



**Verified Carbon
Standard**

NANNING LANDFILL GAS POWER GENERATION PROJECT



south pole
Carbon Asset Management Ltd.

Document Prepared by Swiss Carbon Value Ltd.

Contact Information s.yang@southpole.com

Project Title	Nanning Landfill Gas Power Generation Project
Version	Version 1.1
Date of Issue	22-04-2021
Prepared By	Swiss Carbon Value Ltd.
Contact	Technoparkstrasse 1, 8005 Zurich, Switzerland, +41 43 501 35 50, s.yang@southpole.com , www.southpole.com

CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Project	4
1.2	Sectoral Scope and Project Type	4
1.3	Project Eligibility	5
1.4	Project Design	5
1.5	Project Proponent	5
1.6	Other Entities Involved in the Project	5
1.7	Ownership	5
1.8	Project Start Date	6
1.9	Project Crediting Period	6
1.10	Project Scale and Estimated GHG Emission Reductions or Removals.....	6
1.11	Description of the Project Activity.....	7
1.12	Project Location	8
1.13	Conditions Prior to Project Initiation	10
1.14	Compliance with Laws, Statutes and Other Regulatory Frameworks	10
1.15	Participation under Other GHG Programs	10
1.16	Other Forms of Credit	10
1.17	Additional Information Relevant to the Project	11
2	SAFEGUARDS	11
2.1	No Net Harm.....	11
2.2	Local Stakeholder Consultation	12
2.3	Environmental Impact	13
2.4	Public Comments.....	14
2.5	AFOLU-Specific Safeguards	14
3	APPLICATION OF METHODOLOGY	14
3.1	Title and Reference of Methodology	15
3.2	Applicability of Methodology.....	15
3.3	Project Boundary	20
3.4	Baseline Scenario	22
3.5	Additionality.....	23

3.6	Methodology Deviations.....	23
4	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS.....	23
4.1	Baseline Emissions.....	23
4.2	Project Emissions.....	38
4.3	Leakage	39
4.4	Net GHG Emission Reductions and Removals.....	39
5	MONITORING.....	42
5.1	Data and Parameters Available at Validation	42
5.2	Data and Parameters Monitored	51
5.3	Monitoring Plan	61

1 PROJECT DETAILS

1.1 Summary Description of the Project

Nanning Landfill Gas Power Generation Project (hereafter referred to as the project) is located at Pingli Landfill Site in Xingning District, Nanning City, Guangxi Zhuang Autonomous Region, P.R China. The project is owned by Guangxi Ruihong Energy Technology Co., Ltd. (hereafter referred to as the project owner). The project has obtained the approval letter from Nanning City Administrative Approval Bureau on 22/05/2018. The project started construction on 30/09/2019 and started operation on 03/04/2020. The total installed capacity will be 5.8MW, consisting of 6 sets of 0.966MW generator. The feed-in electricity is estimated to be 365,083 MWh during the fixed 10 years crediting period.

The Pingli landfill site began operation in 2016, with an aggregate designed capacity of 6,060,000 m³ and an operational lifespan of 10.5 years. It will handle an average of 1,135 tonnes MSW per day which is mainly from the Nanning City.

Before the implementation of the project activity, no gas extraction and utilization systems existed and the LPG was emitted into the atmosphere directly. The electricity is provided by South China Power Grid (SCPG) which is dominated by coal-fired power stations. This is the scenario that existed prior to the implementation of the project activity and is also the baseline scenario.

In absence of the project, equivalent amount of electricity exported to the grid by the project would have otherwise been supplied by SCPG. Greenhouse gas (GHG) emissions will be reduced by avoiding CO₂ emissions from those fossil fuel-based power plants connected to the grid and by avoiding GHG emissions from releasing LFG into atmosphere at the landfill site.

The purpose of the project is to utilize landfill gas (LFG), which consists mainly of methane, for electricity generation. It includes LFG collection system, LFG pre-treatment system, electricity generation system and flare system. LFG collected will be used for electricity generation with internal combustion generators. Meanwhile, the flare will only be involved when the electricity generation system is not in operation, hence, the project developer determined that VERs from flare will not be claimed, even if any methane is destroyed by flare during the crediting period. VERs will only be claimed from the methane destroyed by power generation system and the power displacement. The expected average annual emission reductions are 231,811 tCO₂e during the fixed 10 years crediting period. The total estimated emission reductions over the crediting period of the project will be 2,318,113 tCO₂e.

1.2 Sectoral Scope and Project Type

The project falls into sectoral scope 01: energy industries (renewable-/non-renewable sources) and sectoral scope 13: Waste handling and disposal.

The project is not a grouped project.

1.3 Project Eligibility

The project is an LFG power generation project, utilizing landfill gas (LFG), which consists mainly of methane, for electricity generation, which is eligible under the scope of the VCS Program.

1.4 Project Design

The project is not a grouped project.

1.5 Project Proponent

Organization name	Guangxi Ruirong Energy Technology Co., Ltd.
Contact person	Ouyang Yuewen
Title	Carbon Management Department Manager
Address	Xingning District, Nanning City, Guangxi Zhuang Autonomous Region, China
Telephone	+86 17707313599
Email	ouyangyuewen@chinawaterind.com

1.6 Other Entities Involved in the Project

Organization name	Swiss Carbon Value Ltd.
Role in the project	Project developer
Contact person	Renat Heuberger
Title	CEO
Address	Technoparkstr. 1, 8005, Switzerland.
Telephone	+41 43 501 35 50
Email	registration@southpolecarbon.com

1.7 Ownership

The approval for the project issued by Nanning City Administrative Approval Bureau and approval of Environmental Impact Assessment (EIA) issued by Nanning City Xingning District Environmental

Protection Bureau established the project ownership to Guangxi Ruirong Energy Technology Co., Ltd. The main contracts¹ established the property and contractual right in the plant and equipment that generate GHG emission reductions.

1.8 Project Start Date

03/04/2020, the commissioning start date.

1.9 Project Crediting Period

This project adopts the fixed crediting period of 10 years, from 03/04/2020 to 02/04/2030 (the start and end dates included).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
03/04/2020-31/12/2020	176,456
2021	254,289
2022	268,582
2023	279,980
2024	289,291
2025	297,074
2026	262,011
2027	196,560
2028	150,932
2029	118,783
01/01/2030-02/04/2030	24,155

¹ LFG generator contract; construction contract.

Total estimated ERs	2,318,113
Total number of crediting years	10
Average annual ERs	231,811

1.11 Description of the Project Activity

As described in section 1.1., the scenario existing prior to the implementation of the project is the operation of the landfill with uncontrolled emission of the LFG generated to the atmosphere, i.e. the LFG generated due to the decomposition of the organic matter is vented through the vertical wells installed at the landfill's area.

Emissions associated with the baseline scenario are the CH₄ emissions due to the atmospheric release of the LFG and CO₂ emissions due to the power generation from fossil-fuel power plants. With the implementation of the project, the LFG previously released will be collected through the installation of pipelines and emission reductions will be achieved through the destruction of the gas collected in the power plant. Additionally, the project will export renewable electricity to the grid, avoiding the dispatch of the same amount of electricity from fossil-fuel based power plants in the SCPG. Therefore, none of the equipment installed in the project activity exists in the baseline scenario.

The project consists of the installation of an LFG collection system, an LFG pre-treatment system, an electricity generation plant, and a flare system.

LFG collection system

The landfill gas collecting system is a gas pipeline network, consisting of gas collecting wells, gas collecting pipelines, and gas collection blower. LFG will be extracted by gas collection blower and transported by pipeline from gas collection wells.

LFG pre-treatment system

Prior to electricity generation, LFG must be pre-treated to remove its impurities and moisture, etc., to prevent corrosion in the generators. According to the EIA, the pre-treatment system consists of six equipment: 1) Impurity Filter to remove the impurity in LFG primarily; 2) Condenser to remove the water in LFG; 3) Gas-liquid Separator to remove the liquid in LFG further; 4) Fan Blower to boost the LFG; 5) Heat Exchanger to cool down the gas; 6) Advanced Impurity Filter to remove the impurity thoroughly.

The LFG pre-treatment procedure and the main equipment are shown as the following chart:

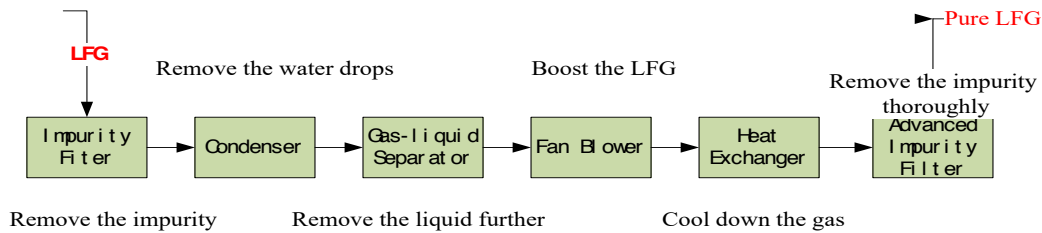


Figure 1 The flow chart of the LFG pre-treatment system

Power generation and grid connection system

A power plant will also be installed in order to generate electricity with the LFG captured. It adopts internal combustion engine generating sets. 6 sets with each capacity of 0.966MW have been installed for power generation. The electricity will be exported to SCPG.

This is a well-known and high reliable technology for biogas utilization. Furthermore, internal combustion engine generating sets have modular design and are available in many different sizes permitting the installation of power plant step by step as the LFG flow increases. High performance and reliability are guaranteed for the equipment.

The detailed information about the technology of the project is shown in the table below.

Table 1 Key technical parameters of internal combustion engine generating set

Type	Gas-fired Engine and generator
Manufacturer	Jenbacher
Model	J320 GS
Rated Voltage	400 V
Rated capacity	966kW
Lifetime	15 years

Flaring system

The landfill gas would be sent to be burnt in the flare device when the plant totally stopped. An enclosed flare is installed in the project. Meanwhile, the flare will only be involved when the electricity generation system is not in operation, hence, the project developer determined that VERs from flare will not be claimed, even if any methane is destroyed by flare during the crediting period.

1.12 Project Location

The project is located in Pingli landfill site in Xingning District, Nanning City, Guangxi Zhuang Autonomous Region, P.R China. The geographical location of the project site is shown in Figure 2. The central coordinates of the project location are longitude of 108°38'11" E and latitude of 23°00'43" N.



1.13 Conditions Prior to Project Initiation

The scenario existing prior to the start of the implementation of the project activity is:

Before the project activity, LFG generated by the landfill site was released directly into the atmosphere. In addition, the quantity of electricity produced using LFG would have been produced by power plants connected to the grid.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity. Please refer to Section 3.4 (Baseline Scenario) for details.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is in the field of waste handling and disposal and meets the relevant provisions of the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste. The generation of power to SCPG will meet the requirement of national laws and regulations, also financially viable.

The project also obtained the approval letters from local governmental authorities: Administrative Approval Bureau (AAB), as well as Environment Protection Agency (EPA). The two approvals well demonstrate that local governments permit the construction of the project. Hence, the project is in compliance with laws, status and other regulatory frameworks.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

The Chinese Emission Trading System (Chinese ETS) includes a national ETS non-operational and eight pilot regional ETS markets (Shenzhen, Shanghai, Beijing, Guangdong, Tianjin, Hubei, Chongqing and Fujian) in operation². For the National ETS, only the fossil fuel power plants will

² <https://openknowledge.worldbank.org/handle/10986/33809>

be regulated³. And Guangxi is not included in the pilot markets. Therefore, the Chinese ETS is not applicable to the project.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit or renewable energy certificates.

1.17 Additional Information Relevant to the Project

Leakage Management

According to the methodology, no leakage effects are accounted for.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The project's goal is not only renewable energy generation, but also an environmental, social, and financial solution to avoid landfill gas release into the atmosphere.

- The project makes use of landfill gas to generate electricity, which is socially desirable.
- It aims to treat methane that would be released to the atmosphere. That means not only the project will reduce GHG emissions to local environment, but also provide an environmentally sound solution to minimize explosion risks and odour at the landfill site.
- The project will create employment opportunities related to the management, operation and maintenance of the power plant.

Further Information

N/A

2 SAFEGUARDS

2.1 No Net Harm

³ http://mee.gov.cn/xxgk/xxgk03/202012/t20201230_815546.html

The Environmental Impact Assessment (EIA) Report for the project was compiled by Guangxi Bohuan Environmental Consultancy Service Co., Ltd. The EIA Report for the project has been approved by Nanning City Xingning District Environmental Protection Bureau on 21/05/2019. According to the approval comments of the EIA Report by Nanning City Xingning District Environmental Protection Bureau, the environmental impacts likely to be caused by the project are considered insignificant and conforming to the laws and regulations; therefore, there is no net harm.

2.2 Local Stakeholder Consultation

The project owner held a local stakeholder consultation meeting on 15/05/2020 in the company office. Before the stakeholder consultation meeting, the project information with contact information and the stakeholder meeting notice were published on the bulletins at the project site and nearby on 15/04/2020. Local stakeholders were invited to attend.

During the meeting, a survey was carried out on the local residents and comments received from the survey are summarized as follows. The survey was conducted through distributing and collecting responses to a questionnaire. In total 30 out of 30 questionnaires were returned with a 100% response rate.

The questionnaires mainly focus on following issues:

- What is the attitude of the stakeholders on the construction and operation of the project?
- Will any impacts be introduced to the local residents' life, environment and economy by the implementation of the project from the view of stakeholders?
- What negative impacts will be introduced to the environment by the implementation of the project from the view of stakeholders?

Based on the 30 returned questionnaires (from the survey), the summary of the comments is shown as follows:

Table 2 Survey Results Statistics

No.	Question	Answer	Amount	Proportion
1	Do you support the project?	Yes	30	100%
		No	0	0%
		Don't care	0	0%
2	What's the negative environmental impacts of the project?	Air pollution	0	0%
		Water pollution	0	0%
		Noise	0	0%
		No negative impacts	30	100%
3	Any impacts on local environment?	Positive	30	100%
		Negative	0	0%
		Don't know	0	0%
4	Are you satisfied with environmental mitigation measures taken?	Yes	27	90%
		No	0	0%
		Don't know	3	10%
5		Yes	29	97%

	Does the project benefit local economic development?	No	0	0%
		Don't know	1	3%
6	Does the project create employment opportunities?	Yes	29	97%
		No	0	0%
		Don't know	1	3%
7	Any impacts on local people life?	Positive	29	97%
		Negative	0	0%
		Don't know	1	3%

The survey shows the stakeholders believe that the project will have positive impacts on the local ecology and employment. All stakeholders expressed their support to the project and no negative comments have been received. A full list of the filled-in questionnaires is available from the project owner.

During the meeting, the project information and the continuous input / grievance mechanism have been introduced to the local stakeholders. The project information with contact information has also been posted on the bulletins at the project site and nearby, which states that there is a grievance book at the project site, and everyone is welcome to give comments. The continuous input / grievance mechanism is as below.

Table 3 Continuous input / grievance mechanism

	Method Chosen (include all known details e.g. location of book, phone number)	Justification
Continuous Input / Grievance Expression Process Book	A grievance book is put at the project site.	The grievance book is kept at the project owner office. Anyone can go there to record their grievance or comment in the book. The project owner personnel will review and respond to the comments and record the response in the book as well.
Telephone access	+86 17707313599	Mr. Ouyang Yuewen, Guangxi Ruirong Energy Technology Co., Ltd.
	+10 59070872	Ms. Sui Yang, Swiss Carbon Value Ltd.
Email access	ouyangyuewen@chinawaterind.com	Mr. Ouyang Yuewen, Guangxi Ruirong Energy Technology Co., Ltd.
	s.yang@southpole.com	Ms. Sui Yang, Swiss Carbon Value Ltd.

2.3 Environmental Impact

According to the Environmental Impact Assessment, environmental impacts possibly caused by the project and protection and guard measures adopted by the project owner are analysed as follows:

Water Quality

The amount of wastewater which is produced by the project is very small. The condensate water during the process of landfill gas collection will be treated by the landfill leachate treatment

system. The domestic wastewater from onsite employees will be treated in the septic tank and then treated by the landfill leachate treatment system.

Air Quality

This project uses LFG which is collected from Pingli landfill site to generate electricity, and it avoids uncontrolled releasing of LFG. Therefore, it reduces greenhouse gas and effluvia emitting to air, and mitigates the possible danger of fire or explosion.

The emission of NO_x, SO₂ and NH₃ for this project is less than the emission standards, that is because prior to electricity generation, LFG has been pre-treated to remove its impurities and moisture. After that, LFG is sent to gas-fired engines. And the exhaust gas would be emitted to atmosphere which is far away from sensitive targets. Therefore, the emission of exhaust gas has little impact on surrounding environment.

Noise

The project is surrounded by landfill site and mountains, the only building which is next to the project is Pingli landfill site office building. The EIA has said that under the influence of distance attenuation, air absorption and trees blocking, the noise of the project has no impact on surrounding residential areas.

Solid Waste

This project produces small amounts of solid waste. The general industrial solid waste is dust. All solid waste will be sent to the landfill site, which could not only ensure the safety of disposal, but also has little impact on surrounding environment.

As mentioned above, the project was not considered that it would bring out negative environmental impacts. On the Contrary, this project will promote local environment by reducing emission of greenhouse gas.

2.4 Public Comments

The project was open for public comment from 16/03/2021 to 15/04/2021. There are no public comments received for the project during the comment period.

2.5 AFOLU-Specific Safeguards

For non-AFOLU projects, this section is not required.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

ACM0001 Large-scale Consolidated Methodology: Flaring or use of landfill gas, Version 19.0

The methodology also refers to:

Emissions from solid waste disposal sites, Version08.0;

Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 03.0;

Tool to calculate the emission factor for an electricity system, Version07.0;

Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version03.0;

Positive lists of technologies, Version02.0.

For more detail information about the methodology and tools, please reference to the following link:

<https://cdm.unfccc.int/methodologies/DB/JPYB4DYQUXQPZLBDVPHA87479EMY9MApplcability of Methodology>

3.2 Applicability of Methodology

According to the EIA of the project, the project meets all applicability conditions of ACM0001 as follows:

No.	Applicability conditions in ACM0001	The project	Applicable to the project or not?
1	The methodology is applicable under the following conditions: (a) Install a new LFG capture system in an existing or new (Greenfield) SWDS where no LFG capture system was or would have been installed prior to the implementation of the project activity; or (b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that: (i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and (ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available;	In the absence of the project, there was no LFG capture system at Pingli landfill site and LFG was emitted directly into atmosphere. The project will install a new LFG capture system at Pingli landfill site and capture and use LFG for power generation. Electricity generated by LFG will be exported to South China Power Grid, which could reduce a certain amount of fossil fuels consumption in the grid. The project does not reduce the amount of	Applicable

	(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways: (i) Generating electricity; (ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or (iii) Supplying the LFG to consumers through a natural gas distribution network; (iv) Supplying compressed/liquefied LFG to consumers using trucks; (v) Supplying the LFG to consumers through a dedicated pipeline; (d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity.	organic waste that would be recycled in the absence of the project activity. Prior to the project being implemented, the organic waste that was brought to the site was sent to the landfill and was not used for any purpose, as such there was no recycling of organic waste prior to project implementation.	
2	The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is: (a) Atmospheric release of the LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and (b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln: (i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or (ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary; (c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas. (d) In the case of LFG from a Greenfield SWDS, the identified baseline scenario is atmospheric release of the LFG or capture of LFG in a managed SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons.	Based on the analysis in Section 3.4, the most feasible baseline scenario of the project is as follows: Atmospheric release of the LFG; and For electricity generation: that electricity would be generated in the grid.	Applicable
3	This methodology is not applicable: (a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace; (b) If the management of the SWDS in the project activity is deliberately changed during the crediting in order to increase methane generation	Only ACM0001 is applied in the project. The management of the SWDS in the project activity will not be deliberately changed during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity.	N/A

	compared to the situation prior to the implementation of the project activity.		
--	--	--	--

In addition, the applicability conditions of tools referred in the methodology ACM0001 has been demonstrated as follows:

Applicability conditions in tool “ Emissions from solid waste disposal sites ”	The project	Applicable to the project or not?
The tool can be used to determine emissions for the following types of applications: (a) Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or combusting the methane (e.g. “ACM0001: Flaring or use of landfill gas”). The methane is generated from waste disposed in the past, including prior to the start of the CDM project activity. In these cases, the tool is only applied for an ex ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g. measuring the amount of methane captured from the SWDS); (b) Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. An example of this application of the tool is ACM0022, in which municipal solid waste (MSW) is treated with an alternative option, such as composting or anaerobic digestion, and is then prevented from being disposed of in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions.	In the absence of the project, LFG from Pingli landfill site is emitted directly into atmosphere. The project will capture and use LFG for power generation. Therefore, the project is Application A. ACM0001 is adopted for the project. This tool will only be applied for an ex ante estimation of emissions in the project description.	Applicable
These two types of applications are referred to in the tool for determining parameters.	Parameters are determined per Application A.	Applicable
In the case that: (a) different types of residual waste are disposed or prevented from disposal; or that (b) both MSW and residual waste(s) are prevented from disposal, then the tool should be applied separately to each residual waste and to the MSW.	Only MSW are disposed in the project.	N/A

Applicability conditions in tool “ Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation ”	The project	Applicable to the Project or not?
If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;	The source of electricity consumption of the project is Scenario A: Electricity consumption from the grid.	Applicable

(b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.		
This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	The recipient of the electricity generated by the project is SCPG, which is the Scenario I: Electricity is supplied to the grid.	Applicable
This tool is not 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. The tool only accounts for CO₂ emissions.	No captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage.	N/A

Applicability conditions in tool “Tool to calculate the emission factor for an electricity system”	The project	Applicable to the Project or not?
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	OM, BM and CM are estimated using the tool for calculating baseline emissions for the project. The project supply electricity to SCPG.	Applicable
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in “Appendix 1: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability	The project supply electricity to SCPG. The emission factor is calculated for grid power plants only.	Applicable

of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.		
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project is located in China, a non-Annex I country.	N/A
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	No biofuel is involved in the Project.	N/A

Applicability conditions in tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”	The project	Applicable to the project or not?
Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions.	The project is LFG power plant. For ex post emission reduction estimation, this tool will be applied.	Applicable
Methodologies where CO ₂ is the particular and only gas of interest should continue to adopt material balances as the means of flow determination and may not adopt this tool as material balances are the cost effective way of monitoring flow of CO ₂ .	ACM0001 is applied in the project, and CO ₂ is not the particular and only gas of interest. Therefore, this tool is applied.	Applicable
The underlying methodology should specify: (a) The gaseous stream the tool should be applied to; (b) For which greenhouse gases the mass flow should be determined; (c) In which time intervals the flow of the gaseous stream should be measured; and (d) Situations where the simplification offered for calculating the molecular mass of the gaseous stream (equations (3) or (17)) is not valid (such as the gaseous stream is predominantly composed of a gas other than N ₂).	ACM0001 has specified: (a) $F_{CH_4,EL,y}$ is determined using the tool; (b) CH ₄ is the greenhouse gas for which the mass flow should be determined; (c) The mass flow should be calculated on an hourly basis for each hour h in year y; (d) The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations (3) or (17) in the tool).	Applicable

Applicability conditions in tool “Positive lists of technologies”	The project	Applicable to the project or not?
The use of this methodological tool is not mandatory for the project participants of a CDM project activity or CDM PoA for demonstrating their additionality.	The tool is applied in the project.	Applicable
This methodological tool shall be applied in conjunction with a small-scale or large-scale methodology which refers to this tool.	The tool is applied in conjunction with ACM0001.	Applicable
The positive lists as contained in section 5 of this tool are valid up to 28 November 2021. Notwithstanding the provisions on the validity of new, revised and previous versions of methodologies and methodological tools in the “Procedure: Development, revision and clarification of baseline and monitoring methodologies and methodological tools”, there will be no grace period for the application of this tool and the validity of the positive list after this date, including in cases where further technologies are added to the positive list through revisions of this tool before this date.	The positive lists as contained in section 5 of this tool are valid.	Applicable

3.3 Project Boundary

According to the methodology ACM0001, the project boundary is the site of the project activity where the LFG is captured and destroyed/used, Pingli landfill site.

Referring to the methodology,

- (a) Captive power plant(s) (including emergency diesel generators) or power generation sources connected to the grid, which are supplying electricity to the project activity;
- (b) Captive power plant(s) (including emergency diesel generators) or power generation sources connected to the grid, which are supplying electricity in the baseline that is displaced by electricity generated by captured LFG in the project activity;

In the project case, the electricity for the project is sourced from SCPG and electricity generated by the LFG captured would have been generated by power generation sources connected to SCPG. Therefore, the project boundary includes the whole LFG related system (e.g. LFG collection, LFG pre-treatment system, LFG power generation system, flare system, etc.) and all grid-connected power plants in SCPG.

According to authoritative documents provided by China DNA⁴, SCPG covers Guangdong Province, Guangxi Zhuang Autonomous Region, Yunnan Province, Guizhou Province and Hainan Province.

The project boundary is shown in Figure 3 below.

⁴ <http://www.mee.gov.cn/ywgz/ymqhbh/wsqtkz/202012/W020201229610353340851.pdf>

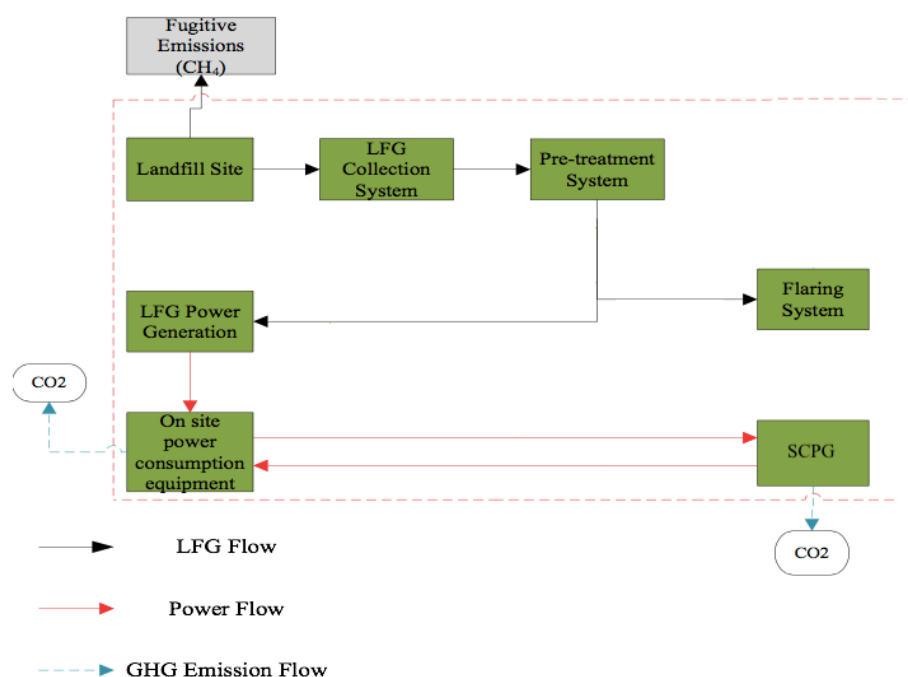


Figure 3 Project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emissions from decomposition of waste at the SWDS site	CH ₄	Yes	The major source of emissions in the baseline
		N ₂ O	No	N ₂ O emissions are small compared to CH ₄ emissions from SWDS. This is conservative
		CO ₂	No	CO ₂ emissions from decomposition of organic waste are not accounted since the CO ₂ is also released under the project activity
	Emissions from electricity generation	CO ₂	Yes	Major emission source
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
	Emissions from heat generation	CO ₂	No	No heat generation is included in the project activity.
		CH ₄	No	Excluded for simplification. This is conservative
		N ₂ O	No	Excluded for simplification. This is conservative
	Emissions from the use of natural gas	CO ₂	No	Excluded for simplification. This is conservative
		CH ₄	No	No supply of LFG through a natural gas distribution network, dedicated pipeline or using trucks is included in the project activity

Source		Gas	Included?	Justification/Explanation
		N ₂ O	No	Excluded for simplification. This is conservative
Project	Emissions from fossil fuel consumption for purposes other than electricity generation or transportation due to the project activity	CO ₂	No	Excluded for no fossil fuel is used by the project activity.
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small
	Emissions from electricity consumption due to the project activity	CO ₂	Yes	May be an important emission source
		CH ₄	No	Excluded for simplification. This emission source is assumed to be very small
		N ₂ O	No	Excluded for simplification. This emission source is assumed to be very small
	Emissions from flaring	CO ₂	No	Emissions are considered negligible
		CH ₄	No	Excluded for simplification. ⁵
		N ₂ O	No	Emissions are considered negligible
	Emissions from distribution of LFG using trucks and dedicated pipelines	CO ₂	No	No distribution of LFG using trucks and dedicated pipelines
		CH ₄	No	No distribution of LFG using trucks and dedicated pipelines
		N ₂ O	No	Emissions are considered negligible

3.4 Baseline Scenario

The project is in the field of waste handling and disposal and meets the relevant provisions of the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste. The generation of power to SCPG also meets the requirement of national laws and regulations.

The project also obtained the approval letters from local governmental authority. The two approvals well demonstrate that local governments permit the construction of the project. Hence, the project is in compliance with laws, status and other regulatory frameworks.

⁵ The flare will only be involved when the electricity generation system is not in operation, hence, the project developer determined that VERs from flare will not be claimed, even if any methane is destroyed by flare during the crediting period. VERs will only be claimed from the methane destroyed by power generation system and the power displacement.

The simplified procedures in the methodology is applied in the project to select the most plausible baseline scenario and demonstrate additionality.

According to the methodology, the baseline scenario for LFG is assumed to be the atmospheric release of the LFG; with all the electricity generated by the project activity is exported to the grid, the baseline scenario for all the electricity exported to the grid is assumed to be electricity generation in existing and/or new grid-connected power plants.

If all or part of the electricity generated by the project activity is exported to the grid, the baseline scenario for all or the part of the electricity exported to the grid is assumed to be electricity generation in existing and/or new grid-connected power plants.

3.5 Additionality

For the simplified procedure to demonstrate additionality, the methodological tool “TOOL32: Positive lists of technologies” is applied in the project.

According to the descriptions above, it is demonstrated that prior to the implementation of the project, the LFG was only vented, and the LFG is used to generate electricity in the project plant with a total nameplate capacity of 5.8 MW, i.e. below 10 MW, which is consistent with the project EIA Report compiled by Guangxi Bohuan Environmental Consultancy Service Co., Ltd. and approved by Nanning City Xingning District Environmental Protection Bureau on 21/05/2019. Therefore, the project is deemed automatically additional.

3.6 Methodology Deviations

No methodology deviation is applied in the project.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions are determined according to equation (1) and comprise the following sources:

- (a) Methane emissions from the SWDS in the absence of the project activity;
- (b) Electricity generation using fossil fuels or supplied by the grid in the absence of the project activity;
- (c) Heat generation using fossil fuels in the absence of the project activity; and
- (d) Natural gas used from the natural gas network in the absence of the project activity.

$$BE_y = BE_{CH_4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y} \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions in year y (t CO ₂ e/yr)
$BE_{CH_4,y}$	=	Baseline emissions of methane from the SWDS in year y (t CO ₂ e/yr)
$BE_{EC,y}$	=	Baseline emissions associated with electricity generation in year y (t CO ₂ /yr)
$BE_{HG,y}$	=	Baseline emissions associated with heat generation in year y (t CO ₂ /yr)
$BE_{NG,y}$	=	Baseline emissions associated with natural gas use in year y (t CO ₂ /yr)

Supply of LFG through a natural gas distribution network is not included in the project activity. Moreover, the project participants do not intend to utilize the LFG for heat generation and nature gas use. Therefore, $BE_{HG,y} = 0$ and $BE_{NG,y} = 0$; and baseline emissions shall be calculated as below:

$$BE_y = BE_{CH_4,y} + BE_{EC,y} \quad \text{Equation (2)}$$

4.1.1 Baseline emissions of methane from the SWDS ($BE_{CH_4,y}$)

Baseline emissions of methane from the SWDS are determined as follows, based on the amount of methane that is captured under the project activity and the amount that would be captured and destroyed in the baseline (such as due to regulations). In addition, the effect of methane oxidation that is present in the baseline and absent in the project is taken into account:

$$BE_{CH_4} = \left((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH,BL,y} \right) \times GWP_{CH_4} \quad \text{Equation (3)}$$

Where:

$BE_{CH_4,y}$	=	Baseline emissions of methane from the SWDS in year y (t CO ₂ e/yr)
OX_{top_layer}	=	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless)
$F_{CH_4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH ₄ /yr)
$F_{CH_4,BL,y}$	=	Amount of methane in the LFG that would be flared in the baseline in year y (t CH ₄ /yr)
GWP_{CH_4}	=	Global warming potential of CH ₄ (t CO ₂ e/t CH ₄)

4.1.1.1 Ex post determination of $F_{CH_4,PJ,y}$

During the crediting period, $F_{CH_4,PJ,y}$ is determined as the sum of the quantities of methane flared and used in power plant(s), boiler(s), air heater(s), glass melting furnace(s), kiln(s) and natural gas distribution, as follows:

$$F_{CH_4,PJ,y} = F_{CH_4,flared,y} + F_{CH_4,EL,y} + F_{CH_4,HG,y} + F_{CH_4,NG,y} \quad \text{Equation (4)}$$

Where:

- $F_{CH_4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH₄/yr)
- $F_{CH_4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year y (t CH₄/yr)
- $F_{CH_4,EL,y}$ = Amount of methane in the LFG which is used for electricity generation in year y (t CH₄/yr)
- $F_{CH_4,HG,y}$ = Amount of methane in the LFG which is used for heat generation in year y (t CH₄/yr)
- $F_{CH_4,NG,y}$ = Amount of methane in the LFG which is sent to the natural gas distribution network and/or dedicated pipeline and/or to the trucks in year y (t CH₄/yr)

The flare will not be used when the power plant is in normal operation, thus, the PD decides not to claim the emission reduction from the flare, even if any methane is destroyed by flare during the crediting period.

There is no LFG used for heat generation in the project activity, and there is no LFG which is sent to the natural gas distribution network and/or dedicated pipeline and/or to the trucks in the project activity.

Hence, $F_{CH_4,PJ,y}$ is determined as the quantities of used in the power plant as follows:

$$F_{CH_4,PJ,y} = F_{CH_4,EL,y} \quad \text{Equation (5)}$$

$F_{CH_4,EL,y}$ is determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” and monitoring the working hours of the power plant, so that no emission reduction are claimed for methane destruction during non-working hours. This is taken into account by monitoring the hours that the equipment utilizing the LFG is operating in year y ($Op_{j,h,y}$).

For the project, the flow of gaseous stream is Volume flow – wet basis, and the volumetric fraction is wet basis, thus, as per the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Option C will be applied.

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

$$F_{i,t} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad \text{Equation (6)}$$

With:

$$\rho_{i,n} = \frac{P_n \times MM_i}{R_u \times T_n} \quad \text{Equation (7)}$$

Where:

$F_{i,t}$	=	Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)
$V_{t,wb,n}$	=	Volumetric flow of the gaseous stream in time interval t on a wet basis at normal conditions (m ³ wet gas/h)
$v_{i,t,wb}$	=	Volumetric fraction of greenhouse gas i in the gaseous stream in time interval t on a wet basis (m ³ gas i/m ³ wet gas)
$\rho_{i,n}$	=	Density of greenhouse gas i in the gaseous stream at normal conditions (kg gas i/m ³ wet gas i)
P_n	=	Absolute pressure at normal conditions (Pa)
T_n	=	Temperature at normal conditions (K)
MM_i	=	Molecular mass of greenhouse gas i (kg/kmol)
R_u	=	Universal ideal gases constant (Pa.m ³ /kmol.K)

The following equation should be used to convert the volumetric flow of the gaseous stream from actual conditions to normal conditions of temperature and pressure:

$$V_{t,wb,n} = V_{t,wb} \times [(T_n/T_t) \times (P_t/P_n)] \quad \text{Equation (8)}$$

Where:

$V_{t,wb}$	=	Volumetric flow of the gaseous stream in time interval t on a wet basis (m ³ wet gas/h)
P_t	=	Pressure of the gaseous stream in time interval t (Pa)
T_t	=	Temperature of the gaseous stream in time interval t (K)

The following requirements apply:

- (e) CH₄ is the greenhouse gas for which the mass flow will be determined;
- (f) The mass flow will be calculated on an hourly basis for each hour *h* in year *y*;
- (g) The mass flow calculated for hour *h* is 0 if the equipment is not working in hour *h* ($Op_{j,h}$ =not working), the hourly values are then summed to a yearly unit basis.

4.1.1.2 Ex ante estimation of $F_{CH_4,PJ,y}$

An ex ante estimate of $F_{CH_4,PJ,y}$ is required to estimate baseline emission of methane from the SWDS (according to equation (2)) in order to estimate the emission reductions of the proposed project activity in the CDM-PDD. It is determined as follows:

$$F_{CH_4,PJ,y} = \eta_{PJ} \times BE_{CH_4,SWDS,y} / GWP_{CH_4} \quad \text{Equation (9)}$$

Where:

$F_{CH_4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH ₄ /yr)
$BE_{CH_4,SWDS,y}$	=	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y (t CO ₂ e/yr)
η_{PJ}	=	Efficiency of the LFG capture system that will be installed in the project activity
GWP_{CH_4}	=	Global warming potential of CH ₄ (t CO ₂ e/t CH ₄)

$BE_{CH_4,SWDS,y}$ is determined using the methodological tool “Emissions from solid waste disposal sites”. For the project, the amount of methane generated from disposal of waste at the SWDS for year y ($BE_{CH_4,SWDS,y}$) is calculated using first order decay (FOD) model as follows:

$$BE_{CH_4,SWDS,y} = \phi_y \times (1 - f_y) \times GWP_{CH_4} \times (1 - OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^y \sum_j (W_{j,x} \times DOC_j \times e^{-k_j \times (y-x)} \times (1 - e^{-k_j})) \quad \text{Equation (10)}$$

Where:

$BE_{CH_4,SWDS,y}$	=	Baseline, project or leakage methane emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (tCO ₂ e/yr)
x	=	Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)
y	=	Year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that can decompose under the specific conditions occurring in the SWDS for year y (weight fraction)
$W_{j,x}$	=	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
ϕ_y	=	Model correction factor to account for model uncertainties for year y
f_y	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
GWP_{CH_4}	=	Global Warming Potential of methane
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

F	=	Fraction of methane in the SWDS gas (volume fraction)
MCF _y	=	Methane correction factor
DOC _j	=	Fraction of degradable organic carbon in the waste type j (weight fraction)
k _j	=	Decay rate for the waste type j (1 / yr)
j	=	Type of residual waste or types of waste in the MSW

The following guidance has been taken into account when applying the tool:

- (h) f_y in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation (2) of this methodology;
- (i) In the tool, x begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and
- (j) Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies.

Determining the parameters required to apply the FOD model:

Table 4 Overview of the determination of parameters

Parameter	Application A	Justification
ϕ_y	0.75	Baseline emissions: default values
OX	0.1	Default value
F	0.5	Default value
DOC _{f,y}	0.5	Default value
MCF _y	1.0	Default values (based on SWDS type)
k _j	Refer to Section 5.1	Default values (based on waste type)
W _{j,x}	Refer to Section 5.2	Estimated once, with the waste composition obtained from EIA.
DOC _j	Refer to Section 5.1	Default values (based on waste type)
f_y	0	Requirement from ACM0001

4.1.1.3 Determination of $F_{CH4,BL,y}$

This section provides a procedure to determine the amount of methane that would have been captured and destroyed (by flaring) in the baseline due to regulatory or contractual requirements, to address safety and odour concerns, or for other reasons (collectively referred to as requirement in this section). The four cases in

Table 5 are distinguished. The appropriate case should be identified, and the corresponding instructions followed.

Table 5 Cases for determining methane captured and destroyed in the baseline

Situation at the start of the project activity	Requirement to destroy methane	Existing LFG capture and destruction system
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

There was no regulation or standard that enforces methane destruction in LFG when Pingli landfill site began operating. Besides, Pingli landfill site didn't collect and utilize the LFG prior to the implementation of the project activity, and no LFG capture and destruction system existing. Therefore, the project is satisfied with the situation of Case 1: No requirement to destroy methane exists and no existing LFG capture system.

In this situation:

$$F_{CH_4,BL,y} = 0 \quad \text{Equation (11)}$$

4.1.2 Baseline emissions associated with electricity generation ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) shall be calculated using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". When applying the tool:

- (k) The electricity sources k in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and
- (l) $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year y ($EG_{PJ,y}$).

$$BE_{EC,y} = \sum_k EC_{BL,k,y} \times EF_{EL,k,y} \times (1 + TDL_{k,y}) \quad \text{Equation (12)}$$

Where:

$BE_{EC,y}$	=	Baseline emissions from electricity consumption in year y (tCO ₂ /yr)
$EC_{BL,k,y}$	=	Quantity of electricity that would be consumed by the baseline electricity consumption source k in year y (MWh/yr)
$EF_{EL,k,y}$	=	Emission factor for electricity generation for source k in year y (tCO ₂ /MWh)
$TDL_{k,y}$	=	Average technical transmission and distribution losses for providing electricity to source k in year y
k	=	Sources of electricity consumption in the baseline

4.1.2.1 Determination of the emission factor for electricity generation ($EF_{EL,k,y}$)

Due to the fact that the baseline scenario of the project is that the LFG from Pingli landfill site was released directly into atmosphere and equivalent electricity generation by the project was supplied by SCPG, Scenario A of the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" applies. $EF_{EL,k,y}$ shall therefore be determined in accordance with Option A1 of the tool, i.e. the applied emission factor shall be the combined margin emission factor of the SCPG, calculated in accordance with the "Tool to calculate the emission factor of an electricity system" ($EF_{EL,k,y} = EF_{grid,CM,y}$).

Details of the calculations and data follow the published data from the Chinese DNA⁶, which uses official national statistics.

Step 1: Identify the relevant electric power system

The delineation of the project electricity system and connected electricity system as defined by the Host Country DNA has been used to define the relevant electric power system. As explained in section 3.3 above, the power generated by the project activity will be transferred to the South China Power Grid (SCPG), comprising the provincial sub-grids of Guangdong Province, Guangxi Zhuang Autonomous Region, Yunnan Province, Guizhou Province and Hainan Province. Therefore, the SCPG is identified as the electric power system of the Project.

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Following the calculations of the DNA, and the statistical data available, Option I is chosen.

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:

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch data analysis OM, or
- (d) Average OM.

⁶ <http://www.mee.gov.cn/ywgz/ydqhbh/wsqtz/202012/W020201229610353340851.pdf>

Detailed information to carry out a dispatch data analysis is not publicly available; therefore, method (b) and method (c) is not suitable for the project.

According to “Tool to calculate the emission factor for an electricity system”, the Simple OM method is applicable to the project if low-cost resources⁷ constitute less than 50% of total grid generation (excluding electricity generated by off-grid power plants) in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The approach 1) was chosen for calculation and low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years⁸. Therefore, Method (a) Simple OM was selected.

The Simple OM can be calculated using either of the two following data vintages:

(a) Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the DOE for validation.

(b) Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Here ex-ante vintage is chosen, and the $EF_{grid,OM,y}$ is fixed during the crediting period. The date of the publication of the most recent official data for the calculation of the emission factor prior to the start of validation was 29/12/2020.

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

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (t CO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

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

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

⁷ Low-cost/must-run resources are defined as power plants with low marginal generation costs or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If a fossil fuel plant is dispatched independently of the daily or seasonal load of the grid and if this can be demonstrated based on the publicly available data, it should be considered as a low-cost/must-run.

⁸ China Electric Power Yearbook 2014-2018, the average of the five most recent years from year 2013 to 2017 is 46.91%.

- (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.

Option B can only be used if:

- (a) The necessary data for Option A is not available; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

Following the calculations of the DNA, Option B is chosen. The criteria for Option B are met:

- (a) The necessary data for Option A is not available, as indicated in the calculations of the DNA; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources, and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Option I is chosen in Step 2.

The project uses Option B for calculating the simple OM emission factor as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \quad \text{Equation (13)}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO₂ emission factor in year y (t CO₂/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);

$EF_{CO_2,i,y}$ = CO₂ emission factor of fuel type i in year y (tCO₂/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.

Based on the data available, the three-year average operating margin emission factor is calculated as a full-generation-weighted average of the emission factors. Details of the calculations and data follow the published data from the Chinese DNA⁹, which uses official national statistics.

$$EF_{grid, OMsimple, y} = 0.8042 \text{ tCO}_2/\text{MWh}$$

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

In terms of vintage of data, project participants can choose between one of the following two options:

- (a) **Option 1:** for the crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group m at the time of PD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- (b) **Option 2:** for the crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the project, option 1 is chosen to calculate Build Margin emission factor ($EF_{grid, BM, y}$).

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

⁹ <http://www.mee.gov.cn/ywgz/ydqhbh/wsqtzk/202012/W020201229610353340851.pdf>

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);
- (c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

- (d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, in MWh);

If the annual electricity generation of that set comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

- (e) Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample-CDM->10yrs}$).

The Build Margin Emission Factor ($EF_{grid, BM, y}$) is calculated as follows:

$$EF_{grid, BM, y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{Equation (14)}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh);

m = Power units included in the build margin;

y = Most recent historical year for which electricity generation data is available.

Due to data's unavailability, the BM calculation follows the guidance provided by CDM EB in the deviation.¹⁰ First, calculate the newly installed capacity and its power generation technology mix, then the weights of different power technologies in the newly installed capacity, finally the BM emission factor base on the emission factors of different types of most advanced commercial generation technologies.¹¹

Because the generating capacity of the coal-fired, oil-fired and gas-fired power plants cannot be separated from the existing statistical data, the BM calculation adopts the following method: First, use the available data in the energy balance tables on the most recent year to calculate the proportion of CO₂ emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO₂ emissions. Second, calculate the emission factor of the fossil fuel fired power generation in each grid using the above proportions as the weights and the emission factors of the most advanced commercial generation technologies as the reference. Finally, the BM emission factor is multiplied by the proportion of fossil fuel fired power generation and the proportion of fossil fuel fired power plants in the newly added 20% capacity. Concrete steps and the formula for BM are as follows:

Sub-step 5a: Calculating the share of CO₂ emissions of different fuel-fired power plants in the total CO₂ emissions

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad \text{Equation (15)}$$

¹⁰ <https://cdm.unfccc.int/Projects/deviations/87512>

¹¹ <http://www.mee.gov.cn/ywgz/xdqhbh/wsqtz/202012/W020201229610353340851.pdf>

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad \text{Equation (16)}$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad \text{Equation (17)}$$

Where:

$F_{i,j,y}$ = The amount of fuel i (in a mass or volume unit) consumed by project j in year y ;

$NCV_{i,j}$ = Net calorific value (energy content) of fossil fuel type i consumed by province j (GJ/mass or volume unit)

$EF_{CO_2,i,j,y}$ = CO₂ emission coefficient of fossil fuel type i (tCO₂/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provincial sub-grids j and the percent oxidation of fuel in year y ;

COAL,OIL,and GAS refers to all forms of coal, oil and gas.

Sub-step 5b: Calculating the Emission Factor of fuel-fired power technology

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad \text{Equation (18)}$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal-fired, oil based and gas-based power generation technology commercially available in China.

Sub-step 5c: Calculating the $EF_{grid, BM, y}$

$$EF_{grid, BM, y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad \text{Equation (19)}$$

Where:

$CAP_{Total,y}$ = the newly increment of total installed capacity;

$CAP_{Thermal,y}$ = the newly increment of fuel-fired installed capacity.

Details of the calculations and data follow the published data from the Chinese DNA¹², which uses official national statistics.

$$EF_{grid,BM,y} = 0.2135 \text{ tCO}_2/\text{MWh}$$

The $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ of the crediting period of the project is calculated ex-ante and will not change during the fixed crediting period.

STEP 6: Calculate the combined margin emission factor

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

(a) Weighted average CM; or

(b) Simplified CM.

The weighted average CM method (option a) should be used as the preferred option. The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \text{Equation (20)}$$

Where

$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (t CO₂/MWh)

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (t CO₂/MWh)

w_{OM} = Weighting of operating margin emission factor (per cent)

w_{BM} = Weighting of build margin emission factor (per cent)

According to 'Tool to calculate the emission factor for an electricity system', the weights of OM and BM for hydropower projects are as follows:

$$w_{OM} = 0.5, w_{BM} = 0.5$$

Therefore, the combined baseline emission factor:

¹² <http://www.mee.gov.cn/ywgz/ymqhbh/wsqtgz/202012/W020201229610353340851.pdf>

$$EF_{EL,k,y} = EF_{grid,CM,y} = 0.8042 \times 0.5 + 0.2135 \times 0.5 = 0.50885 \text{ tCO}_2/\text{MWh}$$

4.2 Project Emissions

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} + PE_{SP,y} \quad \text{Equation (21)}$$

Where:

PE_y	=	Project emissions in year y (t CO ₂ /yr)
$PE_{EC,y}$	=	Emissions from consumption of electricity due to the project activity in year y (t CO ₂ /yr)
$PE_{FC,y}$	=	Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, in year y (t CO ₂ /yr)
$PE_{DT,y}$	=	Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (t CO ₂ /yr)
$PE_{SP,y}$	=	Emissions from the supply of LFG to consumers through a dedicated pipeline, in year y (t CO ₂ /yr)

There is no fossil fuel consumption in the project activity, and there is no distribution of compressed/liquefied LFG using trucks and no supply of LFG to consumers through a dedicated pipeline involved in the project activity, therefore, $PE_{FC,y} = 0$, $PE_{DT,y} = 0$ and $PE_{SP,y} = 0$.

Hence, Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} \quad \text{Equation (22)}$$

The project emissions from consumption of electricity by the project activity ($PE_{EC,y}$) shall be calculated using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". When applying the tool:

- (m) $EC_{PJ,k,y}$ in the tool is equivalent to the amount of electricity consumed by the project activity in year y ($EC_{PJ,y}$); and
- (n) If in the baseline a proportion of LFG is destroyed ($F_{CH4,BL,y} > 0$), then the electricity consumption in the tool ($EC_{PJ,j,y}$) should refer to the net quantity of electricity consumption (i.e. the increase due to the project activity). The determination of the amount of electricity consumed in the baseline shall be transparently documented in the CDM-PDD.

Considering when electricity generators might be under regular maintenance and sometimes shut down, the electricity will be purchased from the SCPG during this period of time. For ex ante calculation, $EC_{PJ,y} = 0$ as simplified consideration since it is estimated to be small amount in the

project operation and it will be monitored during the crediting period. As per the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", emissions from consumption of electricity due to the project activity in year y will be calculated as follows:

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad \text{Equation (23)}$$

Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO ₂ /yr)
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source j in year y (tCO ₂ /MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y
j	=	Sources of electricity consumption in the project

For the determination of $EF_{EL,j,y}$, Option A1 is chosen as:

Option A1: Calculate the combined margin emission factor of the applicable electricity system, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system" ($EF_{EL,j,y} = EF_{grid,CM,y}$).

4.3 Leakage

No leakage effects are accounted for under this methodology.

4.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{Equation (24)}$$

Where:

ER_y	=	Emission reductions in year y (t CO ₂ e/yr)
BE_y	=	Baseline emissions in year y (t CO ₂ e/yr)
PE_y	=	Project emissions in year y (t CO ₂ /yr)

Baseline emissions

Base on section 4.1, the baseline emissions are calculated as follows:

$$BE_y = BE_{CH_4,y} + BE_{EC,y} \quad \text{Equation (25)}$$

Baseline emissions of methane from the SWDS are calculated as follows:

$$BE_{CH_4,y} = \left((1 - OX_{top_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y} \right) \times GWP_{CH_4} \quad \text{Equation (26)}$$

ID number	$F_{CH_4,BL,y}$	$F_{CH_4,PJ,y}$	OX_{top_layer}	$F_{CH_4,BL,y}$	$BE_{CH_4,y}$
Unit	tCH ₄	tCH ₄	Dimensionless	tCH ₄	tCO ₂ e
03/04/2020-31/12/2020	7,195	7,195	0.1	0	161,891
2021	10,369	10,369	0.1	0	233,300
2022	10,952	10,952	0.1	0	246,413
2023	11,416	11,416	0.1	0	256,870
2024	11,796	11,796	0.1	0	265,413
2025	12,113	12,113	0.1	0	272,553
2026	10,684	10,684	0.1	0	240,384
2027	8,015	8,015	0.1	0	180,336
2028	6,154	6,154	0.1	0	138,474
2029	4,843	4,843	0.1	0	108,979
01/01/2030-02/04/2030	985	985	0.1	0	22,162
Sub-total	94,523	94,523	/	0	2,126,773

The ex ante estimate of $F_{CH_4,PJ,y}$ is determined as follows:

$$F_{CH_4,PJ,y} = \eta_{PJ} \times BE_{CH_4,SWDS,y} / GWP_{CH_4} \quad \text{Equation (27)}$$

$BE_{CH_4,SWDS,y}$ is determined using the methodological tool “Emissions from solid waste disposal sites”, details please refer to the ER sheet.

Baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) are calculated as follows:

$$BE_{EC,y} = \sum_k EC_{BL,k,y} \times EF_{EL,k,y} \times (1 + TDL_{k,y}) \quad \text{Equation (28)}$$

ID number	$EG_{PJ,y}$	$EF_{grid,CM,y}$	$TDL_{k,y}$	$BE_{EC,y}$
Unit	MWh	tCO ₂ e/MWh		tCO ₂ e
03/04/2020-31/12/2020	27,790	0.50885	0.03	14,565
2021	40,048	0.50885	0.03	20,990
2022	42,299	0.50885	0.03	22,170
2023	44,094	0.50885	0.03	23,111
2024	45,561	0.50885	0.03	23,879
2025	46,787	0.50885	0.03	24,522
2026	41,264	0.50885	0.03	21,627
2027	30,956	0.50885	0.03	16,225
2028	23,771	0.50885	0.03	12,459
2029	18,707	0.50885	0.03	9,805
01/01/2030-02/04/2030	3,804	0.50885	0.03	1,994
Sub-total	365,083	/	/	191,346

Project emissions

Project emissions are calculated as follows:

$$PE_y = PE_{EC,y} \quad \text{Equation (29)}$$

Project emissions from consumption of electricity by the project activity ($PE_{EC,y}$) are calculated as follows:

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad \text{Equation (30)}$$

ID number	$EC_{PJ,y}$	$EF_{EL,j,y}$	$TDL_{j,y}$	$PE_{EC,y}$	PE_y
Unit	MWh	tCO ₂ e/ MWh		tCO ₂ e	tCO ₂ e
03/04/2020-31/12/2020	0	0.50885	0.20	0	0
2021	0	0.50885	0.20	0	0
2022	0	0.50885	0.20	0	0
2023	0	0.50885	0.20	0	0
2024	0	0.50885	0.20	0	0
2025	0	0.50885	0.20	0	0
2026	0	0.50885	0.20	0	0
2027	0	0.50885	0.20	0	0
2028	0	0.50885	0.20	0	0
2029	0	0.50885	0.20	0	0
01/01/2030-02/04/2030	0	0.50885	0.20	0	0
Sub-total	0	/	/	0	0

Leakage

No leakage effects are accounted for under this methodology.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
03/04/2020-31/12/2020	176,456	0	0	176,456
2021	254,289	0	0	254,289
2022	268,582	0	0	268,582
2023	279,980	0	0	279,980
2024	289,291	0	0	289,291
2025	297,074	0	0	297,074
2026	262,011	0	0	262,011
2027	196,560	0	0	196,560
2028	150,932	0	0	150,932
2029	118,783	0	0	118,783
01/01/2030-02/04/2030	24,155	0	0	24,155
Total	2,318,113	0	0	2,318,113

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	OX _{top_layer}
Data unit	-
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.1

Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/tCH ₄
Description	Global warming potential of CH ₄
Source of data	IPCC Fourth Assessment Report (AR4)
Value applied	25
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	Shall be updated according to any future COP/MOP decisions. GWP values from AR4 are used for ex-ante emission reduction estimates, and GWP values from IPCC Fifth Assessment Report (AR5) will be used for ex-post calculations.

Data / Parameter	η _L
Data unit	-
Description	Efficiency of the LFG capture system that will be installed in the project activity
Source of data	Technical specifications of the LFG capture system to be installed
Value applied	90%
Justification of choice of data or description of measurement methods and procedures applied	-

Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	ϕ
Data unit	-
Description	
Source of data	Default value from Tool: Emissions from solid waste disposal sites
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	For baseline emissions: Application A of the tool is applied in the project and the climate where the SWDS is located is Humid/wet Conditions.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	F
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	DOC _f
------------------	------------------

Data unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	MCF
Data unit	-
Description	Methane correction factor
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	1.0
Justification of choice of data or description of measurement methods and procedures applied	Pingli landfill site is an anaerobic managed solid waste disposal site. Therefore, MCF is 1.0 in accordance with 2006 IPCC Guideline.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	DOC _j
Data unit	-
Description	Fraction of degradable organic carbon in the waste type j (weight fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)

Value applied	-														
Justification of choice of data or description of measurement methods and procedures applied	For MSW, the following values for the different waste types j should be applied: <table border="1"> <thead> <tr> <th>Waste type j</th><th>DOC_j (% wet waste)</th></tr> </thead> <tbody> <tr> <td>Wood and wood products</td><td>43</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr> <tr> <td>Textiles</td><td>24</td></tr> <tr> <td>Garden, yard and park waste</td><td>20</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>0</td></tr> </tbody> </table>	Waste type j	DOC_j (% wet waste)	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Waste type j	DOC_j (% wet waste)														
Wood and wood products	43														
Pulp, paper and cardboard (other than sludge)	40														
Food, food waste, beverages and tobacco (other than sludge)	15														
Textiles	24														
Garden, yard and park waste	20														
Glass, plastic, metal, other inert waste	0														
Purpose of Data	Calculation of baseline emissions														
Comments	-														

Data / Parameter	k_j															
Data unit	1/yr															
Description	Decay rate for the waste type j															
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)															
Value applied	Apply the following default values for the different waste types j: <table><tr><th colspan="2" rowspan="2">Waste type j</th><th>Tropical (MAT > 20°C)</th></tr><tr><th>Wet (MAP> 1000mm)</th></tr><tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper and cardboard (other than sludge), textiles</td><td>0.07</td></tr><tr><td>Wood, wood products and straw</td><td>0.035</td></tr><tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>0.40</td></tr></table>	Waste type j		Tropical (MAT > 20°C)	Wet (MAP> 1000mm)	Slowly degrading	Pulp, paper and cardboard (other than sludge), textiles	0.07	Wood, wood products and straw	0.035	Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17	Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.40
Waste type j				Tropical (MAT > 20°C)												
		Wet (MAP> 1000mm)														
Slowly degrading	Pulp, paper and cardboard (other than sludge), textiles	0.07														
	Wood, wood products and straw	0.035														
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17														
Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.40														

Justification of choice of data or description of measurement methods and procedures applied	According to EIA, the climate data for the location of Pingli landfill site: MAT – Mean annual temperature: 21.6 °C MAP – Mean annual precipitation: 1327.5 mm
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	W _{j,x}																																																											
Data unit	1/yr																																																											
Description	Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)																																																											
Source of data	Estimated once in EIA, based on information from the SWDS owner and administration and from interviews with senior employees.																																																											
Value applied	<table><tr><th>Year</th><th>Wj(waste amount) (t/x)</th></tr><tr><td>2016</td><td>414,200</td></tr><tr><td>2017</td><td>453,650</td></tr><tr><td>2018</td><td>456,780</td></tr><tr><td>2019</td><td>460,000</td></tr><tr><td>2020</td><td>460,000</td></tr><tr><td>2021</td><td>460,000</td></tr><tr><td>2022</td><td>460,000</td></tr><tr><td>2023</td><td>460,000</td></tr><tr><td>2024</td><td>460,000</td></tr><tr><td>2025</td><td>460,000</td></tr><tr><td>2026</td><td>230,000</td></tr></table> <table><tr><th>Waste type of Landfill site</th><th>Weight content (%)</th><th>Notes</th></tr><tr><td>Food waste</td><td>61.52</td><td>Rapidly degradable</td></tr><tr><td>Pulp and Paper</td><td>6.53</td><td>Slowly degradable</td></tr><tr><td>Wood and wood products</td><td>5.26</td><td>Slowly degradable</td></tr><tr><td>Textiles</td><td>4.21</td><td>Slowly degradable</td></tr><tr><td>Garden Waste</td><td>9.15</td><td>Moderately degradable</td></tr><tr><td>Metal</td><td>0.31</td><td>Non-degradable</td></tr><tr><td>Glass</td><td>2.28</td><td>Non-degradable</td></tr><tr><td>Stone and dust</td><td>6.51</td><td>Non-degradable</td></tr><tr><td>Plastic and rubber</td><td>4.23</td><td>Non-degradable</td></tr><tr><td>Total</td><td>100</td><td></td></tr></table>			Year	Wj(waste amount) (t/x)	2016	414,200	2017	453,650	2018	456,780	2019	460,000	2020	460,000	2021	460,000	2022	460,000	2023	460,000	2024	460,000	2025	460,000	2026	230,000	Waste type of Landfill site	Weight content (%)	Notes	Food waste	61.52	Rapidly degradable	Pulp and Paper	6.53	Slowly degradable	Wood and wood products	5.26	Slowly degradable	Textiles	4.21	Slowly degradable	Garden Waste	9.15	Moderately degradable	Metal	0.31	Non-degradable	Glass	2.28	Non-degradable	Stone and dust	6.51	Non-degradable	Plastic and rubber	4.23	Non-degradable	Total	100	
Year	Wj(waste amount) (t/x)																																																											
2016	414,200																																																											
2017	453,650																																																											
2018	456,780																																																											
2019	460,000																																																											
2020	460,000																																																											
2021	460,000																																																											
2022	460,000																																																											
2023	460,000																																																											
2024	460,000																																																											
2025	460,000																																																											
2026	230,000																																																											
Waste type of Landfill site	Weight content (%)	Notes																																																										
Food waste	61.52	Rapidly degradable																																																										
Pulp and Paper	6.53	Slowly degradable																																																										
Wood and wood products	5.26	Slowly degradable																																																										
Textiles	4.21	Slowly degradable																																																										
Garden Waste	9.15	Moderately degradable																																																										
Metal	0.31	Non-degradable																																																										
Glass	2.28	Non-degradable																																																										
Stone and dust	6.51	Non-degradable																																																										
Plastic and rubber	4.23	Non-degradable																																																										
Total	100																																																											
Justification of choice of data or description of measurement methods and procedures applied	-																																																											
Purpose of Data	Calculation of baseline emissions																																																											
Comments	-																																																											

Data / Parameter	$EF_{grid,OM,y}$
Data unit	t CO ₂ /MWh
Description	Operating margin CO ₂ emission factor in year y
Source of data	2019 Baseline Emission Factors for Regional Power Grids in China
Value applied	0.8042
Justification of choice of data or description of measurement methods and procedures applied	Official publication data from the Chinese DNA
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	t CO ₂ /MWh
Description	Build margin CO ₂ emission factor in year y
Source of data	2019 Baseline Emission Factors for Regional Power Grids in China
Value applied	0.2135
Justification of choice of data or description of measurement methods and procedures applied	Official publication data from the Chinese DNA
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	t CO ₂ /MWh
Description	Combined margin CO ₂ emission factor in year y

Source of data	Calculated following the “Tool to calculate the emission factor for an electricity system”
Value applied	0.50885
Justification of choice of data or description of measurement methods and procedures applied	Calculated following the “Tool to calculate the emission factor for an electricity system”
Purpose of Data	Calculation of baseline emissions Calculation of project emissions
Comments	-

Data / Parameter	R_u
Data unit	$\text{Pa.m}^3/\text{kmol.K}$
Description	Universal ideal gases constant
Source of data	Value from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value applied	8,314
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	MM_i
Data unit	kg/kmol
Description	Molecular mass of greenhouse gas i
Source of data	Value from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value applied	16.04

Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	P_n
Data unit	Pa
Description	Total pressure at normal conditions
Source of data	Value from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value applied	101,325
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	T_n
Data unit	K
Description	Temperature at normal conditions
Source of data	Value from “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”
Value applied	273.15
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions

Comments	-
----------	---

5.2 Data and Parameters Monitored

Data / Parameter	Management of SWDS
Data unit	-
Description	Management of SWDS
Source of data	Original design of the landfill
Description of measurement methods and procedures to be applied	Project participants should refer to the original design of the landfill to ensure that any practice to increase methane generation have been occurring prior to the implementation of the project activity. Any change in the management of the SWDS after the implementation of the project activity should be justified by referring to technical or regulatory specifications
Frequency of monitoring/recording	Annually
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	Op _{j,h}
Data unit	-
Description	Operation of the electricity generators that consume the LFG
Source of data	Project participants

Description of measurement methods and procedures to be applied	Products generated. $O_{pj,h}=0$ when: No products are generated in the hour h. Otherwise, $O_{pj,h}=1$
Frequency of monitoring/recording	Hourly
Value applied	8,500
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Amount of electricity generated using LFG by the project activity in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Monitor net electricity generation by the project activity using LFG
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value applied	Refer to section 4.4
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to

	ensure accuracy. The readings will be double checked by the electricity distribution company. The calibration of meter, including the frequency of calibration, will be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meter should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	This parameter is required for calculating baseline emissions associated with electricity generation ($BE_{EC,y}$) using the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”

Data / Parameter	$TDL_{k,y}$
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source k in year y
Source of data	Default value from methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years
Value applied	3%
Monitoring equipment	-

QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	EC _{PJ,y}
Data unit	MWh
Description	Amount of electricity consumed by the project activity in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Sources of consumption shall include, where applicable, electricity consumed for the operation of the LFG capture system, for any processing and upgrading of the LFG, for transportation of the LFG to the flare or other applications (boilers, power generators), for the compression of the LFG into the natural gas network, etc.
Frequency monitoring/recording of	Continuous measurement and monthly recording
Value applied	0
Monitoring equipment	Electricity meter
QA/QC procedures to be applied	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company. The calibration of meter, including the frequency of calibration, will be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meter should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.

Purpose of data	Calculation of project emissions
Calculation method	-
Comments	This parameter is required for calculating project emissions from electricity consumption due to an alternative waste treatment process $t_{PE_{EC,y}}$ using the methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”

Data / Parameter	$TDL_{j,y}$
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Default value from methodological tool “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation”
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years
Value applied	20%
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	f
Data unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Historic data from SWDS
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	For application A: Once for the crediting period
Value applied	0
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$V_{i,t,wb}$
Data unit	m ³ gas i/m ³ wet gas
Description	Volumetric fraction of greenhouse gas i in the gaseous stream in time interval t on a wet basis
Source of data	Gas analyzer
Description of measurement methods and procedures to be applied	Continuous in-situ analyzer

Frequency monitoring/recording of	Continuous measurement and hourly recording
Value applied	-
Monitoring equipment	Gas analyzer
QA/QC procedures to be applied	The calibration should include zero verification with an inert gas (e.g. N ₂) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	$V_{t,wb}$
Data unit	m ³ wet gas/h
Description	Volumetric flow of the gaseous stream in time interval t on a wet basis
Source of data	Flow meter
Description of measurement methods and procedures to be applied	Volumetric flow measurement should always refer to the actual pressure and temperature. Instruments with recordable electronic signal (analogical or digital) are required.
Frequency monitoring/recording of	Continuous measurement and hourly recording
Value applied	-
Monitoring equipment	Flow meter
QA/QC procedures to be applied	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory for all projects applying large scale methodology(ies). Calibration and frequency of calibration is according to manufacturer's specifications.

Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	-

Data / Parameter	T_t
Data unit	K
Description	Temperature of the gaseous stream in time interval t
Source of data	-
Description of measurement methods and procedures to be applied	Instruments with recordable electronic signal (analogical or digital) are required. Examples include thermocouples, thermo resistance, etc.
Frequency of monitoring/recording	Continuous measurement and hourly recording
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	Provided $V_{t,wb}$ is converted to normal conditions during the monitoring process, this parameter may not be needed.

Data / Parameter	P_t
Data unit	Pa
Description	Pressure of the gaseous stream in time interval t

Source of data	-
Description of measurement methods and procedures to be applied	Instruments with recordable electronic signal (analogical or digital) are required. Examples include pressure transducers, etc.
Frequency of monitoring/recording	Continuous measurement and hourly recording
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	Periodic calibration against a primary device must be performed periodically and records of calibration procedures must be kept available as well as the primary device and its calibration certificate. Pressure transducers (either capacitive or resistive) must be calibrated monthly.
Purpose of data	Calculation of baseline emissions
Calculation method	-
Comments	Provided $V_{t,wb}$ is converted to normal conditions during the monitoring process, this parameter may not be needed.

Data / Parameter	CAPEX and OPEX
Data unit	Currency
Description	Total investment to implement the project and total cost to operate the project
Source of data	Engineering, procurement and construction contracts; and maintenance contracts
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	At the first issuance request after each phase of the project is fully implemented
Value applied	-
Monitoring equipment	-

QA/QC procedures to be applied	Audited by professional, independent financial auditors. The DOE should only verify that the data provided corresponds to the data from independent financial auditors
Purpose of data	-
Calculation method	-
Comments	The information provided for CAPEX shall indicate the investment made: (i) in the collection and flaring system; (ii) in the power plant and connection to the grid (if applicable); and (iii) in the purchase of the new boiler or refurbishment of the existing one and in the steam/hot air pipeline if steam/hot air is exported out of the project boundary (if applicable). The information supplied for OPEX shall indicate the costs for: (i) staff and maintenance involved in the operation of the collection and flaring system; and (ii) staff and maintenance involved in the operation of the collection and power generation system. The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality

Data / Parameter	Tariff of electricity exported
Data unit	Currency
Description	Tariff of the electricity exported
Source of data	Power purchase agreement
Description of measurement methods and procedures to be applied	-
Frequency of monitoring/recording	At the first issuance request after each phase of the project is fully implemented
Value applied	-
Monitoring equipment	-

QA/QC procedures to be applied	Audited by professional, independent financial auditors. The DOE should only verify that the data provided corresponds to the data from independent financial auditors
Purpose of data	-
Calculation method	-
Comments	The monitoring of this parameter is only required for projects applying the simplified procedures to identify the baseline scenario and demonstrate additionality

5.3 Monitoring Plan

Operational and Management Structure

The operational and management structure of the project is summarized as below.

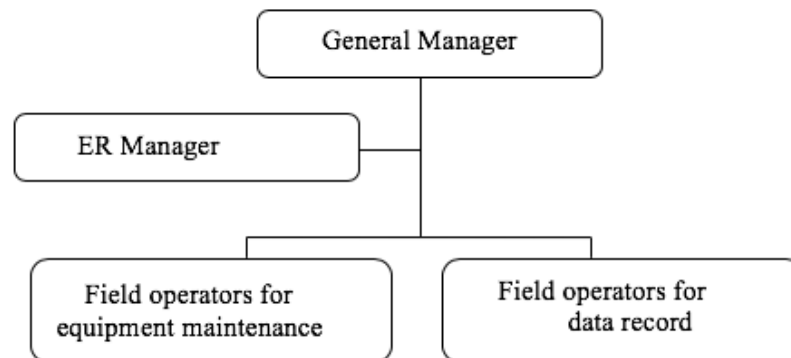


Figure 4 The management flow chart

The general manager of the power plant is the principal of the monitoring task, who sets out the responsibility of everyone in the monitoring system and establishing related documents. The principal should confirm that the staffs in the monitoring system have the ability to deal with the distributive tasks.

An ER Manager will be appointed, specifically responsible for meter calibration, training, checking the daily operation, reporting and archiving. The ER Manager will report monthly to the General Manager (GM) about the project performance and monitored data. In the event that non-conformance in the performance to the mentioned procedures and/or functioning problems of the monitoring equipment are identified, the ER manager will inform the GM about the situation and work out relevant measures to be taken.

The ER manager will also be responsible for aggregating the monitored data monthly and yearly, archiving and keeping data during the crediting period and two years after.

Field operators will take turns to work in the control centre 24 hours a day. They will be in charge of data supervision, checking and inspecting the system. If necessary, they will have the responsibility for executing the emergency plan and drafting emergency situation reports.

Monitoring Equipment and Data

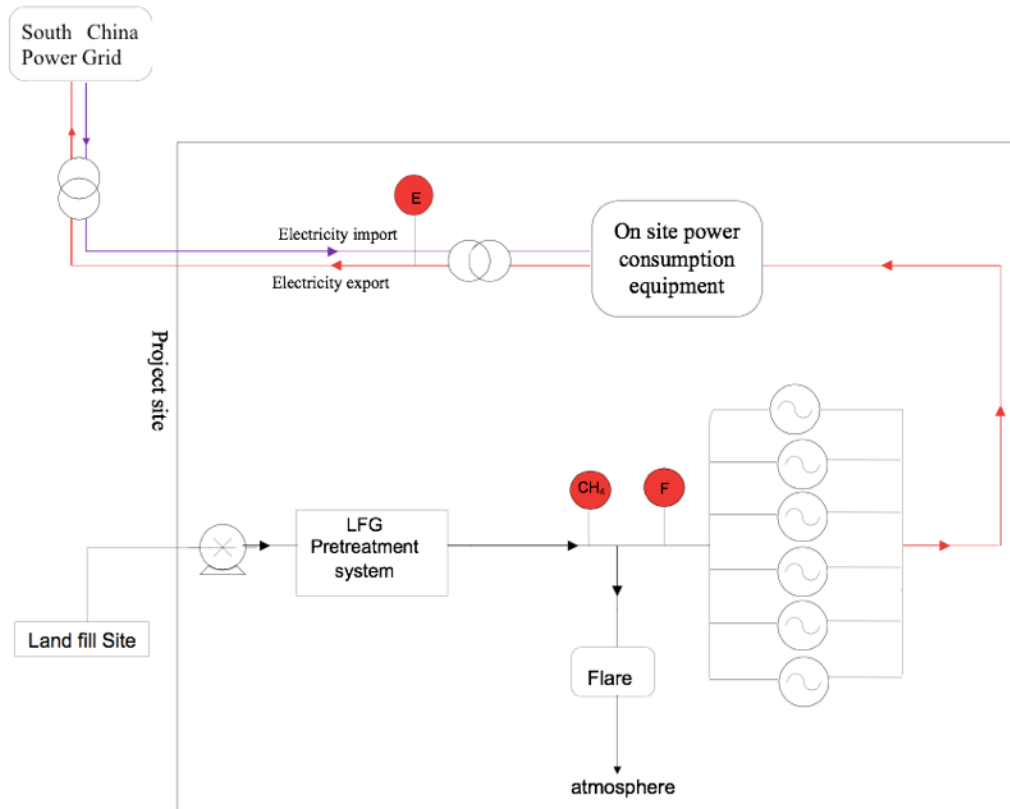


Figure 5 The monitoring flow chart

CH₄ - Gas analyzer to continuously measure methane fraction in LFG

F - Flow meter to continuously measure flow of LFG fed to the Power Plant

E - Bi-directional electricity meter to continuously measure the net electricity exported to SCPG and electricity imported from SCPG

Flow of LFG fed to the Power Plant

The flow meter is installed at the LFG pipe inlet to gas engines to monitor the flow of landfill gas fed to the gas engines. The monitoring frequency should be Continuous. And the data will be recorded and electronic archived once per one hour by computer automatically.

Methane fraction in the landfill gas

Install the Gas analyzer to monitor the concentration of CH₄. The monitoring frequency should be Continuous. And the data will be recorded and electronic archived once per one hour by computer automatically.

Net electricity exported to the grid

From the diagram above, the electricity meter E is the main meter for monitoring the net amount of the electricity exported by project ($EG_{PJ,y}$).

E is installed by local grid company at the transformer substation located at the project site. E will monitor the electricity exported to SCPG (after the voltage is increased in the transformer substation). The data will be recorded monthly by project owner. The electricity invoice or receipt could be used as back up data source and be cross checked by verifier during Verification.

Electricity imported from the grid

E is the bi-directional electricity meter, it could continuously measure the electricity imported from SCPG ($EC_{PJ,y}$) simultaneously, when the power plant is shut down and non-operation.

QA/QC

All the monitoring devices used (including flow meter, gas analyzer and electricity meter) will be calibrated periodically according to relevant national standards and regulations.

The electricity meter will be subject to regular maintenance and testing to ensure accuracy. The calibration of meter, including the frequency of calibration, will be done in accordance with national standards or requirements. The accuracy class of the meter will be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.

And the calibration reports will be kept in the archives by the project owner.

Data Management

Specific staff will be appointed by the project owner to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all monitored data collected as part of monitoring archived electronically and be kept at least for 2 years after the end of last the crediting period.

Electronic data and documents will be regularly copied and archived via hard disk or CD-ROM and kept at least two years after the end of the crediting period.

Written data and documents, including electricity receipts for cross-checking, will be copied and archived and kept at least two years after the end of the crediting period.

Procedure in case of failure

Once a meter in fault, it shall be immediately repaired or replaced with another calibrated meter by a professional engineer, and the LFG or electricity generated during the period of erroneous measurement and replacement of the fault meter shall not be accounted for conservative consideration.