procedures	The gas analyser is checked and calibrated every year.
Purpose of data	Project emissions calculation including emissions from incomplete flaring
Additional comment	The analyser takes into consideration the pressure and temperature of the biogas. The final result is normalized.

Data / Parameter	FC_y
Unit	t/yr
Description	Quantity of fossil fuel (naphta) used for emergency needs in the year y.
Source of data	Plant's records
Value(s) applied	0 (For ex-ante calculations)
Measurement methods and procedures	The yearly quantity is calculated using accounting documents for the purchased quantity of fuel during the reported period the initial and the residual content of the reservoirs.
Monitoring frequency	Yearly
QA/QC procedures	The procedure is included in the ISO 9001:2001 system which is implemented by the plant.
Purpose of data	Project emissions calculations.
Additional comment	

Data / Parameter	V_{t,db}
Unit	m ³ CH ₄ /h
Description	Volumetric flow of the gaseous stream
Source of data	Plant's records
Value(s) applied	-
Measurement methods and procedures	The quantity of biogas is measured continuously
Monitoring frequency	Continuously, calculated for every minute interval
QA/QC procedures	The procedure is integrated in the ISO 9001:2001 system implemented by the plant. The meters are checked and calibrated every year.
Purpose of data	Ex-post project emissions calculation.
Additional comment	

Data / Parameter	F_{CH4}
Unit	KgCH ₄ /year
Description	Mass flow of methane in the residual biogas flared
Source of data	Plant's records
Value(s) applied	-
Measurement methods and procedures	The quantity and quality of biogas is measured continuously and normalized. The mass flow is calculated based on above measurements.
Monitoring frequency	Continuously, calculated for every minute interval
QA/QC procedures	The procedure is integrated in the ISO 9001:2001 system implemented by the plant. The meters are checked and calibrated every year.
Purpose of data	Ex-post project emissions calculation.
Additional comment	For ex-ante calculations no data for mass flow of methane is used but the adapted Formula (3) as per the requirements of AMS-III.H.

B.7.2. Sampling plan

Since proportion of data to be monitored is 100%, there will be no sampling

B.7.3. Other elements of monitoring plan

1. Monitoring objective

The objective of the monitoring plan is to assure the complete, consistent, clear, and accurate monitoring and calculation of the project emission reductions during the whole crediting period. The project owner is responsible for the implementation of the monitoring plan.

2. General information

The Kubratovo WwTP is certified under ISO 14001:2004 by Tuev Nord and has certificate No 44 104 087290, valid until 12 Sept. 2014. The WwTP is also certified under OHSAS 18001:2007 with certificate No 44 116087290, valid until 15.01.2018.

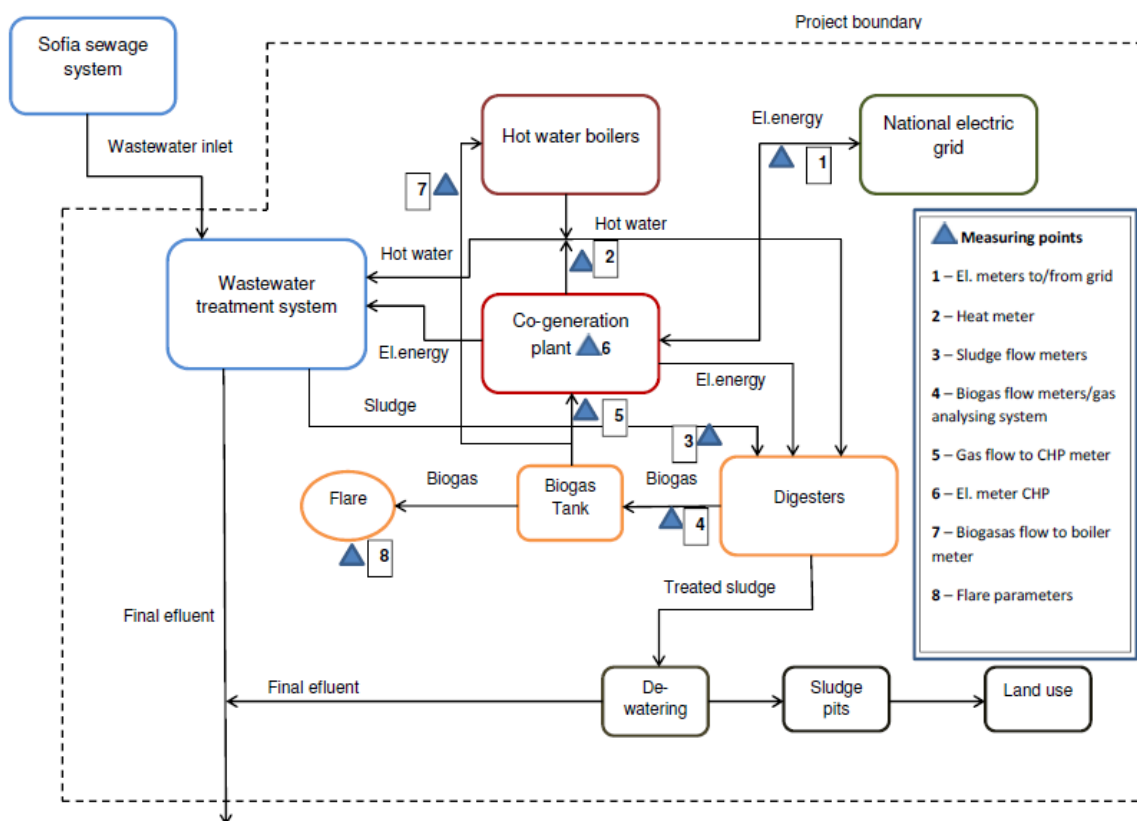
The scope of services is:

“Management and maintenance of water supply and sewerage systems on the territory of Sofia Municipality. Water supply, sewerage and treatment of waste waters services on the territory of Sofia Municipality.”

The operator of the Waste water Treatment Plant is required to comply with the data collection, testing and analysis, and data management obligations of this MP. The operator must integrate the following data collection requirements into the company's data basis and information collection policies.

3. Monitoring data

The following diagramme shows the main measuring points related to the project:



1. Data on CHP plant performance:

- Total electricity generation (MWh/yr)
- Total net heat production (MWh/yr)

The data will be collected and processed on yearly basis

2. Data on biogas generation and sludge:

- Quantity and quality of biogas generated (m³/year)

- Quantity of CH₄ flared (kg/year)
- Quantity of sludge entering digesters (m³/y)
- Quantity of dry substance in the sludge entering digesters (t/y)

The data will be collected continuously and recorded and processed monthly and yearly.

The operator has the responsibility to input the required data feeds on a monthly and annual basis as required in the monitoring methodology and input data templates in the electronic workbook. The workbook should be saved after each update. Back-up copies of the workbook should be saved and stored on a secure system on a monthly basis to avoid loss of information.

The following measuring equipment will be used for monitoring of the project activity:

Table 21: List of measuring equipment

Measuring equipment	Measured variable parameter,	Equipment producer and type	Serial number	Installation date	Date of latest calibration	Periodicity of calibration	Measurement error data	Comments
Automatic gas analyzer, flow-meter system	Methane concentration in the biogas $w_{CH_4,y}$ Methane – 0-100 Vol% Oxygen – 0-25 Vol% Carbon dioxide – 0-100 Vol% H ₂ S – 0-500 ppm Absolute pressure 0-1600 mbar	Draeger, Awite Awiflex	564_09	01 July 2009	08 July 2012	Six months	+/- 1 % for Methane and Carbon Dioxide +/- 0.015 % for temperature	Analysis the content of the biogas (normalised)
Automatic gas analyzer, flow-meter system	Biogas flow $BG_{burnt,y}$ 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 °C to +60 °C	Binder , Combimass eco basic switch bio EEEx de Messsystems	IBExU05AT EX1068	01 July 2009	08 July 2012	Six months	+/-1%	The flow-meter is integral part of the AWITE automatic gas analyzer, flow-meter system.
Digital electric meter	Electricity generated by the CHP $EG_{grid,y}$	Combined device "Integra 1630"; current transformer 200/5	Ser. No 21-091420; annunciator module	July 2009	July 2009 – factory calibrated	4 years	+/- 0.5%	

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			LSB6RGB					
Digital electric meter	Electricity exported to the grid	ABB, AINRTAL-X; Current transformer HMO 110 110/V3//01/V3//0.1 kV; Voltage transformer TMO 126 4x200/5/5/5A	Ser. No 02364831	October 2009	29.12.2008 calibrated by NEC	4 years according to the regulation	+/- 0.5%	The commercial electric meter is property of the electric distribution company (NEC)
Digital electric meter	Electricity exported to the grid	ABB, AINRTAL-X; Current transformer HMO 110 110/V3//01/V3//0.1 kV; Voltage transformer TMO 126 4x200/5/5/5A	Ser. No 02364856	October 2009	06.02.2009, calibrated by NEC	4 years according to the regulation	+/- 0.5%	The commercial electric meter is property of the electric distribution company (NEC)
Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X001	2006	Production	Not required if there are no range changes	Standart Calibration +/-0.5% of rate	Sludge flow meter for Digester 1
Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA-XE/MAG-XE) DE41F	000015791/X003	2006	Production	Not required if there are no range changes	Standart Calibration +/-0.5% of rate	Sludge flow meter for Digester 2

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Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA- XE/MAG-XE) DE41F	000015791/ X004	2006	Production	Not required if there are no range changes	Standart Calibration +/-0.5% of rate	Sludge flow meter for Digester 3
Inlet sludge flow to digester	Sludge Flow in m3/h Qmax:600m3/h Tmax:90°C Q_DGs_inlet	ABB Electromagnetic Flowmeter FXE4000 (COPA- XE/MAG-XE) DE41F	000015791/ X002	2006	Production	Not required if there are no range changes	Standart Calibration +/-0.5% of rate	Sludge flow meter for Digester 4
Automati c gas analyzer, flow- meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder Combimass eco basic switch bio EEx de Messsystems	S.No.C0806 50	01 July 2009	08 July 2012	6 months	+/-1%	Biogas flowmeter for Digester 1 (normalised)
Automati c gas analyzer, flow- meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder Combimass eco basic switch bio EEx de Messsystems	S.No.C0806 47	01 July 2009	08 July 2012	6 months	+/-1%	Biogas flowmeter for Digester 2 (normalised)
Automati c gas analyzer, flow- meter system	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder Combimass eco basic switch bio EEx de Messsystems	S.No.C0806 49	01 July 2009	08 July 2012	6 months	+/-1%	Biogas flowmeter for Digester 3 (normalised)
Automati c gas analyzer, flow- meter	Biogas flow 24 V DC ; max. 3 W; IP 65 by EN 60529 -20 oC to +60 °C BG_{burnt,y}	Binder Combimass eco basic switch bio EEx de Messsystems	S.No.C0806 48	01 July 2009	08 July 2012	6 months	+/-1%	Biogas flowmeter for Digester 4 (normalised)

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system								
Automatic gas analyzer, flow-meter system	Biogas flow to CHPs, Nm ³ /h	Binder Combimass eco ver.2014-02	S.No.C120564	July 2014	March 2014	6 months	+/- 0.25%+0.025% of max calibrated value(4245, 24Nm ³ /h)	The flowmeter is measuring the gas used in the CHPs (normalised) For crosschecking purposes
Turbine gas meter	Biogas flow to boilers 50-1000m ³ /h	Common Turbine gas meter	450345/2011	09.2014	09.2014	1 year	0.2Qmax-Qmax<+/- 1% Qmin-0.2Qmax<+/-2%	The flowmeter is measuring the gas used in the boiler. For crosschecking purposes

4. Responsibility

The management and operation of the project is the responsibility of the Sofiyska voda AD (the project operator). Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project's implementation and operation, for the purpose of achieving trustworthy VERs is the key responsibility of the operator.

The project operator will have responsibility to procure and install all the necessary equipment and data acquisition systems to enable the collection and of the stipulated data at the required frequency, and to manage and present this data in the electronic workbook as part of a wider data management system that will be sufficient to meet the needs of the monitoring and the independent verifier.

The establishment of transparent, auditable systems for the collection and storage of data, including adequate record keeping and data monitoring systems. The operator must develop and implement a protocol that provides for these critical functions and processes, which must be fit for independent auditing.

For electronic and paper based data entry and record keeping system, there must be clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made, so that compliance with requirements can be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, must be outlined to provide for the possibility of electronic system failures and used in the event of such failure. The record keeping system must provide for a paper trail that can be audited.

The operator will appoint a competent manager who will be in charge of and accountable for the generation of VERs including monitoring, record keeping, computation of VERs, audits and verification. The operator will officially sign off on all official paper versions of GHG emission worksheets.

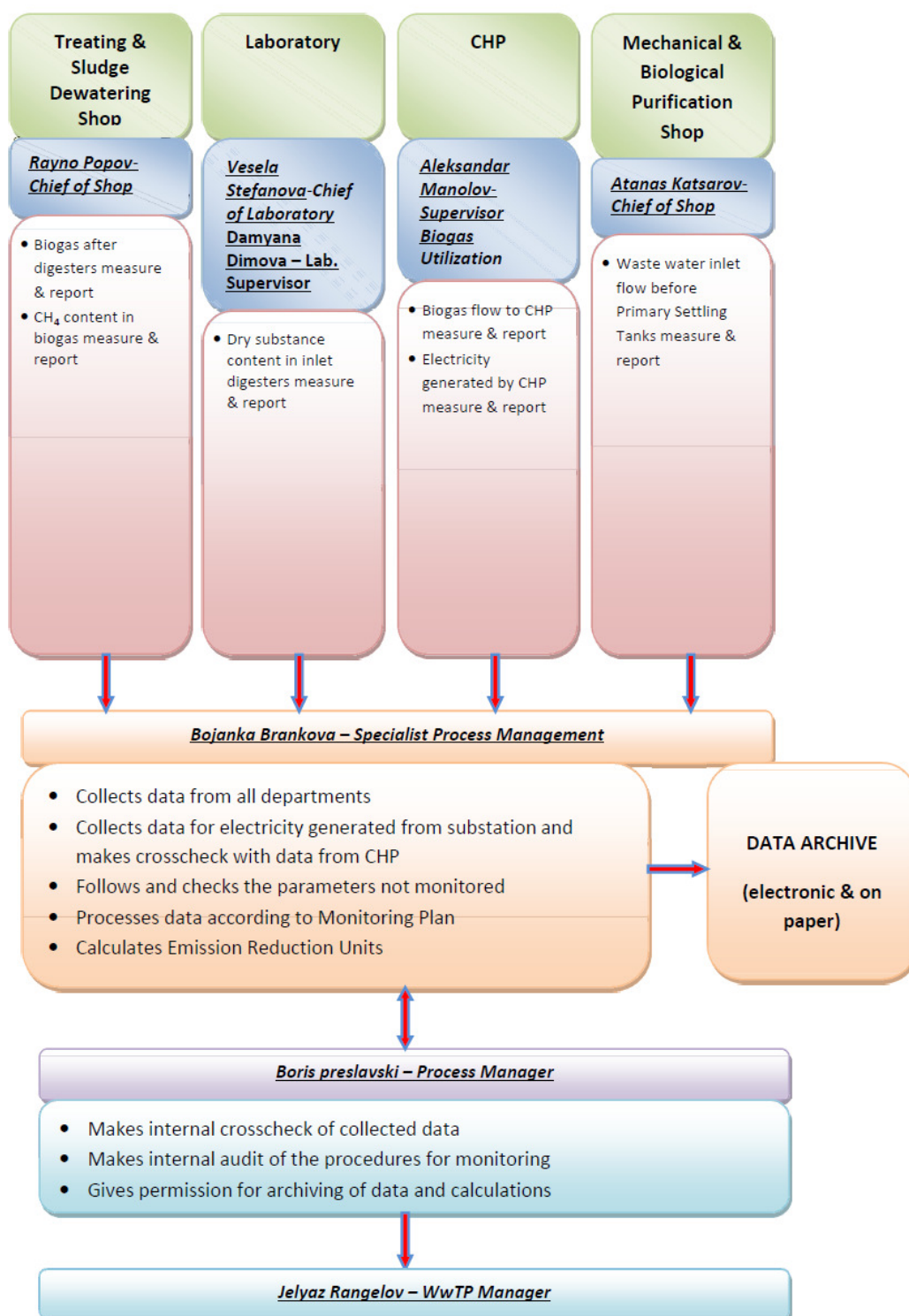
The general project management will be implemented by Mr. Jelyaz Rangelov – Manager of Kubratovo WwTP through supervising and coordinating activities of his subordinates, such as head of laboratory, head of Process Management dept., head of accounting department, head of planning unit. During the daytime a group of mechanics who will be responsible for maintenance of all technological and measuring equipment as well as automation tools will be present on-site.

On-line information will be transmitted to the Process Management chief Mr. Boris Preslavski. His department will calculate finally emission reductions based on this data and will archive all data.

The personnel of Treating and Dewatering of the sludge shop, listing 26 people and headed by the Chief of shop Mr. Rayno Popov are authorized to take all measurements related to the generation of biogas.

The plant laboratory managed by Mrs. Vesela Stefanova and Mrs. Damyana Dimova measure the dry substance content in the sludge at inlet of anaerobic digesters. The data is transferred to the Process Management dept. for further processing.

Flow chart with procedures for monitoring reporting and data flow



5. QA/QC and procedures in case of emergency

The activities outlined here will be undertaken under the ISO 9001:2008 QA/QC system that is implemented in the WwTP. This will ensure that all management and operational systems will meet the requirements of external auditors.

The operator will prepare reports as needed for audit and verification purposes.

The project owner will prepare an annual Monitoring report which should include: information on overall project performance, emission reductions generated and verified and comparison with targets, observations regarding baseline scenario indicators, compliance with sustainable development targets, information on adjustment of key assumptions concepts, calculation methods and other amendments of the monitoring system.

It is the responsibility of the operator to ensure that the required capacity and internal training is made available to its operational staff to enable them to undertake the tasks required by the monitoring process. Initial staff training must be provided before the project starts operating and generating VERs.

In the spirit of capacity building and project co-operation, the operator may want to include in training activities staff from government agencies involved in the project and possibly from other Bulgarian entities involved in GHG reduction projects.

The following table summarises the roles and responsibilities of the various project partners with regard to the monitoring system.

Table 22: Project management and operation system

	SBP Operator and Management
Monitoring system	Review monitoring plan and suggest adjustments if necessary; Develop and establish management and operations system linked with ISO9001:2008; Establish and maintain monitoring system and implement MP.
Data Collection	Establish and maintain data measurement and collection systems for all MP indicators; Check data quality and collection procedures regularly.
Data computation	Enter data in MP workbooks; Use MP workbooks to calculate emission reductions.
Data storage systems	Implement record maintenance system; Store and maintain records (paper trail); Implement sign off system for completed worksheets; Forward monthly and annual worksheet outputs.
Performance monitoring and reporting	Analyse data and compare project performance with project targets; Analyse system problems and recommend improvements (performance management); Prepare and forward periodic reports.
Training and Capacity Building	Develop and establish MP training, skills review and feedback system; Ensure operational staff trained and enabled to meet needs of MP; Consider providing training support to national authorities and other GHG reducing projects.
Quality assurance/Quality control audit and verification	Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification Prepare for, facilitate and co-ordinate audits and verification process

The values metered by the measuring instruments at the output side of the Project plant will be used in the calculation of the Project's emission reductions. Electricity meters are installed to measure the daily electric energy generated by the project activity. If the meter for daily measurement needs to be repaired or calibrated, a reserve meter should be put into operation. In case records are missing due to meters failure or replacement, the electricity generation for that period and that part of the installation will be estimated on a historical basis at similar loads for the same period.

The QA/QC procedures for the thermal energy measurement devices are described separately for each measurement device (flow meter) in their manufacture instructions. QA/QC system ISO 9001:2008 is implemented in the plant and all measurement processes, as device technical description and documentation, position, QA/QC procedures, calibration, training, temporally replacing procedures etc. are included.

For all measurement devices out of the calibration period the maximal error of the device will be used in conservative direction at readings.

Data record will be archived for a period of 2 years after the issuance of the CERs to which the records pertain.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

Date of completion of application of the methodology: 07/07/2015

Contact information of the entity responsible for the application of the selected methodologies:

Organization	Green Carbon Bulgaria Ltd.
Street/P.O. Box	33 "6 th September" str.
Building	-
City	Sofia
State/Region	Sofia
Postcode	1000
Country	Bulgaria
Telephone	+359 888937176
Fax	
E-mail	grozeva@greencarbon-bg.com
Website	
Contact person	Ivona Grozeva
Title	Executive Director
Salutation	Mrs.
Last name	Grozeva
Middle name	Grozeva
First name	Ivona
Department	
Mobile	+359 888937176
Direct fax	
Direct tel.	
Personal e-mail	grozeva@greencarbon-bg.com

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

07 September 2004 – as per the Protocol for opening of the construction site (Appendix 7)

C.1.2. Expected operational lifetime of project activity

Operational lifetime of 25 years 0 months years has been adopted as per JI PDD – ID-BG1000106⁷⁵, section 1.2 and validated by the Determination Report No 743 691⁷⁶, issued by Tuev Sued on 25/01/2006.

C.2. Crediting period of project activity**C.2.1. Type of crediting period**

As per GS TAC decision from September 2014 the crediting period is a renewable 3*7 year period with a maximum of 21 years overall. The starting date of the first crediting period under JI and under a Green Investment Scheme is 1 January 2007. The baseline will get renewed retroactively 2 years prior to the date of registration of the project under Gold Standard.

C.2.2. Start date of crediting period

Two years prior the date of the registration by the Gold Standard Foundation.

C.2.3. Length of crediting period

7 years 0 months (renewable)

⁷⁵ <http://ji.unfccc.int/UserManagement/FileStorage/RNAHXPJKJS6OCL34W7Y91U8FB0DIZ2>

⁷⁶ <http://ji.unfccc.int/UserManagement/FileStorage/AY829537NMFZCB0ROTQGXDIV1LE4PS>

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

In 2005 the Environmental impacts of the project have been assessed according to the requirements of the Bulgarian Environmental Protection Act by the Regional Environmental Directorate, and they have been considered negligible. The Ministry of Environment and Water has issued a Decision that the project does not require an Environmental Impact Assessment (EIA) - attached to the PDD. The letter confirms that as a result of the realization of the project it is not expected increase in the air, water or soil pollution, or negative impacts on the local fauna and flora. Moreover, the process of wastewater treatment itself is a prerequisite and leads to the restoration and maintenance of species' diversity along the nearby Iskar river.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The Local stakeholder consultation process was organised according to the requirements of Gold Standard V 2.2.

Sofyiska Voda invited a wide range of stakeholders, covering the categories suggested by Gold Standard. In addition to the relevant governmental institutions were invited local and international NGOs, as well as representatives of GS.

All invitees were invited at least 2 weeks before the meeting for confirmation of their presence (as required by the Gold Standard V 2.2). The invitations were sent mainly via mail, but also using e-mail. Sofyiska voda attempted to contact almost all of the invitees in order to receive a confirmation.

In order to invite stakeholders from Category A (Local People), announcements were published in one national newspaper, three news websites, on the information board of the head office of Sofyiska voda and the WWTP Kubratovo, as well as on the web page of Sofyiska Voda:

The meeting took place on April 15th, 2015 in Sofia, Kubratovo WWTP. 15 stakeholders attended the meeting representing a diverse group of stakeholders from ministries, agencies and NGOs.

E.2. Summary of comments received

After the presentation of the project a discussion was held and questions were posed. The stakeholders performed the Blind SD Matrix exercise and filled in evaluation forms.

A few questions rather than comments were raised:

- Would the employees working on the project have been hired in the absence of project?
- What is the produces heat used for?
- How is the remaining sludge after the process managed?
- Is there any information about the effect of the sludge/soil fertilizer on the soils?

E.3. Report on consideration of comments received

The overall evaluation of the meeting by the participants was very positive. The attendees expressed opinion that the project should be better publicized in order to serve as an example.

No negative comments/remarks were received. All the questions raised were answered accordingly.

A detailed description of the Local stakeholders consultation process is given in the LSCR.

SECTION F. Approval and authorization

The project has been issued a Letter of Endorsement (LoE) by the Bulgarian Ministry of Environment and Water stating that the Ministry will cancel AAUs from the Bulgarian Register corresponding to the quantity of the verified emission reductions generated by the project. The LoE is available for inspection by DOE.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Sofiyska voda AD
Street/P.O. Box	Business Park Sofia, Mladost 4
Building	2A
City	Sofia
State/Region	Sofia
Postcode	1766
Country	Bulgaria
Telephone	+359 2 812 25 30
Fax	+359 2 974 45 14
E-mail	sstanev@sofiyskavoda.bg
Website	www.sofiyskavoda.bg
Contact person	Stanislav Stanev
Title	Operations and Maintenance Director
Salutation	Mr.
Last name	Stanev
Middle name	Stanislav
First name	Head office
Department	
Mobile	+359 2 974 45 14
Direct fax	+359 2 812 25 30
Direct tel.	sstanev@sofiyskavoda.bg
Personal e-mail	Sofiyska voda AD

Project participant and/or responsible person/ entity	☐ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Green Carbon Bulgaria Ltd.
Street/P.O. Box	33 "6 th September" str.
Building	-
City	Sofia
State/Region	Sofia
Postcode	1000
Country	Bulgaria
Telephone	+359 888937176
Fax	

E-mail	grozeva@greencarbon-bg.com
Website	
Contact person	Ivona Grozeva
Title	Executive Director
Salutation	Mrs.
Last name	Grozeva
Middle name	Grozeva
First name	Ivona
Department	
Mobile	+359 888937176
Direct fax	
Direct tel.	
Personal e-mail	grozeva@greencarbon-bg.com

Appendix 2. Affirmation regarding public funding

ODA uploaded at GS Registry.



ANNEX D - OFFICIAL DEVELOPMENT ASSISTANCE DECLARATION

Date: 30th October 2015

The Gold Standard Foundation

79 Avenue Louis Casai

Geneva Cointrin, CH-1216

Switzerland

RE: Declaration of Non-Use of Official Development Assistance by Project Owner of GS 4238

STANISLAV STANEV

I hereby declare that I am duly and fully authorized by the Project Owner of the above-referenced project to act on behalf of all Project Participants and make the following representations:

I. The Gold Standard Documentation

I am familiar with the provisions of The Gold Standard Documentation relevant to Official Development Assistance (ODA). I understand that the above-referenced project is not eligible for Gold Standard registration if the project receives or benefits from Official Development Assistance with the condition that some, or all, of the carbon credits [CERs, ERLs, or VERs] coming out of the project are transferred to the ODA donor country. I hereby expressly declare that no financing provided in connection with the above-referenced project has come from or will come from ODA that has been or will be provided under the condition, whether express or implied, that any or all of the carbon credits issued as a result of the project's operation will be transferred directly or indirectly to the country of origin of the ODA.

II. Duty to Notify Upon Discovery

If I learn or if I am given any reason to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the project, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the carbon credits generated from the project as a condition of investment, I will notify The Gold Standard immediately using the Amended ODA Declaration Form provided below.





III. Investigation

The Gold Standard reserves the right to conduct an investigation into any project it reasonably believes may be receiving ODA with the condition that some or all of the carbon credits from the project will be transferred to the ODA donor country.

IV. Sanctions

I am fully aware that the sanctions identified in The Gold Standard Terms and Conditions may be applied to me or the above-referenced project in the event that any of the information provided above is false or I fail to notify The Gold Standard of any changes to ODA in a timely manner.

I swear that all of the statements contained herein are true to the best of my knowledge.

Signed:  _____

Name: STANISLAV STANEV _____

Title: OPERATIONS AND MAINTENANCE DIRECTOR _____

On behalf of: SOFIYSKA VODA AD _____

Place: SOFIA _____

Appendix 3. Applicability of methodology and standardized baseline

Print-screen of the EF calculation table

The screenshot shows an Excel spreadsheet with the following structure:

- Operating Margin (OM) Options:**
 - 1. Simple OM: Option A (Data: 1.1842, Calculation: 0.50), Option B (Data: 1.1842, Calculation: 0.50)
 - 2. Simple adjusted OM: Data: 1.1842, Calculation: 0.50
 - 3. Dispatch data analysis OM: Option 1 (Data: 1.1842, Calculation: 0.50), Option 2 (Data: 1.1842, Calculation: 0.50)
 - 4. Average OM: Option A (Data: 1.1842, Calculation: 0.50), Option B (Data: 1.1842, Calculation: 0.50)
- Build Margin (BM):**
 - BM [CO₂/MWh] = 0.8639, W_{BM} = 0.50
- Weighted OM & BM:**
 - OM [CO₂/MWh] = 1.1842, W_{OM} = 0.50
 - BM [CO₂/MWh] = 0.8639, W_{BM} = 0.50
 - Combined Margin [CO₂/MWh] = 1.0190

Appendix 4. Further background information on ex ante calculation of emission reductions

Plant records for 2012 – sludge treated

ЕЖЕМЕСЕЧНА СПРАВКА ЗА ЕКСПЛОАТАЦИОННИ ПАРАМЕТРИ - СПСОВ
Януари 2012 г. - Декември 2012 г.

Месец/Година	Q - BxMT	Q - BxMT	Биогаз	Биогаз - [CH ₄]	Биогаз - Соече	Биогаз - ПКЦ	Пр-во топлин. ПКЦ(биогаз)	Биогаз - CHP	Пр-во ел.ен - CHP
	Q DGs_inlet	Q DGs_inlet	BG outlet DGs	CH ₄ concentration	BG to Flares	BG to Boilers	Boilers output	BG to CHP	CHP output
	[m ³ /w]	[m ³ /w]	[m ³ /w]	[%]	[m ³ /w]	[m ³ /w]	[MWt/w]	[m ³ /w]	[MWt/w]
Jan 2012	55175	2781	862280	65	1483	143811	676	746966	1306.6
Feb 2012	53360	2577	815280	64	1967	200551	985	603752	918.4
Mar 2012	56401	3045	717780	65	3000	144697	681	508833	1067.5
Apr 2012	56160	3056	862590	65	27000	81415	383	754135	1359.6
May 2012	57040	4252	831030	65	62725	77957	366	770348	1378.3
Jun 2012	54900	4689	870730	64	7517	3348	15	880066	1664.6
Jul 2012	57040	3833	1000620	64	55900	15270	72	928750	1720.9
Aug 2012	57480	3501	902850	64	30642	0	0	882308	1705.1
Sep 2012	53460	3038	755042	64	35232	0	0	738750	1456.2
Oct 2012	54550	2,799	1,040,533	63	64467	3787	18	982279	1727.6
Nov 2012	54360	2,854	965,467	62	27667	10720	50	947051	1806.1
Dec 2012	57040	3,414	1,079,245	62	15292	37183	175	1024820	1812.7

Plant records for 2010 – 2012 – el. energy, thermal energy generated

ЕЖЕМЕСЕЧНА СПРАВКА ЗА ЕКСПЛОАТАЦИОННИ ПАРАМЕТРИ - СПСОВ
Януари 2012 г. - Декември 2012 г.

Месец/Година	Q - BxMT Q_DGs_inlet [m³/s]	Q - BxMT_CB Q_DGsInlet_DS [m³/s]	Q - ФП_СОВ Q_FPs_OGS [m³/s]	Биогаз BG outlet DGs [m³/s]	Биогаз - [CH4] CH4 concentration [%]	Биогаз - CHP BG to CHP [m³/s]	Пр-во ел.ен - CHP CHP output [MWh/s]
Jan 2010	40070	3237		70204	63	71346	1347.9
Feb 2010	36146	1556		58530	63	57044	1040.3
Mar 2010	37440	1708		54000	63	51747	1007.1
Apr 2010	36340	1564		63930	62	62900	1161.4
May 2010	37040	2487		57000	62	55900	1056.4
Jun 2010	40084	2707		67400	63	67200	1277.4
Jul 2010	46740	2931		70530	64	68543	1323.9
Aug 2010	40000	2827		70000	64	61000	1106.6
Sep 2010	42040	2340		67630	65	64332	1217.9
Oct 2010	45000	3133		70000	65	74700	1514.8
Nov 2010	47000	2921		74000	62	74000	1500.0
Dec 2010	50480	3703		74000	63	74400	1518.3
Jan 2011	51816	706		77000	64	77400	1561.7
Feb 2011	5154	58		10540	66	10540	2.1
Mar 2011	47882	1406		34300	64	33867	100.8
Apr 2011	48000	2218		57740	64	57482	1026.7
May 2011	50000	2501		68000	64	68000	1200.2
Jun 2011	5244	2606		88000	63	88000	1481.5
Jul 2011	55216	2641		88000	62	85700	1575.0
Aug 2011	51654	2675		91000	64	91000	1744.7
Sep 2011	48880	2412		95130	63	92000	1636.8
Oct 2011	50117	3230		102500	63	94700	1701.6
Nov 2011	52000	2675		90700	62	89000	1668.7
Dec 2011	53000	3703		84600	63	73000	1350.3
Jan 2012	55175	2781		88200	65	74000	1306.6
Feb 2012	53540	2677		81000	64	60700	918.4
Mar 2012	54401	2405		71700	65	50800	1007.2
Apr 2012	56160	2606		80200	65	75432	1395.6
May 2012	67040	4052		90100	65	77040	1378.1
Jun 2012	64000	4800		87000	64	80000	1400.6

Справка За Месечен и Годишен Разход на Ел. Енергия - 2012 г.					
Отдел / cost center	ТОУ/1324	ПКЦ/1327	Газ-генератор и произвед ена	Газ-Генератори продаде на	Общо по месеци по електро мер на НЕК
Януари	283,529	112,153	1,277,109	4,992	1,282,007
Февруари	300,571	123,552	896,317	352	1,731,692
Март	298,550	75,483	1,049,966	33	1,304,093
Април	273,260	63,991	1,370,988	2,236	617,403
Май	275,159	89,108	1,351,090	6,457	547,814
Юни	282,046	96,473	1,650,806	52,822	170,935
Юли	266,914	106,576	1,695,284	161,005	150,089
Август	268,031	107,540	1,665,612	68,156	136,557
Септември	233,577	90,636	1,404,408	74,784	332,225
Октомври	257,199	116,218	1,697,583	103,556	212,583
Ноември	249,336	127,703	1,772,624	75,045	144,125
Декември	269,109	134,407	1,892,184	22,398	270,004
Общ Год. Разход (kWh):	3,257,281	1,243,840	17,723,971	571,836	6,899,527

Appendix 5. Further background information on monitoring plan

N/A

Appendix 6. Summary of post registration changes

N/A

Appendix 7. Additional information

Protocol for opening of the construction site.

ПРИЛОЖЕНИЕ № 2

ОБЩЕСТВО С ОГРАНИЧЕНА ОТГОВОРНОСТ

АГЕНСТВО ПО КОНСУЛТАЦИИ

по чл. 107, ал. 3, т. 2

№ КОО-001/14.07.04г.

РАБОТА С КОПИЯТА

Получено: *[Signature]*

Приложение № 2 към чл. 7, ал. 3, т. 2
(Образец 2)

Строеж: *РЕКОНСТРУКЦИЯ НА СПОРТ-СТАДИОНА ЗА ДИСКОВЕ*

Местонахождение: *С. БЛАГОЕВО, М. БЛАГОЕВЦИ*

Възложител: *СОФИЙСКА ВРРА "ЯД"*

Консултант (строителен надзор): *ОФИНВЕСТ ВРРА*

Технически ръководител: *ИНЖ. ДИМИТ СТОЙЧЕВ ОСМАНИДОВ*

Строител: *ПАСИДАНТ "БЪЛГАРИЯ" ЕООД*

ПРОТОКОЛ

за откриване на строителна площадка

02.09.04г.

Днес, ... Г., долуподписаният:

А. Консултант(строителен надзор) *Борислав Стоянов*

Борислав - *УПРАВИТЕЛ*

(трите имена по документ за самоличност и длъжност)

в присъствието на:

Б. Възложителя: *Благодър Владислав Благодър*

НАЧАЛНИК СПСОВ

(трите имена по документ за самоличност и длъжност)

В. Строителя: *Петър Ламини*

(трите имена по документ за самоличност и длъжност)

съставих този протокол, с който удостоверявам:

1. За строежа е издадено разрешение за строеж № *205* от *18.07.2003* г.

от *Д.А.Г.* на *СОФИЙСКА ВРРА "ЯД"*

(гл. архитект на община) (имената на собствениците на терена и строежа)

съгласно: документ (и) за собственост и/или за учредяване право на строеж и др.: *АКТ № 899 ЗА НАБЕЛЖИНА ОБЩИНСКА СОБСТВЕНОСТ*

2. Налице са следните разрешения и документи: *ОТ 06.09.1999г.*

2.1. За заемане на тротоар (част от него и/или част от уличното платно)

(№ от Г. на)

2.2. За преминаване на строителна и транспортна техника през централни градски части и др. зони с ограничен режим за преминаване:

(№ от Г. на)

2.3. За ограждане на строителната площадка с временна плътна ограда с височина м, разположена по страничните регулационни линии (имотни граници) и спрямо уличната регулационна линия съгласно скица № от Г., издадена от

2.4. За извозване на хумус: (№ от Г. на)

2.5. За извозване на земни маси: (№ от Г. на)

2.6. За извозване на строителни отпадъци: (№ от Г. на)

2.7. За изкореняване (отсичане) на съществуващи дървета и др.: (№ от Г. на)

3. Изходните точки на външните връзки със съществуващата техническа инфраструктура са:

3.1. За временен водопровод: съгласно

3.2. За временна канализация: съгласно

3.3. За временно сл. захранване: съгласно

3.4. съгласно

4. Описание на строителната площадка:

(окомерна скица на площадката)

4.1.

(Прави се подробен опис на състоянието на строителната площадка)

4.2. В НАДПОДЗЕМНА БИЗАРСТ. ДР. СЪЩЕСТВУВАЩИ НАДЗЕМНИ И ПОДЗЕМНИ СЪОРЪЖЕНИЯ И КОМУНИКАЦИИ

(Описват се налични в зоната на строителната площадка строежи, действащи на надземни и подземни съоръжения и комуникации, които подлежат на преместване)

4.3. НАМА

(Описание на постройки, подлежащи на събаряне; на съоръжения, подлежащи на преместване; на насаждения, подлежащи на изкореняване и изсичане)

4.4. БЭТРОШНИ РЭТКА

(Описва се как ще се осъществява достъпът до строителната площадка)

4.5.

(други)

5. Състоянието на околното пространство е:.....

(Описва се състоянието - поземлени имоти, терени, зелени, площи, улици, тротоари)

6. Предвидени мерки по ПОИС (РПОИС) за осигуряване на безопасни и здравословни условия на труд:

СЪГЛАСНО ПОДС

(Описват се)

Забележка при съставяне на протокола:.....

Составитель:  

А.  В.  С.  Д.  Е.  Ж.  З. 

София

Б.

(Handwritten signature)

Забелешки:

1. Всички описани по-горе документи са неразделна част от настоящия протокол и копия от тях се прилагат към него.
2. Настоящият протокол се съставя в четири еднообразни екземпляра - по един за общината (района), за възложителя, за строителя и строителния надзор и заедно с приложените към него се съхранява от посочените лица.
3. Попълват се само необходимите данни, свързани със спецификата на строежа.
4. При поэтапно изпълнение (в случай на промишлено строителство, линейни строежи и др.) настоящият протокол може да се състави за всеки етап поотделно.
5. Екземпляр от настоящия протокол се съхранява на местостроежа за представяне на контролните органи при проверка.

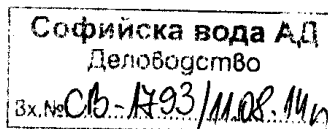
СЕРТИФИКАТ
 ПОДПИСАНИЕ КОНСУЛТАТА
 /ИЗДАНИЕ 587/
 № К000001/14.07.04г.
 ГАРИНС, ПРИКЛИНАЛА
 Подпись: *[Signature]*

СОФИНВЕСТ
 ЕООД



РЕПУБЛИКА БЪЛГАРИЯ

МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ



Изм. №: 26-00-1543
 София, 06.08.2014 г.

ДО
 СОФИЙСКА ВОДА АД
 Бизнес парк София,
 Сграда 2А, Младост 4
 1766 София

ПИСМО ЗА ПОДКРЕПА

Министерство на околната среда и водите принципно подкрепя предложената проектна идея

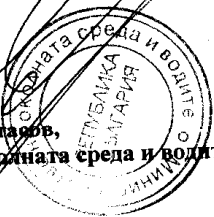
Предложение №/Дата	26-00-1543/27.05.2014 г.
Наименование	Улавяне на метан и комбинирано производство на енергия в Пречиствателна станция „Кубратово“
Местоположение на проекта	Площадката на Софийската пречиствателна станция за отпадъчни води в близост до селище Кубратово, област София, България
Доставчик	„Софийска вода“ АД

за сертифицирането на проекта по доброволен „Златен стандарт“ под условие, че проектът не води до двойно отчитане на редуцираните емисии парникови газове и потвърждава, че може да анулира Предписани емисионни единици (ПЕЕ) от първия период на действие на Протокола от Киото (ПК1) до изтичане на допълнителния период за изпълнение на задълженията по ПК1, с цел конвертирането им в доброволни намаления на емисии, генерирани чрез проекта през втория период на действие на Протокола, след представяне на верификационен доклад.

След края на допълнителния период за изпълнение на задълженията по Протокола от Киото (ПК) Министерство на околната среда и водите ще може да анулира съответното количество ПЕЕ, издадено на страната за първия период на ПК, равняващо се на верифицираните редукции на емисии от проекта при наличието на следните условия:

1. Представяне на доклад, заверен от независим оторизиран верификатор, гарантиращ за надеждността на данните, и в който е посочен размерът на реализираните редукции на емисии;
2. Наличие на правила на международно и в частност на европейско ниво, които да позволяват доброволно канселиране на издадените през първия период Предписани емисионни единици;
3. Невъзникване на допълнителни задължения и тежести, вкл. финансови, за Министерство на околната среда и водите (МОСВ);
4. Липса на двойно отчитане на редуцираните емисии.

Станислав Анастасов,
Министър на околната среда и водите



Indicative offer - confidential

Page 1 of 2

Simidchiev, Dobri

From: lieseE@ebrd.com
Sent: 13 Октомври 2004 г. 21:46
To: Starling, Kevin; Ordman, David
Cc: Faitondjiev, Georgi; Simidchiev, Dobri; RussellH@ebrd.com; Tsanoval@SOF.EBRD.com; LigorJ@ebrd.com
Subject: Indicative offer - confidential

Dear Kevin, David,

Following our recent discussions, I would like to confirm the interest of the EBRD in considering purchasing, for the account of the Netherlands, the Carbon Credits arising from your waste water treatment project. I have to add that any such purchase will be subject to satisfactory results of evaluation and negotiations: (i) negotiation of detailed terms for the transaction, satisfactory to you and to the Bank; (ii) formal approval by the Bank's management; (iii) negotiation and execution of appropriate documentation; (iv) the fulfilment of all applicable conditions precedent (like obtaining approval from the Bulgarian and Dutch Governments).

See attached a model for the possible cash flows from the carbon transaction. Basically the fund could offer three variables, which are: the price per tonne, level of advance payment and penalty. All these will have an effect on the attractiveness of the possible offer. Depending on your ability to mitigate the risks or to structure the project, all of these have a different value for you. To summarise:

I calculated with three options. 1. no advance payment; 2. advance payment of 50% during construction and 3. payment over 7 years (one year advance payment). For all of these options there could a penalty. This penalty is the lower of 2 times the contracted price or the market price minus contracted price.

	option 1	option 2	option 3
penalty	EUR 4.75	EUR 4.50	EUR 4.75
no-penalty	EUR 4.50	EUR 4.25	EUR 4.50

On the subject to see if you obtained the right value for your carbon potential, I attached the CDM & JI Monitor of today. This publication is prepared by Point Carbon (www.pointcarbon.com). On page 1 they give an overview of recent deals. Two JI deals are mentioned: one about 1 million tonnes for EUR 4 per tonne and another almost 4 million for EUR 5 per tonne. The first deal is big (which is of interest for me as buyer, less development cost), but the EBRD knows your company well, so the Fund is willing to pay more than this first deal. The other is an even bigger project and therefore an very interesting deal, especially as syndication of the total volume is possible. The price of this deal is therefore a bit higher than the offer.

Again, I believe this is a good and fair offer for the carbon credits. Let me know if you agree.

If you have any questions, don't hesitate to contact me. I will be on a team retreat the coming two days and back in office on Monday.

I am looking forward to working further with you.

14.10.2004 г.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Editorial improvement
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for small-scale CDM project activities (these instructions supersede the "Guidelines for completing the project design document form for small-scale CDM project activities" (Version 01.1)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Error! Reference source not found.; • Change the reference number from <i>F-CDM-SSC-PDD</i> to <i>CDM-PDD-SSC-FORM</i>; • Editorial improvement.
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	13 March 2012	EB 66, Annex 9 Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities"
03.0	15 December 2006	EB 28, Annex 34 • The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02.0	08 July 2005	EB 20, Annex 14 • The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at http://cdm.unfccc.int/Reference/Documents.
01.0	21 January 2003	EB 07, Annex 05 Initial adoption.
Decision Class: Regulatory		
Document Type: Form		
Business Function: Registration		
Keywords: project design document, SSC project activities		