# XINGNING TOKZIN PET RECYCLING PROJECT

Document Prepared by BAINENG NEW ENERGY (SHENZHEN) CO., LTD

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| Project Title | **Xingning Tokzin PET Recycling Project** |
| Version | 04 |
| Date of Issue | 18-July-2024 |
| Prepared By | Baineng New Energy (Shenzhen) Co., Ltd. |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

"Xingning Tokzin PET Recycling Project" (hereafter referred to as "the project") aims to produce the PET flakes by recycling and processing post-consumer PET bottles, to replace the same PET products produced from the raw materials. The processing capacity of waste PET is 65,000 tons per year and the total production capacity is about 55,000 tons of recycled polyester (PET) flakes per year. The Project located in Dongguan Shijie (Xingning) Industrial Transfer Area, Xingning City, Meizhou City, Guangdong Province, P,R,C and is developed and operated by Xingning Tokzin Yinghui Resources Co., Ltd. (hereinafter called "the project proponent").

Prior to the project implementation, the same amount of PET flakes was produced from raw materials (crude oil and natural gas); the baseline scenario is the same as the condition prior to project initiation. The Project achieves GHG emission reductions by avoiding the consumption of the equivalent raw materials and by reducing related energy consumption as well.

The Project aims to recycle the waste plastic PET, and the main technological process is described as "unpacking, optical sorting, manual sorting, first break, float-sink separation, dewatering, one-stage washing, two-stage washing, dewatering, three-stage washing, dewatering, cyclone separation, screening, optical sorting and packaging". More details are described in Section 1.11 below. The Project does not involve the chemical reaction

The project proponent has obtained the construction permit issued by Xingning Municipal Housing and Urban-Rural Development Bureau on 21-September-2020, then the construction of the new PET recycling facility started on 10-October-2020. The project started operation since 06-April-2022. The first crediting period of the project is from 06-April-2022 to 05-April - 2029. The estimated annual average GHG emission reductions are 35,890 $tCO_2e$ and the total estimated GHG emission reductions over the first crediting period are 251,230 $tCO_2e$. The audit history of the project is shown in Table 1.1:

**Table 1.1** Audit history of the Project

| Audit Type | Period | Program | VVB Name | Number of years |
|---|---|---|---|---|
| Validation | 19-February-2024[1] | VCS | CTI Certification Co., Ltd | N/A |
| Total | / | VCS | / | / |

## 1.2 Sectoral Scope and Project Type

[1] At the time of this PD completion, the validation is still in process and thus, the date of the site visit is shown here.

Sectoral Scope: 13. Waste Handling and Disposal

The project is not a Grouped Project.

## 1.3 Project Eligibility

According to section 2.1.1 of VCS Standard v4.5, the scope of the VCS Program includes:

1) The scope of the VCS Program includes seven Kyoto Protocol greenhouse gases. The Project reduces emissions of $CO_2$ which is a Kyoto Protocol greenhouse gas.

2) Ozone-depleting substances (ODS): NA

3) Project activities supported by a methodology approved under the VCS Program through the methodology development and review process: As per VCS requirement, the Project applies VMR0007 (Version 1.0) in conjunction with the latest version of AMS-III.AJ

4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions): The methodology AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0), which is a CDM methodology and CDM is an approved GHG program.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements: NA

According to section 2.1.2 of VCS Standard v4.5, the scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction. The Project avoids GHG emissions by displacing the production of virgin PET materials with recycled PET flakes; the GHG emissions generated by PET production from fossil fuel are not generated primarily for the purpose of their subsequent reduction, removal, or destruction. Therefore, the Project is not excluded under the scope of the VCS program.

Meanwhile, the project is not belong to the projects excluded in Table 1 of VCS Standard v4.5, section 2.1.3.

Thus, the project is eligible under the scope of VCS program.

## 1.4 Project Design

The project includes a single location or installation only.

### Eligibility Criteria

The project is not a grouped project. Thus, this section is not applicable.

## 1.5 Project Proponent

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| **Organization name** | **Xingning Tokzin Yinghui Resources Co., Ltd.** |
| **Contact person** | Yupeng Liu |
| **Title** | General Manager |
| **Address** | Dongguan Shijie(Xingning) Industrial Transfer Area, Xingning, Meizhou, Guangdong, China |
| **Telephone** | +86 0753-3836668 |
| **Email** | office@tzyhgd.com |

## 1.6 Other Entities Involved in the Project

| | |
|---|---|
| **Organization name** | **Baineng New Energy (Shenzhen) Co., Ltd.** |
| **Role in the project** | Consultant |
| **Contact person** | Zexu Zhang |
| **Title** | General Manager |
| **Address** | Room 302, No. 2815 Longteng Avenue, Xuhui District, Shanghai, China |
| **Telephone** | +86-13916000152 |
| **Email** | project@cypressenergy.cn |

## 1.7 Ownership

The ownership of Xingning Tokzin Yinghui Resources Co., Ltd. over the project arises under the project approval issued by a competent authority in compliance with laws; the ownership also arises by virtue of property rights in the plant and equipment that generates GHG emission reductions, as shown in Table 1.2.

**Table 1.2** Evidence establishing project ownership accorded to the project proponent

| Evidence types of project ownership | Condition of the Project and the project proponent |
|---|---|
| 1) Project ownership arising or granted under statute, regulation or | The project proponent has obtained the approval from the Bureau of the Development and Reform |

| | |
|---|---|
| decree by a competent authority.<br>2) Project ownership arising under law. | Bureau of Xingning City for the construction and operation of the Project. The Approval is a competent authority, and the approval demonstrates that the project proponent has been granted the project ownership in compliance with relevant laws and regulations in China. |
| 3) Project ownership arising by virtue of a statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership). | The project proponent has signed equipment purchase contracts with suppliers and signed the construction contract with contractors. Therefore, the project proponent has property rights in the plant and its equipment that generates GHG emission reductions. |

## 1.8 Project Start Date

Project start date: 06-April-2022 on which the project started operation.

## 1.9 Project Crediting Period

According to section 3.9.1 of VCS Standard version 4.5: The total project crediting period shall be either seven years (twice renewable for a total of up to 21 years) or ten years fixed, except for AFOLU and GCS projects as defined below and in the GCS Requirements respectively.

The project is not an AFOLU nor GCS project, the project chooses to adopt the renewable crediting period of which the first crediting period is 7 years from 06-April-2022 to 05-April-2029 and could be renewed twice. Since the expected project lifetime is 20 years according to the FSR, the total crediting period will not exceed 05-April-2042.

## 1.10 Project Scale and Estimated GHG Emission Reductions or Removals

| Project Scale | |
|---|---|
| Project | ✓ |
| Large project | |

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 06-April-2022 to 31-December-2022 | 26,549[2] |
| 01-January-2023 to 31-December-2023 | 35,890 |
| 01-January-2024 to 31-Decembe -2024 | 35,890 |
| 01-January-2025 to 31-December-2025 | 35,890 |
| 01-January-2026 to 31-December -2026 | 35,890 |
| 01-January-2027 to 31-December -2027 | 35,890 |
| 01-January-2028 to 31-December -2028 | 35,890 |
| 01-January-2029 to 05-April-2029 | 9,341[3] |
| **Total estimated ERs** | **251,230** |
| **Total number of crediting years** | **7** |
| **Average annual ERs** | **35,890** |

## 1.11 Description of the Project Activity

The Project activity, under the premise of ensuring the quality of the product, will recycle and process the waste plastic PET instead of using the raw material (crude oil and natural gas) to produce the PET flakes. Therefore, the GHG emission reductions will be generated through the implementation of the project by avoiding the consumption of the equivalent raw materials and reducing related energy consumption as well.

The project is owned by Xingning Tokzin Yinghui Resources Co., Ltd. The processing capacity of waste PET is 65,000 tons per year and the total production capacity is about 55,000 tons of recycled polyester (PET) flakes per year. The estimated annual emission reductions are 38,176 $tCO_2e$.

[2] The estimated annual ERs are 35,890 $tCO_2e$, the period from 06-April-2022 to 31-December-2022 accounts for 270 days, thus the estimated ERs during 06-April-2022 to 31-December-2022 are calculated as 35,890 $tCO_2e/yr$ × 270/365 = 26,549 $tCO_2e$. Detailed calculation process is included in the ER spreadsheet

[3] The estimated annual ERs are 35,890 $tCO_2e$, the period from 01-January-2029 to 05-April-2029 accounts for 95days, thus the estimated ERs during 01-January-2029 to 05-April-2029 are calculated as 35,890 $tCO_2e/yr$ × 95/365 = 9,341 $tCO_2e$. Detailed calculation process is included in the ER spreadsheet

The existing scenario prior to the implementation of the project is the product being produced by using the raw material, and the baseline scenario of the project is the same as the existing scenario.

**Technology description**

The Project installs series of product equipment and system. The Project aims to recycle the waste plastic PET, and the production processes do not involve any chemical reactions. The electricity for production is supplied by the South China Power Grid (SCPG).

The project production processes are shown in the Figure 1-1, and the main production technologies are described in below paragraph:

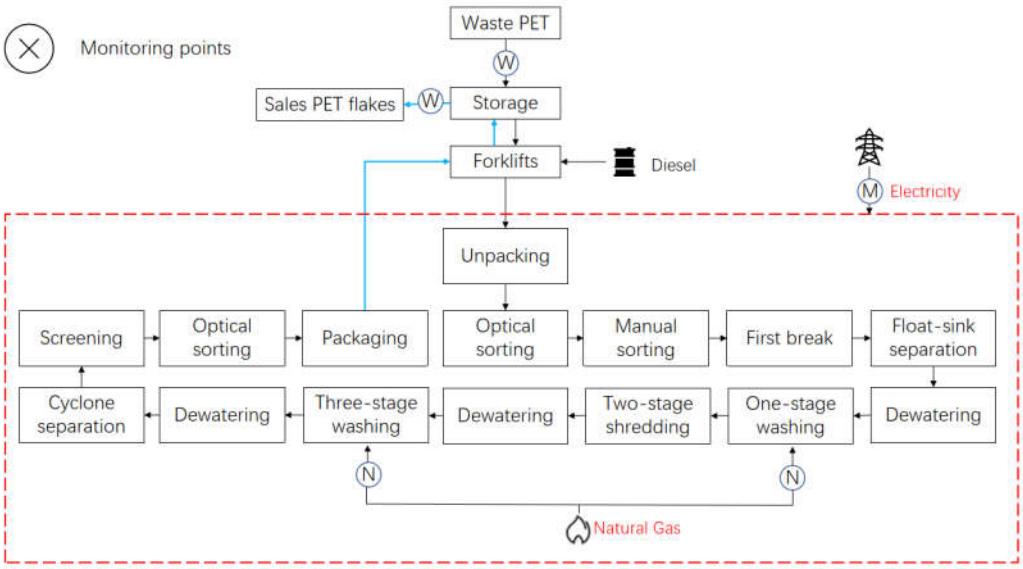


**Figure 1.1** Project production processes

**(1) Unpacking**

The waste PET are recycled into the opener for unpacking. After unpacking, the waste PET is loosened by a roller sieve, and the impurities such as sand and waste paper inside are screened out.

**(2) Optical sorting**

Different materials, different colors of waste PET has a different spectrum, the automatic sorting machine through the detection of the spectrum of the bottle will be mixed in the PET bottle of other materials and PET bottles of different colors sorted out.

**(3) Manual sorting**

In order to ensure the purity of raw materials, manual sorting is carried out after light sorting, and PET bottles that are missed or misclassified in the light sorting process are sorted out.

(4) First break

The original bottle is broken into 25mm coarse bottle pieces by crusher.

(5) Float-sink separation

The lid and paper float on the surface of the water in the rinsing cylinder, and the PET rough bottle pieces sink to the bottom, thereby separating the lid and paper from the raw material.

(6) Dewatering

The centrifugal dewatering technology was used to dehydrate the raw materials, and the dewatering rate reached 95%.

(7) One-stage washing

Add NaOH to the clean water, and clean the PET bottle pieces at a cleaning temperature between 20-60℃.

(8) Two-stage washing

Add NaOH to the clean water, and clean the PET bottle pieces at a cleaning temperature between 20-60℃.

(9) Dewatering

The centrifugal dewatering technology was used to dehydrate the raw materials, and the dewatering rate reached 95%.

(10) Three-stage washing

Add NaOH to the clean water, and clean the PET bottle pieces at a cleaning temperature between 80-100℃.

(11) Dewatering

The centrifugal dewatering technology was used to dehydrate the raw materials, and the dewatering rate reached 95%.

(12) Cyclone separation

The air separator is used to further remove the water on the surface of the bottle sheet and separate it with the PVC label paper to become loose PET flakes, and then put it into the bag by the funnel.

(13) Screening

The powder and small granular materials in the bottle are screened and separated by vibration.

(14) Optical sorting

Different materials, different colors of waste PET has a different spectrum, the automatic sorting machine through the detection of the spectrum of the bottle will be mixed in the PET flakes of other materials and PET flakes of different colors sorted out.

**(15) Packaging**

PET flakes are put into packaging bags by homogenizing bucket. Then warehousing and shipping.

Main equipment installed for the Project is shown in Table 1.3. The production system made of the equipment has an annual capacity of recycling 65,000 tons PET bottles and producing 55,000 tons recycled PET flakes.

**Table 1.3** Main equipment installed for the Project

| Machine name | Type | Number | Lifetime[4] |
|---|---|---|---|
| Automatic sorting machine | AUTOSORT2800 | 3 | 20 years |
| Wind sorting machine | FX1200A S-00 | 2 | 20 years |
| Crushing machine | JS1500 | 2 | 20 years |
| Friction cleaning machine | MCJ1000A-00 | 1 | 20 years |
| Hot wash machine | RX2100C-S-00 | 3 | 20 years |
| Dehydrator | TS800H-S-00 | 3 | 20 years |

## 1.12 Project Location

The Project located in Dongguan Shijie (Xingning) Industrial Transfer Area, Xingning City, Meizhou City, Guangdong Province, P.R.C., as shown in Figure 1.2. The geographic coordinates of the project site are 115°40'42'' E and 24°11'11''N.

[4] Equipment parameters and lifetime information are derived from the manufacturer's specifications and nameplates

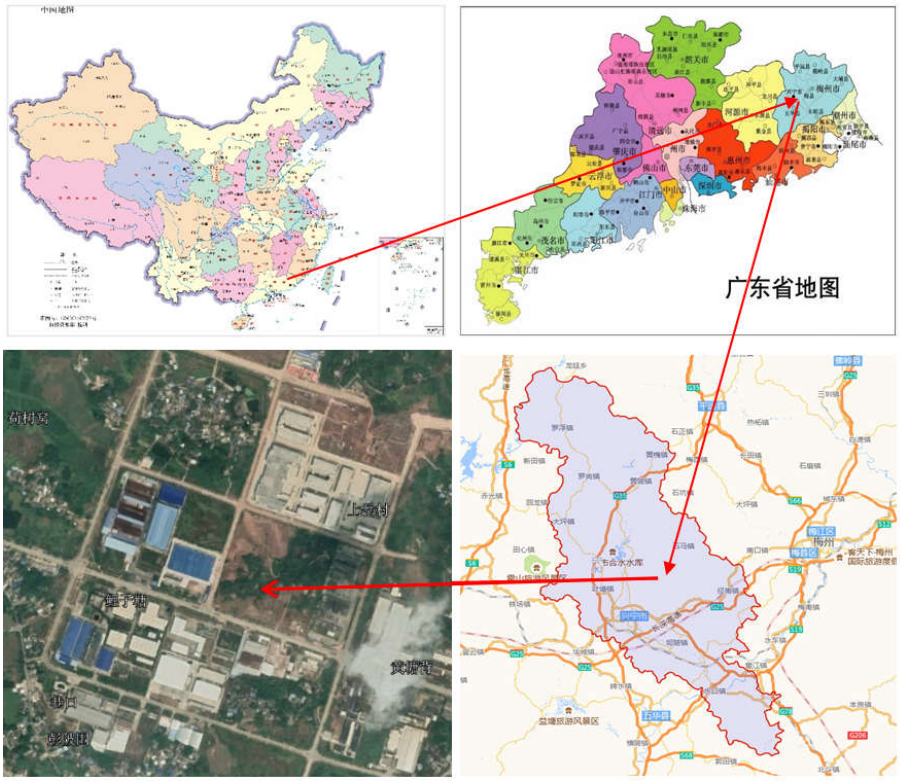


**Figure 1.2** Location of the project

## 1.13 Conditions Prior to Project Initiation

The project activity recycles post-consumer PET bottles and processes them into recycled PET flakes which will then be further processed downstream into final products.

Prior to project initiation, the post-consumer PET bottles were disposed in the landfill or incineration without being recovered; the PET flakes were produced by using virgin raw material, i.e., crude oil and natural gas obtained from oil and gas exploitation. The baseline scenario is the same as the condition prior to project initiation; please refer to Section 3.4 for details.

## 1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project complies with all relevant laws and regulations in China, as shown in **Table 1.3**.

**Table 1.3** Compliance with relevant laws and regulations

| Laws and regulations | The Project |
|---|---|
| Regulations on the Approval and Recordation of Enterprise Investment Projects[5], Administrative Measures on the Approval and | The Project has obtained the approval and has been recorded by the Development and Reform Bureau of Xingning City in |

[5] http://www.gov.cn/zhengce/content/2016-12/14/content_5147959.htm

| | |
|---|---|
| Recordation of Enterprise Investment Projects[6], which sets out the procedures of project approval and recordation. | compliance with the regulation and the administrative measure. |
| According to Environmental Protection Law of the People's Republic of China[7], enterprises, public institutions and other producers and business operators that discharge pollutants shall take measures to prevent and control the environmental pollution caused by waste gas, waste water, waste residues, dust, malodorous gases, radioactive substances and noise, vibration and electromagnetic radiation generated during production, construction or other activities. | The project proponent takes measures to prevent and control the pollution including waste gas, waste water, dust and noise, etc. The measures have been described in the EIA report. In addition, the local Ecology and Environment Bureau is responsible for ensuring that the measures are in place and that the project proponent complies with laws and regulations on pollution prevention and control. |
| Law of People's Republic of China on Environmental Impact Assessment[8], Regulations on Environmental Protection Management for Construction Projects[9], Classified Administration Catalogue of Environmental Impact Assessments for Construction Projects[10], which set out the requirements on the completion and approval of the environmental impact assessment (EIA) report/form of construction projects. | The EIA report of the Project has been completed and then approved by the Environmental Protection Bureau of Xingning City, which is in compliance with the provisions in the law, the regulation and the catalogue. |
| Construction Law of the People's Republic of China[11], which sets out the requirements on application and approval of the construction permit prior to the project construction. | The Project obtained the construction permit prior to the construction in compliance with the provisions in the law. |
| Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste[12], in effect since September 2020, which encourages recycling of waste materials. | The Project is a PET recycling and reproduction project, and thus complies with the law. |
| Law of the People's Republic of China on the | The impacts on air, water and noise during the construction and operation of the Project |

[6] http://www.gov.cn/zhengce/2020-12/27/content_5574475.htm
[7] https://www.mee.gov.cn/ywgz/fgbz/fl/201404/t20140425_271040.shtml
[8] https://www.mee.gov.cn/ywgz/fgbz/fl/201901/t20190111_689247.shtml
[9] http://www.gov.cn/zhengce/2020-12/26/content_5574290.htm
[10] https://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202012/t20201202_811053.html
[11] http://www.npc.gov.cn/npc/c30834/201905/0b21ae7bd82343dead2c5cdb2b65ea4f.shtml
[12] https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml

| | |
|---|---|
| Prevention and Control of Air Pollution[13]<br>Law of the People's Republic of China on Prevention and Control of Water Pollution[14]<br>Law of the People's Republic of China on Prevention and Control of Noise Pollution[15] | comply with the requirements set out in these laws. |
| Catalogue for the Guidance of Industrial Structure Adjustment[16], which lists projects in three categories: encouragement category, restriction category and elimination category. | The Project belongs to the encouragement category of the Catalogue. |
| Recycled Polypropylene (PET) flakes (GB/T 40006.9-2021)[17] | The PET flakes produced in the project activity meet the requirements set out in the industry standard. |

## 1.15 Participation under Other GHG Programs

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

The project has neither been registered nor seeking registration under any other GHG programs.

### 1.15.2 Projects Rejected by Other GHG Programs

The Project hasn't been rejected by 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. In fact, China's national emissions trading scheme (ETS) only includes high-emission and energy intensive industries which are categorized as key emission enterprises by the provincial government[18], and the project proponent is not included in the list of key emission enterprises in the national carbon emissions transaction quota management in 2022 in Guangdong Province[19].. The project proponent and the project activity will not be included in the national ETS; no emission cap will be enforced on the project proponent or the project activity, nor can the project proponent participate in carbon transactions in the national ETS. Therefore, the net GHG

[13] https://mee.gov.cn/ywgz/fgbz/fl/201811/t20181113_673567.shtml
[14] https://www.mee.gov.cn/ywgz/fgbz/fl/200802/t20080229_118802.shtml
[15] https://www.mee.gov.cn/ywgz/fgbz/fl/202112/t20211225_965275.shtml
[16] http://www.gov.cn/xinwen/2019-11/06/5449193/files/26c9d25f713f4ed5b8dc51ae40ef37af.pdf
[17] https://openstd.samr.gov.cn/bzgk/gb/newGbInfo?hcno=A64C04FB7292A20022602620FF5407DD
[18] https://www.gov.cn/zhengce/zhengceku/202402/content_6930138.htm
[19] https://gdee.gd.gov.cn/gkmlpt/content/4/4026/mpost_4026490.html#3217

emission reductions from the Project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions.

### 1.16.2 Other Forms of Environmental Credit

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

#### Supply Chain (Scope 3) Emissions

The project proponent has made the statement on its website according to the instruction of section 3.24.7 of VCS Standard v4.5 which can be accessed through the link: http://www.gdintop.com/news/19675.html.

## 1.17 Sustainable Development Contributions

The project activity recycles post-consumer PET bottles to process them into PET flakes that will be further processed downstream into final products. The Project achieves GHG emission reductions by avoiding the consumption of the equivalent raw materials and by reducing related energy consumption. The Project contributes to achieving the United Nations' Sustainable Development Goals (SDG) in the following aspects:

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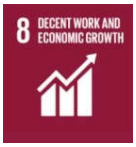
|  | **SDG 8 Decent Work and Economic Growth[20]:** "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all": The project activity will need manpower to operation, management and maintenance, which will directly increase the employment opportunities for local residents or for migrant workers. This contributes to one of the China's actions for promoting sustainable developing, "Fully implement the policy of Employment Priority, and promote more productive and high-quality employment through multiple channels[21]".<br><br>Monitoring of SDG8: The number, age, gender, salary rate of all employees will be recorded by the HR department and summarized annually in the HR record. All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later. |
|  | **Goal 12 Responsible consumption and Production[22]:** "Ensure sustainable consumption and production patterns": The project activity produces recycled PET flakes by utilizing waste PET daily necessities. which replaces the same PET products produced from the raw materials to avoid the consumption of the equivalent raw materials, to reduce the related energy consumption, |

[20] https://sdgs.un.org/goals/goal8
[21] https://www.gov.cn/zhengce/content/2021-08/27/content_5633714.htm
[22] https://sdgs.un.org/goals/goal12

| | |
|---|---|
| | MSW (Municipal Solid Waste) disposal and accumulation. This contributes to one of China's actions for promoting sustainable developing, "achieve carbon peaks in 2030, and achieve carbon neutralization before 2060, accelerating the establishment and improvement of green low-carbon circulation economic systems, and promoting the comprehensive green transformation of economic and social development[23]".<br><br>Monitoring of SDG12: the quantity of PET waste collected will be recorded at the time of sending each consignment from recycling facility to processing / manufacturing facility through the truck scale. All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later. |
|  | **Goal 13 Climate Action[24]:** "Take urgent action to combat climate change and its impacts": GHG emission reductions will be generated through the implementation of the project activity by avoiding the consumption of the equivalent raw materials and reducing related electricity and fossil fuel consumption. The project will achieve a GHG emission reduction of 35,890t$CO_2$e/yr during the first crediting period. Thus, the project will achieve SDG 13 Climate Action. This contributes to achieve one of China's stated sustainable development priorities "Promote the implementation of the national strategy to actively respond to climate change and achieve the carbon intensity reduction target ahead of schedule[25]".<br>The actual emission reductions contributing to SDG13 will be calculated following the applied methodology AMS-III.AJ., v09.0 and VMR0007, v1.0. All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later. |

## 1.18 Additional Information Relevant to the Project

### Leakage Management

Not applicable.

### Commercially Sensitive Information

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

### Further Information

[23] https://www.gov.cn/zhengce/content/2021-10/26/content_5644984.htm
[24] https://sdgs.un.org/goals/goal13
[25] https://www.gov.cn/zhengce/2021-10/27/content_5646697.htm

No further information is required.

# 2 SAFEGUARDS

## 2.1 No Net Harm

The environmental impacts during the construction and operation of the Project have been carefully and strictly assessed in the EIA report and the EIA has been approved by Xingning City Environmental Protection Bureau on 22-May-2020. According to the Environmental Impact Assessment Acceptance Report, the project has passed the EIA acceptance check, with mitigation measures taken, the project does not bring significant environmental impacts during the construction or operation period all environmental impact assessment indicators have met requirement of relevant national laws, regulations or standards. Refer to Section 2.3 for details.

According to the requirements in Section 3.19.4–3.19.10 of VCS Standard (Version 4.5), the detailed analysis of the risks to stakeholders and the environment are as follows:

(1) Likely natural and human-induced risks to stakeholders' well-being expected during the project lifetime as a result of project activities

The project is a waste plastic recycling project which will not cause any natural risks. The project is located in the Dongguan Shijie (Xingning) Industrial Transfer Area designed for industrial use[26] and according to the EIA, the project does not involve any demolition or land acquisition, which does not involve any human-induced risks to stakeholders' well-being. On contrary, the project creates job opportunities for the local people which is beneficial to the stakeholders well-being.

(2) Risks for stakeholders to participate in the project, including project design and consultation. Risks may include trade-offs with food security, land loss, loss of yields, negative impacts on livelihoods, and climate change adaptation.

The local stakeholder consultation has been conducted before the construction of the project and the results show that the local stakeholders are supportive for the project. The on-going communication mechanism has also been established details refer to section 2.2 below. As mentioned above, the project is a waste plastic recycling project located in the Dongguan Shijie (Xingning) Industrial Transfer Area designed for industrial use and according to the EIA, the project does not involve any demolition or land acquisition, thus the project will not cause any risks include trade-off like food security, land loss, loss of yields. The project has taken necessary mitigation measures according to the EIA and its approval to eliminate the impact on local communities and has passed the EIA acceptance check. The project has passed the EIA acceptance check, with mitigation measures taken, the project does not bring significant environmental impacts during the construction or operation period all environmental impact

[26] https://upimg.baike.so.com/doc/7533132-7807225.html

assessment indicators have met requirement of relevant national laws, regulations or standards. On contrary, the project creates job opportunities for the local people which have positive impacts on livelihoods. In addition, the project is a GHG emission reduction project, the successful development of this project can help future climate change adaptation.

(3) The management teams involved in the project shall have expertise in and prior experience implementing similar carbon or land management projects, and community engagement at the project scale and in the local context.

The consultancy of the project: Baineng New Energy (Shenzhen) Co., Ltd. has rich experience in developing the carbon projects and community engagement in China. The consultancy company is based in Shenzhen, which is a locally based company in Guangdong Province as the project activity. It is very familiar with the local socio-economic environment in Guangdong. Also, it has successfully developed the similar plastic recycling projects[27] which are in the same project scale as this project under VCS.

(4) Risks related to working conditions as a result of project activities and shall design and implement mitigation measures to provide safe and healthy working conditions for employees.

According to the Construction acceptance report and the safety production regulation of Xingning Tokzin Yinghui Resources Co., Ltd., the construction, operation and the internal Regulations on safety production of the Project are in accordance with GB 50681-2011 Code for design of machinery building architecture, GBZ1-2002 Hygienic standards for the design of industrial enterprises, GB5083-1999 General Principles for Safety and Health Design of Production Equipment, GB50016-2014 Code for fire prevention design of buildings. The project proponent provides regularly training on safety production to all employees. Furthermore, the project proponent has purchased the work injury insurance and medical insurance for all employees in line with the Labor Law of the People's Republic of China.

(5) Risks related to the safety of women and girls in the local community due to project activities.

According to the Constitution of the People's Republic of China and Law on the Protection of the Rights and Interests of Women and Children, women and girls enjoy the equal rights with men. All individuals or organizations within China must obey the laws. The project protects women's rights and interests according to laws. Women in the project enjoy equal rights with men, such as equal pay for equal work for men and women. The project protects women's safety and health during labor and work according to relevant laws and regulations. The project has taken necessary mitigation measures according to the EIA and its approval to eliminate the impact on local communities and has passed the EIA acceptance check. The project has passed the EIA acceptance check, with mitigation measures taken, the project does not bring significant environmental impacts during the construction or operation period all environmental impact

[27] https://registry.verra.org/app/projectDetail/VCS/3393
https://registry.verra.org/app/projectDetail/VCS/3603

assessment indicators have met requirement of relevant national laws, regulations or standards. Therefore, the project does not cause any negative impact on the safety, health and environment of the local communities.

(6) Risks as a result of project activities to children, and minority and marginalized groups in the local community

According to the Law of the People's Republic of China on the Protection of Minors, the Provisions on the Prohibition of Child Labor and Labor Law of the People's Republic of China, the children and minority and marginalized groups rights must be protected and child labor is strictly prohibited in China. No children nor juveniles are involved in the project. Besides, the project owner strictly complies with "Constitution of People's Republic of China"[28], pays attention to equality, unity and mutual assistance among all groups. In conclusion, the construction and implementation of the project do not affect the life of children, minority and marginalized groups in the local community.

(7) Impacts caused by pollutant emissions to air, discharges to water, noise and vibration, the generation of waste, or the release of hazardous materials as a result of project activities.

The impacts regarding air pollution, wastewater, noise etc, have been thoroughly assessed in the EIA report and in conclusion, with mitigation measures taken, the project does not bring significant environmental impacts during the construction or operation period. Refer to Section 2.3 for details.

In conclusion, there are no negative socio-economic impacts related to the Project. Instead, the project activity offers long-term job opportunities and contributes to climate change adaption which have positive impacts on well-beings.

In summary, the construction and operation of the Project has no net harm environmentally or socio-economically.

## 2.2 Local Stakeholder Consultation

**The procedures or methods used for engaging local stakeholders**

Prior to the project start, the project proponent identified people living or working around the project site and government officials as local stakeholders. The project sponsors also decided to consult with local stakeholders by issuing announcements and questionnaires. The project proponent put up public announcements on bulletin boards at neighbourhoods near the project site; to contact the local government and the Ecology and Environment Bureau, the project proponent made direct phone calls. The introduction about the Project, the date and the purpose of the questionnaire survey as well as the project proponent's phone number and email address were conveyed via these public announcements. On 18-February-2020,

[28] https://baike.so.com/doc/30506610-32302071.html

stakeholder representatives gathered at a conference room of the project proponent to participate in the questionnaire survey.

**The procedures or methods used to document the local stakeholder consultation outcomes**

The project proponent conducted the local stakeholder consultation by distributing questionnaires prior to the project construction. The questionnaire was designed to ask people's opinions about various aspects of the Project. In total 100 out of 100 questionnaires were returned with a 100% response rate. The surveyed stakeholders varied in age, gender, occupation and educational background, as shown in **Table 2.1**. The survey results are summarized in **Table 2.2**.

**Table 2.1** Basic information of the stakeholders surveyed

| Item \ Distribution | | Number | Percentage |
|---|---|---|---|
| Gender | Male | 46 | 46% |
| | Female | 54 | 54% |
| Age | <30 | 20 | 20% |
| | 31-40 | 35 | 35% |
| | 41-50 | 30 | 30% |
| | >50 | 15 | 15% |
| Education | Junior high school or below | 57 | 57% |
| | Senior high school | 17 | 17% |
| | College or above | 26 | 26% |
| Occupation | Employee | 37 | 37% |
| | Self-employed | 33 | 33% |
| | Civil servant | 7 | 7% |
| | Unspecified | 23 | 23% |

**Table 2.2** Summary of the survey results

| No. | Questions | Response | Number | Percentage |
|---|---|---|---|---|
| 1 | Are you satisfied with the local environmental quality? | Very satisfied | 20 | 20% |
| | | Satisfied | 77 | 77% |
| | | Not satisfied | 3 | 3% |
| 2 | Are you aware of the proposed projects in the area? | No | 10 | 10% |
| | | A little | 80 | 80% |
| | | Yes | 10 | 10% |

| | | | | |
|---|---|---|---|---|
| 3 | What do you think are the major environmental impacts of the Project? (multiple choices possible) | None | 79 | 79% |
| | | Air pollution | 10 | 10% |
| | | Water pollution | 0 | 0% |
| | | Noise pollution | 5 | 5% |
| | | Harm to animals and plants | 2 | 2% |
| | | No idea | 15 | 15% |
| 4 | From the perspective of environmental protection, what is your attitude towards the project? | Positive | 80 | 80% |
| | | Negative | 0 | 0% |
| | | indifferent | 20 | 20% |
| 5 | Will the project have a negative impact on the ecosystem? | Yes | 1 | 1% |
| | | No | 90 | 90% |
| | | No idea | 9 | 9% |
| 6 | Do you think the Project will have promotion in local economic development? | Positive | 97 | 97% |
| | | Negative | 3 | 3% |
| | | None | 0 | 0% |
| 7 | Do you have any concerns about the project? | Yes | 3 | 3% |
| | | No | 97 | 97% |

The survey shows that the Project was well known by local residents. All respondents had heard about the Project. All of them were supportive of the project construction and believed that the Project would bring more benefit than harm. All of the respondents support the construction and operation of the project.

In conclusion, the implementation of the Project is regarded as beneficial by the local stakeholders.

**The mechanism for ongoing communication with local stakeholders**

During the project operation, questionnaire surveys took place in the same manner on a regularly basis i.e., once every two years.. Besides questionnaire surveys, local stakeholders can also raise their concerns and opinions directly by making a phone call through the published phone number to the project proponent. In addition, the project proponent would inform the local authorities of key implementation events or changes to the project, then the local authorities inform the residents around the project site, and the comments and suggestions from residents are collected by the local authorities; the local government agencies

would also conduct spot checks on the project implementation on a regular basis and give suggestions on potential issues.

**How due account of all and any input received during the consultation has been taken**

As described earlier, if some of the stakeholders express their concerns in the questionnaire surveys, the project proponent would explain related issues including the measures to be taken. The project proponent will also organize internal meetings to ensure that the project operation complies with requirements in the EIA report and applicable laws, regulations and national standards.

If any conflicts or grievances arise, they will be solved in a timely manner in the following three-step approach.

Firstly, for ordinary conflicts and grievances, the project manager from the project management office will attempt to resolve them with the stakeholders in seven days. If the conflicts and grievances could not be solved by the project management office, the project proponent shall contact and discuss with relevant stakeholders as well as representatives from the Management Committee of Dongguan Shijie (Xingning) Industrial Transfer Area to amicably resolve all the conflicts and grievances and provide a written response to the grievances in a manner that is culturally appropriate within 30 days after receiving the grievance and publish the results on the notice boards in the Industrial Transfer Area and local community.

Secondly, for any grievances that are not resolved by amicable negotiations, they will be referred to the local ecology and environment bureau for mediation; the local ecology and environment bureau plays the role of a neutral third party. Local ecology and environment bureau, upon receipt of the reporting of grievance, will coordinate with the project proponent to seek a solution, working together with the relevant government sector. A written response to grievances shall be sent to relevant stakeholders within 30 days after receiving the grievance and publish the results on the notice boards in the Industrial Transfer Area and local community

Thirdly, any grievances that are not resolved through mediation will be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) people's courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to a competent supranational adjudicatory body, if any. All of the responses will be recorded in written form and be confirmed by both sides. The written responses will be also kept by the project proponent and published on the notice board in the the Industrial Transfer Area and local community.

## 2.3 Environmental Impact

The project proponent has entrusted a qualified third party (Guangdong Senhai Environmental Protection Equipment Engineering Co., LTD.) to conduct the environmental impact assessment (EIA) on the Project. The EIA report, completed by the third party, was approved by the the Xingning City Environmental Protection Bureau on 22-May-2020. According to the

Environmental Impact Assessment Acceptance Report, the project has passed the EIA acceptance check, with mitigation measures taken, the project does not bring significant environmental impacts during the construction or operation period all environmental impact assessment indicators have met requirement of relevant national laws, regulations or standards.

**Construction period**

Air quality

Major impacts on air quality during the project construction include 1) dust caused by machinery use and by transport of construction materials and waste, 2) exhaust gas from vehicles and machineries, 3) VOCs released from interior decoration. The smoke and dust are introduced into a vacuum sintering furnace with a supporting spray device for treatment. The dust waste gas is directly sucked into a central bag filter through the duct for treatment. By reasonably setting up corresponding treatment facilities for each pollution source, all types of waste gases are treated to meet the second stage, level two standards of "Emission Limits of Atmospheric Pollutants in Guangdong Province" (DB44/27-2001) and are discharged at high altitude in compliance with regulations.

Water quality

During the project construction, wastewater results from both construction and domestic water use. Domestic wastewater enters the urban sewage treatment pipeline. Construction wastewater contains relatively high concentrations of SS; a grease separation sedimentation tank is installed, and after being sedimented, the construction wastewater will be used in daily watering and spraying.

Noise

Noise during the project construction is generated by machineries and vehicles. To minimize noise pollution, low-noise equipment is employed as much as possible, the use of high-noise equipment is strictly prohibited during the lunch break (from noon to 2 pm), and during the night (from 10 pm to 6 am). Use of mufflers and other sound insulation measures must be carried out on high-noise equipment. The noise control shall meet the requirements of the national standard *Emission Standard of Environment Noise for Boundary of Construction Site* (GB 12523-2011).

Solid waste

Solid waste during the project construction includes construction spoil, construction waste and domestic garbage. Part of the construction spoil will be backfilled after the construction, and the rest has been transported to a site designated by local authorities. Construction waste has been transported to recycling facilities which are specialized in handling construction waste. Domestic waste garbage is collected in bins and handled by municipal waste treatment system regularly. The management and disposal of solid waste during construction complies with the

Management Measures for Urban Domestic Waste issued by Ministry of Urban and Rural Housing and Urban Rural Development and Standards for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes (GB18599-2001).

**Operation period**

Air quality

The recycling facility is equipped with a gas-fired water boiler. The combustion of natural gas in the boiler releases flue gas containing $SO_2$, $NO_x$, particulate matter as well as $CO_2$ through a chimney; the concentrations of $SO_2$, $NO_x$ and particulate matter in the flue gas of this project must meet the requirements set out in *Emission Standard of Air Pollutants for Boiler* (GB13271-2014).

Volatile organic compounds (VOCs) released from the project activity are treated by using the combination of negative pressure collecting, UV photolysis and activated carbon adsorption.

The staff canteen the project site shall follow the requirements in *Emission Standard of Cooking Fume* (GB 18483-2001).

Water quality

Wastewater produced by the project activity mainly comes from waste PET cleaning and daily water use of employees.

The project site is equipped with its own wastewater treatment facility. Wastewater from waste PET cleaning, which contains COD, BOD, SS and $NH_3$-N, is treated in the wastewater treatment facility to meet the requirements in *The Reuse of Urban Recycling Water - Water Quality Standard for Industrial Uses* (GB/T19923-2005) and the requirements in *Integrated Wastewater Discharge Standard* (GB 8978-1996). Part of the treated water is reused, and the rest of it is discharged into the urban sewage treatment pipeline.

The domestic wastewater from daily use of employees is treated in the septic tank and then discharged into the sewage treatment facility in the project site.

Noise

All machineries generating noise in the project activity are located indoors, hence limiting the negative impacts of noise. Still, several measures are adopted to minimize the noise impact, including the use of sound-absorbing materials and the purchase of low-noise equipment. The noise level complies with <Emission standard for environmental noise at boundary of industrial enterprises> (GB 12348-2008).

Solid waste

All the domestic waste generated by employees is collected in dustbins and then disposed of by the municipal sanitation services.

The project equipment operation requires the use of lubricating oil. The VOCs treatment uses activated carbon to absorb organic components. Both waste lubricating oil and waste activated carbon are considered as hazardous wastes according to China's Hazardous Waste List (2016). They are temporarily stored in the plant and transferred to a qualified organization for professional disposal in compliance with *Standard for Pollution Control on Hazardous Waste Storage* (GB 18597-2001)

In conclusion, with mitigation measure taken, the project does not bring significant environmental impacts during the construction or operation period.

## 2.4 Public Comments

The Project has been open for public comments during 30-October-2023 to 29-November-2023 on the Verra Registry and no comments were received during the public comment period.

## 2.5 AFOLU-Specific Safeguards

Not applicable as this project is NOT an AFOLU project.

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

**Methodology**

AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) is used for the project.

https://cdm.unfccc.int/methodologies/DB/LOWIXM9S6DV07DGXB21DPVLE8N3VB9

VMR0007 Revision to AMS-III.AJ.: Recovery and Recycling of Materials from Solid Wastes, v1.0

https://verra.org/methodologies/vmr0007-revision-to-ams-iii-aj-recovery-and-recycling-of-materials-from-solid-wastes-v1-0/

**Tools used for the Project activity:**

TOOL03: "Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion (Version 03.0)"

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf

TOOL07: "Tool to calculate the emission factor for an electricity system (Version 07.0)"

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

TOOL21: "Demonstration of additionality of small-scale project activities (Version 13.1)"

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf

## 3.2 Applicability of Methodology

Section 2.1 of the methodology AMS-III.AJ. (Version 09.0) states that:

The methodology comprises activities for the recovery and recycling of materials in municipal solid waste (MSW) to process them into intermediate or finished products, displacing the production of virgin materials in dedicated facilities, thereby resulting in avoidance of energy use.

The methodology covers the emissions associated with:

(a) Production of virgin pellets of plastics consisting of either high density polyethylene (HDPE), low density polyethylene (LDPE), Polyethylene Terephthalate (PET) or Polypropylene (PP). For the sake of this methodology, "plastic" means HDPE, LDPE, PET and PP, unless otherwise specified;

(b) Production of container glass using virgin input ("container glass" hereafter) that is displaced by the recycled container glass ("container glass cullet" hereafter) due to the project activity;

(c) Production of metals (i.e., aluminium and steel)[29] from mined ore or virgin raw materials that is displaced by the recycled metals due to the project activity.

The project activity recycles post-consumer PET bottles to process them into PET flakes, displacing the production of PET plastic from virgin inputs, reducing energy consumption and hence GHG emissions. Therefore, the Project meets Case (a) thereof, and calculates the emissions associated with the production of virgin PET plastic.+

The analysis of applicability is detailed in the Table 3-1:

**Table 3-1 Applicability of AMS-III.AJ. (Version 09.0)**

| Applicability | Project situation |
|---|---|
| Case A: Project activities that target the participation of the informal Waste sector.<br><br>In Case A, the recycling facility is operated by the informal sector. The recycling facility may also receive wastes collected by the formal waste sector (e.g., public collection system). Waste fractions that were already being recycled in the baseline by enterprises in the formal sector cannot be included | Applicable.<br><br>According to the project proponent background, reviewing the public information, the project factory is not planned, sponsored, financed, carried out nor regulated and/or recognized by the |

[29] Other metals are not covered under this methodology.

| | |
|---|---|
| in the calculations.<br><br>Case B: Greenfield facility and/or capacity addition to existing facilities with formal sector. Participation.<br><br>In Case B, the recycling facility is owned and operated by the formal waste sector. It may receive recyclable materials from the informal waste sector but has no participation of the informal sector in its organization or management functions. | local authorities or their agents. The project is run by individual, who is not formal sector.<br><br>Therefore, the project belongs to Case A. |
| Case A (a)<br><br>The recycling facility may be an existing facility, or a newly implemented facility. | Applicable.<br><br>The recycling facility that processes the waste plastic is newly built. |
| Case A (b)<br><br>It is possible to directly measure and record the final output of the recycling facility, that is the weight of materials leaving the recycling facility (on a dry basis), segregated by type. | Applicable.<br><br>PET flakes produced by the same production line are of the same type, the performance can be different according to the client's demand, they can be segregated by type. The project activity directly measures and records the weight of PET flakes leaving the recycling facility (on a dry basis) with equipped truck scale. |
| Case A (c)<br><br>Each type of recycled material is sold directly to a processing/manufacturing facility, or to a chain of intermediary retailers that are able to transfer the materials to final identifiable processing/ manufacturing facilities that process the segregated fractions. | Applicable.<br><br>The recycled PET flakes are sold to processing/ manufacturing facilities or intermediary retailers to be processed into final products. |
| Case A (d)<br><br>The Project Design Document (PDD) shall explain the procedures such as contractual agreements proposed to eliminate double counting of emission reductions, for example due to the formal waste sector or the processing/ manufacturing facility, or other parties possibly claiming credits for emission reductions. Similarly, through contractual agreement and other means such as survey/ analysis | Applicable.<br><br>The project proponent their upstream and downstream partners with abatement statements to prove that double counting of emission reductions will not occur.<br><br>Also, contractual agreements between the project proponent and the downstream facilities have been provided to prove the materials supplied from the recycling |

| | |
|---|---|
| undertaken by a third party, credible proof shall be provided to show that the materials supplied from the recycling facility are used for processing/ manufacturing and not for other purposes such as a source of fuel or disposal PET. | facility are used for manufacturing final products instead of fuel or disposal.<br><br>As described in Section 1.16.1, this project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner according to the enforced company list in public information. The project proponent has made the statement on its website according to the instruction of section 3.24.7 of VCS Standard v4.5 which can be accessed through the link: http://www.gdintop.com/news/19675.html . Hence, the emission reductions will not be double counted. |
| Case A (e)<br><br>Emission reductions can be claimed for the difference in energy use for the production of materials from virgin inputs versus production from recycled material. In the case of paper or cardboards, emission reductions due to the avoidance of methane formation in anaerobic decay may be claimed if the baseline scenario is the waste disposal in a disposal site without methane recovery. | Applicable.<br><br>the Project's emission reductions can be claimed for the difference in energy use for the two kinds of products.<br><br>The product is not paper, the other case is not considered. |
| In any of the above cases the project proponent shall be able to demonstrate, using three years[30] historic data (market data, official statistics etc.) prior to the start date[31] of the project activity, that the finished products (HDPE, LDPE, PET, PP, steel aluminium, paper and cardboard and glass) were manufactured in the host country of the CDM project using either virgin raw materials produced in country or virgin raw materials imported from another non-Annex I country. This analysis may be limited to only those finished products where recycled materials have proven to be a technically viable option, that is those | Applicable.<br><br>As this is a greenfield facility which is less than three years old, the data for 2021 which is one year prior to the project start date has been consulted, according to the relevant data in 2021, the demand consumption of bottle grade PET in 2021 is 6,943,000 tons[32] and the bottle grade PET imported in 2021 is about 62,000 tons[33]. That is to say, the imported bottle grade PET accounts for 0.89% of the total |

[30] A minimum of one-year data would be required if the facility is less than three years old.
[31] As per the definition of start date provided in the EB 41 report, paragraph 67.
[32] https://xueqiu.com/1973934190/222035951
[33] http://m.100ppi.com/focus/detail-forecast-166188.html

| | |
|---|---|
| types of products that are expected to be the end products produced from materials recycled as part of the project activity. | demand consumption in 2021. To be conservative, we applied 1% for $w_{i,imported,y}$ and 99% for $w_{i,in\text{-}country,y}$ for the ex-ante ERR calculation and the baseline emissions are adjusted by using the baseline correction factor (Bi) as described in the methodology. |
| As an alternative to the requirement stipulated in paragraph 8 of the methodology, the project proponents may choose to adjust the baseline emissions by using the baseline correction factor (Bi) as described under the baseline section below. | Applicable.<br><br>According to the methodology Table 2, the baseline correction factor (Bi) of PET is 0.6. |
| The recycling facility shall source its materials from MSW; materials from an unknown source are not eligible under this methodology. The project activity consists of separation of the recyclables from bulk MSW by means of manual or magnetic or mechanical separations. If the project activity involves the collection of wastes on a door-to-door basis, or collection at recipient's containers for the voluntary dispensing of wastes by the local community, all recyclables (paper, plastics, glass, etc.) processed by the recycling plant shall be collected together, selective collection of metals or any other wastes is excluded. As a consequence, wastes not pertaining to the identified baseline waste collection and destination stream that would not be delivered to the baseline disposal site and/or treatment plant (e.g. incineration) are not eligible. | Applicable.<br><br>The PET bottles are collected from MSW, which is demonstrated by the agreement signed between the project proponent and the supplier. The project activity consists of mechanical and manual separations to obtain purified PET, and does not consist of separation of the recyclables from bulk MSW.<br><br>The waste PET suppliers only supply the waste PET bottles collected from MSW to project proponent. there is no waste unrelated to the identified baseline waste collection and destination stream. The waste PET bottles would have otherwise been disposed of either by incineration or landfill under the baseline scenario; therefore, they are eligible under this methodology. |
| In the specific case of metals, the methodology excludes collection of the scraps generated from the production process of primary/secondary/ finished metal and materials or in the processing of the finished metal and materials into final products, and it covers only postconsumer obsolete wastes. Project proponents shall provide evidence that the materials recycled under the project activity are recovered only from end-of-life-wastes and project activity does not | Not applicable.<br><br>The project activity is reprocessing the plastic PET, not metal. |

| | |
|---|---|
| divert waste from any historically existing informal or formal recycling activity. | |
| The amount of fuel and electricity consumed by the recycling facility can be measured and recorded. | Applicable.<br>The amount of natural gas and electricity consumed by the recycling facility is measured and recorded. |
| Project proponents shall demonstrate that the properties of the materials produced from waste recycling are the same as those from virgin materials. For example, if the waste materials such as recycled plastic bottles are converted into building blocks or roof tiles, the emission reductions based on displacement of original virgin materials cannot be claimed under this methodology. For recycled materials, project proponents shall provide documentation proving that the properties of the materials produced are comparable according to standard testing methods for each material. | The project proponent has provided testing reports which show that the properties of PET flakes produced from the project activity are the same as those from virgin materials. |
| Measure are limited to those that result in aggregate emission reductions of less than or equal to 60kt$CO_2$ equivalent annually. | Applicable.<br>The project activity results in annual emission reductions less than 60 kt $CO_2e$. |

Through the analysis above, the methodology AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) is applicable to the project.

**Table 3.2** Applicability of the applied methodological tools

| Applicability Criteria | Project situation |
|---|---|
| TOOL03 | |
| It can be used in the cases where $CO_2$ emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. | Applicable.<br>The quantity of fossil fuel combusted is recorded in order to calculate project emissions. |
| TOOL07 | |
| 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 | Applicable.<br>The use of waste PET bottles to produce PET flakes in the project scenario will use less |

| | |
|---|---|
| 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). | electricity than in the baseline scenario where PET flakes are produced directly from raw materials. Thus, the project activity results in savings of electricity that would have been provided by the grid. Therefore, this tool is applied to estimate the OM, BM and CM for baseline emissions. |
| 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 II a and option II b. If option II a 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 of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity. | Applicable.<br><br>The emission factor for the project electricity system is calculated only for the grid power plants. |
| 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. | Applicable.<br><br>The project electricity system is totally located in China, a non-Annex I country. |
| Under this tool, the value applied to the $CO_2$ emission factor of biofuels is zero | Not relevant since there is no biofuel involved. |
| TOOL21 | |

| | |
|---|---|
| The use of the methodological tool "Demonstration of additionality of small-scale project activities" is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board. | Not relevant since the project dose not propose new methodologies. |
| Project participants and coordinating/ managing entities may also apply "TOOL19: Demonstration of additionality of microscale project activities" as applicable. | Not relevant as this project is not a micro-scale project. |

## 3.3 Project Boundary

According to the methodology, the project boundary includes the physical geographical sites of:

(a) Waste collection sites;

(b) The recycling facility;

(c) Processing/manufacturing facility;

(d) Virgin material production[34];

(e) MSW disposal site or treatment plant in the baseline scenario.

The Figure 3-1 presents the project boundary and the process involved.

[34] Virgin material production is included in the project boundary, even if it is not an identifiable site, because the emission factor for virgin material production for baseline calculation is based on the assumptions on the typical conditions for the virgin

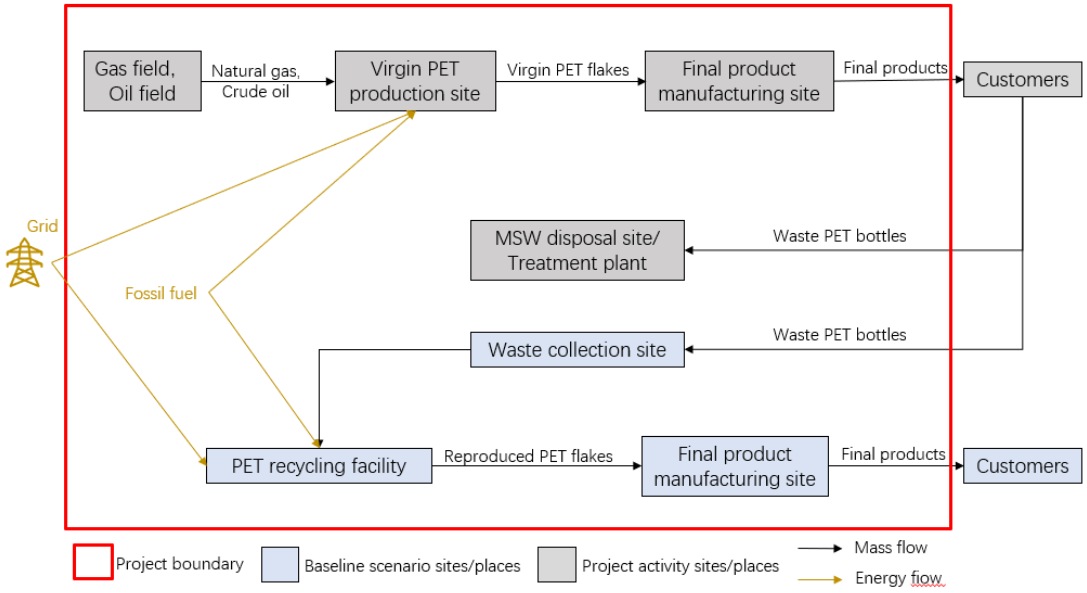



**Figure 3.1** Project boundary

The following table present the carbon pool considered within the project boundary:

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Electricity consumption | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Minor emission source. |
| | | $N_2O$ | No | Minor emission source. |
| | | Other | No | Minor emission source. |
| | Fuel consumption | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Minor emission source. |
| | | $N_2O$ | No | Minor emission source. |
| | | Other | No | Minor emission source. |
| Project | Electricity consumption | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Minor emission source. |
| | | $N_2O$ | No | Minor emission source. |
| | | Other | No | Minor emission source. |
| | Diesel and natural gas | $CO_2$ | Yes | Main emission source. |
| | | $CH_4$ | No | Minor emission source. |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | consumption | $N_2O$ | No | Minor emission source. |
| | | Other | No | Minor emission source. |

## 3.4 Baseline Scenario

The identified credible alternatives are:

a) implementation of the project activity without VCS;

b) continuation of current business-as-usual scenario, i.e., the PET products would be produced by using crude oil and natural gas from the oil exploitation as raw material.

The alternative (a) faces the investment barrier, which is elaborated in Section 3.5. The alternative (b) faces no barrier as it is the common situation.

Therefore, the identified baseline scenario would be alternative (b): continuation of current business-as-usual scenario, i.e., the PET products would be produced by using crude oil and natural gas from the oil exploitation as raw material.

## 3.5 Additionality

**Regulatory Surplus**

The relevant laws and regulations regarding plastic recycling in China are as follows:

- Law of the People's Republic of China on the Prevention and Control of Solid Waste Pollution[35], in effect since September 2020, which **encourages** recycling of waste materials.

- Environmental Protection Law of the People's Republic of China which **encourages** the recycling waste materials.

- Catalogue for the Guidance of Industrial Structure Adjustment[36], which lists projects in three categories: encouragement category, restriction category and elimination category. The Project belongs to the **encouragement** category of the Catalogue.

- "Technical specification for recycling of waste plastics"[37], which stipulates technical requirements for recycling of waste plastics and it does not mandatory the recycling of waste plastics.

[35] https://www.mee.gov.cn/ywgz/fgbz/fl/202004/t20200430_777580.shtml
[36] http://www.gov.cn/xinwen/2019-11/06/5449193/files/26c9d25f713f4ed5b8dc51ae40ef37af.pdf
[37] https://max.book118.com/html/2019/1011/6030212144002112.shtm

Despite an increasing attention China has been paying to sustainable development, none of the laws, statutes, or other regulatory framework in effect mandate PET recycling; encouragement towards reusable / recyclable packaging has not generated enough effects[38]. Therefore, the regulatory surplus has been achieved.

The additionality of the Project is demonstrated as per TOOL21 "Demonstration of additionality of small-scale project activities" (Version 13.1), in line with the methodology AMS-III.AJ. (Version 09.0).

Figure 1 (Criteria for automatic additionality using provisions of small-scale (SSC) or microscale (MSC) additionally tools) in the Appendix of TOOL21 (Version 13.1) has been applied. The project activity aggregate size is less than SSC thresholds (60 $ktCO_2e/y$); the project activity is not comprised of any technologies from the positive list under TOOL32; the aggregate size is greater than MSC thresholds (20 $ktCO_2e/y$). Due to these facts, the project shall use the regular additionality procedure to demonstrate the additionality.

As per TOOL21 (Version 13.1), project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

It will be demonstrated that the project activity would not have occurred anyway due to the investment barrier, as elaborated below.

**Investment barrier**

During Board meeting held on 03-September-2019, VCS was seriously considered in the decision to implement the Project by the project developer. The investment decision considers the financial analysis in the FSR. The IRR benchmark used in the FSR was referenced from the "Notice issued by National Development and Reform Commission and the Ministry of Housing and Urban-Rural Development in 2013 on Adjusting the Financial Benchmark Rate of Construction Projects" which is the most recent available official source published by the

[38] https://cms.law/en/int/expert-guides/plastics-and-packaging-laws/china

national government. The FSR was completed in August-2019 and input values in FSR were taken from 2019. The investment decision was made on 03-September-2019 which is less than one month after the completion of the FSR, therefore, it's unlikely that the input values have material changes at the time of investment decision.

Two alternatives have been identified previously (refer to Section 3.4). Alternative (b) is the continuation of current business-as-usual scenario, which does not involve an investment from the project participants, hence not requiring an investment analysis.

Alternative (a) is the implementation of the project activity without VCS. As the project activity generates financial and economic benefits other than VCS-related income by selling PET flakes, a benchmark analysis has been chosen and conducted for the investment analysis of Alternative (a); the financial indicator equity IRR (post-tax) has been chosen.

According to Notice issued by National Development and Reform Commission and the Ministry of Housing and Urban-Rural Development on Adjusting the Financial Benchmark Rate of Construction Projects in some Industries[39], the project belongs to "Manufacture of plastics and synthetic resins in primary form" in the "Petrochemical industry"; the benchmark equity IRR (post-tax) for this category is 16%[40].

The equity IRR of the project is calculated according to the basic parameters from feasibility study report (FSR) of the proposed project, and the comparison of the proposed project IRR with and without VCUs are shown below:

**Table 3.3** Main parameters applied for IRR calculation

| Parameter name | Project data | Data source |
|---|---|---|
| Waste PET consumed (t) | 65,000 | FSR |
| Waste PET price (CNY/t) | 4,600 | FSR |
| Annual PET production (t) | 55,000 | FSR |
| PET product price (CNY/t) | 6,500 | FSR |
| Static total investment (CNY) | 122,600,000 | FSR |
| **Annual O&M cost (CNY)** | 36,275,536 | FSR |
| -Annual salary and benefits (CNY) | 7,980,000 | FSR |
| -Annual material cost (CNY) | 13,000,000 | FSR |
| -Annual electricity cost (CNY) | 9,462,700 | FSR |
| -Annual water cost (CNY) | 93,600 | FSR |
| -Annual maintenance fee (CNY) | 2,886,863 | FSR |
| -Annual insurance fee (CNY) | 577,373 | FSR |
| -Annual other cost | 2,275,000 | FSR |

[39] https://www.ndrc.gov.cn/fggz/gdzctz/tzfg/201907/W020191104862129391071.pdf
[40] .https://www.ndrc.gov.cn/fggz/gdzctz/tzfg/201907/t20190729_1197578.html

| | | |
|---|---|---|
| VAT | 13% | FSR: "Announcement on deepening the relevant policies of VAT reform"[41] |
| VAT tax refund rate | 50% | FSR: Notice on Adjusting and Improving VAT Policies for Comprehensive Utilization of Resources and Labor Services[42] |
| Income tax rate | 25% | FSR: Enterprise Income Tax Law of the People's Republic of China[43] |
| Urban maintenance and construction tax rate | 5% | FSR: Tax Law of the People's Republic of China on Urban Maintenance and Construction[44] |
| Surtax for education | 5% | FSR: Decision of The State Council on amending the Interim Provisions on levying Additional Education Fees[45] |
| VCUs price (CNY/t) | 80 | Based on the global carbon market[46,47], the carbon price in EU ETS has reached 25euros (198CNY)/tonne and the price in China's ETS has reached 7.81 euros (62CNY)/tonne in 2019. And PP holds the optimistic expectation about the prospects of the global carbon market and has great confidence in Verra and holds optimistic expectation against the VCUs price since Verra is the world's leading standards for climate action and sustainable development. |
| Project lifetime | 20 years | FSR |

The equity IRR of the project is calculated according to the basic parameters from feasibility study report (FSR) of the proposed project, and the comparison of the proposed project IRR with and without VCUs are shown below:

**Table 3.4** Comparison of IRR values with and without revenue from carbon credits

[41] https://www.gov.cn/gongbao/content/2019/content_5416183.htm
[42] http://www.chinatax.gov.cn/chinatax/n810341/n810765/n812156/201111/c1185761/content.html
[43] http://www.gov.cn/zhengce/2007-03/19/content_2602200.htm
[44] https://www.chinatax.gov.cn/chinatax/n365/c5155445/content.html
[45] https://www.gov.cn/zhengce/content/2008-03/28/content_5555.htm
[46] https://carboncreditcapital.com/carbon_market_value_report_2019/
[47] http://www.tanpaifang.com/tanjiaoyi/2020/0616/71557.html

| Scenario | Equity IRR (%) |
|---|---|
| Without VCUs income | 7.74% |
| With VCUs income | 10.08% |

From the calculation, it can be seen that without VCUs revenue, the equity IRR of the project is below the benchmark 16%, and the financial status with VCUs revenue will be significantly improved.

**Outcome:** according to the tool, the project activity has a lower IRR than the benchmark, then the project activity cannot be considered as financial attractive.

**Sensitivity analysis**

Subsequently, the sensitivity analysis is conducted to show whether the conclusion regarding to the financial attractiveness is robust to reasonable variation under the critical assumptions. The static total investment and annual O&M costs are important components of the project costs and are thus considered. The variable that most significantly impact the project revenues is annual PET sales revenues, i.e., the product of annual PET production and reproduced PET price, which are taken into account as two separate variables. Another variable, purchased waste PET cost (waste PET consumption × waste PET cost), is also an important part of the project costs, but it is not separately considered in the sensitivity analysis. This is because waste PET price is positively correlated to the reproduced PET sales price according to the market price data and actual waste PET purchase and product sales data of PP. Therefore, in the IRR calculation, the project proponent already correlates PET production with waste PET consumption, and correlates reproduced PET price with waste PET price. By taking into account annual PET production and reproduced PET price in the analysis, waste PET consumption and waste PET cost are also implicitly considered.

In summary, the variables to be considered in the sensitivity analysis are:

- Static total investment,

- Annual PET production,

- Annual O&M cost,

- Reproduced PET price.

The sensitivity analysis results are shown in the table below.

| Variation | -10% | -5% | 0 | 5% | 10% |
|---|---|---|---|---|---|
| Static total investment | 9.18% | 8.44% | 7.74% | 7.09% | 6.48% |
| Annual PET production | 5.68% | 6.73% | 7.74% | 8.73% | 9.69% |

| | | | | | |
|---|---|---|---|---|---|
| Annual O&M cost | 10.49% | 9.14% | 7.74% | 6.29% | 4.77% |
| Reproduced PET price | 3.53% | 5.71% | 7.74% | 9.67% | 11.51% |

The results show that the IRR remains below the benchmark value in the variations of all the four variables within the range of ±10%, which shows the robustness of the conclusion that the Project is unlikely to be financially/economically attractive.

The detailed analysis of four variables is as follows.

**Static total investment**

With a decrease in the static total investment by 10%, the IRR is 9.18% which is still lower than the benchmark. Only if the static total investment decreases by 42.03% will the IRR reach the benchmark. Such a massive reduction in investment is impossible to occur. In fact, the actual investment for the project has amounted to 131,825,300 CNY according to the provide proof of investment by the owner, more than the investment applied in the IRR calculation. Therefore, it is impossible to improve the financial attractiveness by reducing static total investment.

**Annual PET production**

If annual PET production increases by 45.41%, the IRR would reach the benchmark. The production capacity was approved by the government and was estimated based on the capacity of the equipment and facilities installed. The actual production of 2022 and 2023 is about 40,500 tons and 53,500 tons separately. Therefore, even considering the design margin, an increase in PET production by 45.41% is impossible to achieve.

**Annual O&M costs**

If annual O&M costs decrease 31.65%, the IRR would reach the benchmark. However, according to data from the National Bureau of Statistics, the indices of urban employees' wages in Guangdong Province were 109.6, 114.2, 115.764, 109.322 and 111.403 (the value of the previous year taken as 100) for the last five years from 2017 to 2021, all higher than 100, indicating a continuous increase for these years[48]. It is reasonable to assume that the increasing trend will continue. Moreover, the actual OM cost from April to December in 2022 is 2,724.36*$10^4$RMB, and the actual OM cost in 2023 is 3,631.65*$10^4$RMB. which are higher than the investment applied in the IRR calculation, therefore, a 31.65% decrease in O&M costs is unlikely to occur.

**Reproduced PET price**

When an increase of 22.91% is assumed in reproduced PET price, the IRR would reach the benchmark. Although the PET price might fluctuate within a certain range, it normally remains at a stable level. Moreover according to the current actual sales price of the factory, the price

[48] https://www.ceicdata.com.cn/zh-hans/china/wage-index

of PET flakes is around 6,400-6,500 CNY/t. Therefore, it is not credible to improve the economic attraction due to the increase of 22.91% in reproduces PET price.

Therefore, the project activity would not have occurred anyway due to the investment barrier.

In conclusion, the Project is additional.

## 3.6 Methodology Deviations

The project does not involve any methodology deviation.

# 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 4.1 Baseline Emissions

According to the methodology, the baseline emission include:

(a) For the production of the plastic, the emissions associated with energy consumption for the production of plastic pellets from virgin plastic materials;

(b) For paper and cardboard, the emissions associated with the anaerobic decay within a disposal site may be claimed;

(c) For the production of glass, emissions associated with the energy consumption for the production of virgin container glass corresponding to the preparation and mixing of raw materials before the melting stage;

(d) For the production of metals, emissions associated with energy consumption for the production from virgin materials.

Baseline emission shall be determined as

$$BE_y = BE_{plastic,y} + BE_{glass,y} + BE_{paper,y} + BE_{metal,y} \quad (1)$$

Where:

| | |
|---|---|
| $BE_y$ | Baseline emissions in year y ($tCO_2e$) |
| $BE_{plastic,y}$ | Baseline emissions associated with the recycling of plastic in year y ($tCO_2e$) |
| $BE_{glass,y}$ | Baseline emissions associated with the recycling of glass in year y ($tCO_2e$) |
| $BE_{paper,y}$ | Baseline emissions associated with the recycling of paper in year y ($tCO_2e$) |
| $BE_{metal,y}$ | Baseline emissions associated with the recycling of metal in year y ($tCO_2e$) |

The Project only recycled and fabricated the plastic product (PET flakes), the baseline emissions associated with the other materials are equal to 0, therefore:

$$BE_y = BE_{plastic,y} \quad (2)$$

Baseline emissions associated with the recycling of plastic type i from virgin inputs are calculated based on the consumption of plastic type i is produced in the host country as well as imported, using the equation below:

$$BE_{plastic,y} = \sum_i \left[ Q_{i,y} \times L_i \times (1 - DF) \times \left( SE_{i,in-country,y} \times w_{i,in-country,y} + SE_{i,imported,y} \times w_{i,imported,y} \right) \right] \quad (3)$$

Where:

| | |
|---|---|
| $BE_{plastic,y}$ | Baseline emissions in year y associated with the recycling of plastic ($tCO_2e$). |
| i | Indices for material type i (i = 1,2,3,4 for HDPE, LDPE, PET and PP). |
| $Q_{i,y}$ | Quantity of plastic type i recycled in year y (t/y). |
| $L_i$ | Net to gross adjustment factor to cover degradation in material quality and material loss in the production process of the final product using the recycled material (use 0.75). |
| $DF$ | Discount factor for upstream displacement (30%) |
| $w_{i,in-country,y}$ | Percentage of plastics produced in the host Country out of total plastic consumed in year y (%) |
| $SE_{i,in-country,y}$ | Specific emissions in the baseline for the production of virgin plastics type i in the host Country in year y ($tCO_2/t_i$) |
| $w_{i,imported,y}$ | Percentage of imported plastics out of total plastic consumed in year y (%) |
| $SE_{i,imported,y}$ | Specific emissions in the baseline for virgin plastics type i imported in year y ($tCO_2/t_i$) |

Specific emissions in the baseline for the production of virgin plastics type i in the host country ($SE_{i,in-country,y}$) are determined based on the equation below:

$$SE_{i,in-country,y} = \left( SEC_{BL,i} \times EF_{BL,el,y} + SFC_{BL,i} \times EF_{BL,FF,CO2} \right) \quad (4)$$

Where:

| | |
|---|---|
| $SEC_{BL,i}$ | Specific electricity consumption for the production of virgin material type i (MWh/ti). |
| $EF_{BL,el,y}$ | Emission factor for the baseline electricity consumption for virgin plastic production in the host party ($tCO_2$/MWh) |

| | |
|---|---|
| $SFC_{BL,i}$ | Specific fuel consumption for the production of virgin material type i (GJ/t). |
| $EF_{BL,FF,CO2}$ | $CO_2$ emission factor for fossil fuel ($tCO_2/GJ$). Project participants shall assume that the baseline fuel is natural gas when it's not possible to identify the type of fuel consumed for the production of plastics from virgin materials |

For the plastic PET imported from the foreign country, as mentioned in section 3.2 above, according to the public information[49, 50], the percentage of imported plastics ($w_{i,imported,y}$) is 1%, thus, $w_{i,imported,y} = 1\%\ and\ w_{i,in-country,y} = 99\%$

$$SE_{i,imported,y} = B_i \times \left(SEC_{BL,i} \times EF_{el,imported} + SFC_{BL,i} \times EF_{FF,imported,CO2}\right)$$

| | |
|---|---|
| $B_i$ | Correction factor based on share of production in non-Annex I countries, as specified in Table 2. |
| $EF_{el,imported}$ | Emission factor for the baseline electricity consumption for the portion of plastic that is imported ($tCO_2/MWh$). Apply a default value of 0.24 ($tCO_2/MWh$) |
| $EF_{FF,imported,CO2}$ | CO2 emission factor for fossil fuel (tCO2/GJ). Assume that natural gas supplies the energy needed to produce the virgin plastic imported if it is not possible to identify the fuel type. |

Therefore, the calculation of emission for the plastic imported is out of the consideration, so,

$$BE_{plastic,y} = Q_{i,y} \times L_i \times (1 - DF) \times \Big(\left(SEC_{BL,i} \times EF_{BL,el,y} + SFC_{BL,i} \times EF_{BL,FF,CO2}\right) \times 99\% + B_i \times \left(SEC_{BL,i} \times EF_{el,imported,y} + SFC_{BL,i} \times EF_{FF,imported,CO2}\right) \times 1\%\Big) \quad (5)$$

For the virgin plastic type i = PET, the values of related parameters are:

$SEC_{BL,i}$ = 1.11 MWh/$t_i$;

$SFC_{BL,i}$ = 15 GJ/$t_i$.

$B_i$=0.6

$EF_{el,imported}$=0.24 $tCO_2/MWh$

The following conservative assumptions were made to derive the default values above:

1. The energy needed for the production of the virgin monomers Ethylene, Propylene, Ethylene Glycol and Terephthalic Acid through thermal cracking of olefins is supplied by natural gas; A conservative value of 15 GJ/tons of energy needed to produce ethylene was selected from Table 4.3 of the report "Tracking Industrial Energy Efficiency and $CO_2$ emissions" published by the International Energy Agency (IEA, 2007);

[49] https://xueqiu.com/1973934190/222035951
[50] http://m.100ppi.com/focus/detail-forecast-166188.html

2. The energy needed for the production of the polymers is supplied by electricity: For PET, a conservative value of 4.0 GJ/t (divided by 3.6 to convert MWh/t) was sourced from Table 1 of SAYGIN et al (2011).

3. The remaining steps of virgin pellet production (melting and shaping, pelletizing, compounding) require relatively negligible amounts of energy and hence are ignored.

**1. Calculation of fossil fuel emission factor $EF_{BL,FF,CO_2}$**

For the production of PET, it's hard to identify the type of fuel consumed for the production, as per the methodology, the baseline fuel is natural gas.

$EF_{FF,CO2} = EF_{natural\ gas}$ =54,300 kg$CO_2$/TJ=0.0543 t$CO_2$/GJ

**2.Calculation of grid electricity emission factor $EF_{BL,el,y}$**

The emission factor for the baseline electricity consumption for virgin plastic production in the host party (parameter $EF_{BL,el,y}$ ) shall be determined based on the weighted average consumption of electricity from the electric grid(s) and from captive power plant(s) as indicated in the equation below. Project participants may choose to fix this parameter ex-ante and update it at the renewal of the crediting period or monitor this parameter ex-post. If the parameter is fixed ex-ante, it shall be calculated using the most recent data available.

$$EF_{BL,el,y} = \frac{\sum_k \left(EF_{BL,grid,k,y} \times EC_{BL,grid,k,y}\right) + \sum_i \left(EF_{BL,captive,k,y} \times EC_{BL,captive,k,y}\right)}{\sum_k EC_{BL,grid,k,y} + \sum_j EC_{BL,captive,j,y}} \quad (6)$$

Where:

| | |
|---|---|
| $EF_{BL,grid,k,y}$ | Emission factor of the grid k supplying electricity to produce virgin plastics in the host party in year y (t$CO_2$/MWh) |
| $EC_{BL,grid,k,y}$ | Electricity consumed from the grid k to produce virgin plastics in the host country in year y (MWh) |
| $EF_{BL,captive,k,y}$ | Emission factor of the captive power plant j supplying electricity to produce virgin plastics in the host party in year y (t$CO_2$/MWh) |
| $EC_{BL,captive,k,y}$ | Electricity consumed from the captive power plant j to produce virgin plastics Identify the relevant electricity systems; in the host country in year y (MWh) |

In the Chinese plastic industry, all the electricity used for producing the plastic is supplied by the grid, it doesn't exist the energy supplied by the captive power plant, therefore, the equation (6) will be simplified as:

$$EF_{BL,el,y} = EF_{BL,grid,k,y} \quad (7)$$

The grid electricity emission factor $EF_{BL,grid,k,y}$ is calculated through the TOOL07: Tool to calculate the emission factor for an electricity system (version 07.0).

Step 1: Identify the relevant electricity systems;

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

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

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

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

Step 6: Calculate the combined margin (CM) emission factor.

As China MEE has published the calculation method for emission factor of grid, the published data and method have been applied for this project to calculate operating margin (OM) and build margin(BM), as following steps:

**Step 1: Identify the relevant electricity systems.**

The project is in Meizhou City, Guangdong Province, P.R China, which belongs to South China Regional Power Grid (SCPG) according to the public delineation of National Center for Climate Change Strategy and International Cooperation (NCSC).

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

For this project, Option I (only grid power plants are included in the calculation) is chosen.

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

Calculation of Operating Margin should be based on one of the four following methods according to the tool:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As the low-cost / must-run resources constituted more than 50% of total electricity generation of South China Power Grid in recent five years (i.e., 50.40, 51.21, 50.09, 50.25 and 50.96 for 2015-2019 respectively). The Simple adjusted OM (b) method is selected and the following data vintage is chosen to calculate the emission factor:

Ex-ante option: use a 3-year generation-weighted average, based on the most recent data available, without requirement to monitor and recalculate the emissions factor during the crediting period. And according to the tool, the emission factor is determined once at the

validation stage, thus monitoring and recalculation of the emissions factor during the crediting period is required.

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

The simple adjusted OM emission factor ($EF_{grid,OM\text{-}adj,y}$) is a variation of the simple OM, where the power plants/units (including imports) are separated in low-cost/must-run power sources (k) and other power sources (m). As under Option A of the simple OM, it is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OM-adj,y} = (1-\lambda_y) \times \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y \times \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}} \quad (8)$$

Where:

| | |
|---|---|
| $EF_{grid,OM-adj,y}$ | Simple adjusted operating margin $CO_2$ emission factor in year y (t $CO_2$/MWh) |
| $\lambda_y$ | Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y |
| $EG_{m,y}$ | Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh) |
| $EG_{k,y}$ | Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh) |
| $EF_{EL,m,y}$ | $CO_2$ emission factor of power unit m in year y (t $CO_2$/MWh) |
| $EF_{EL,k,y}$ | $CO_2$ emission factor of power unit k in year y (t $CO_2$/MWh) |
| *m* | All grid power units serving the grid in year y except low-cost/must-run power units |
| *k* | All low-cost/must run grid power units serving the grid in year y |
| *y* | The relevant year as per the data vintage chosen in Step 3 |

Based on the most recent available data published by NCSC at the time of this PD submission, 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 NCSC[51], which uses official national statistics.

$EF_{grid,OMsimple,y}$ = $0.7722 tCO_2/MWh$

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

As per Section 6.5 of Tool 07 (version 07.0), in terms of vintage of data, project participants can choose between one of the following two options:

[51] http://www.ditan.com/static/upload/file/20231121/1700533899201781.pdf

(a) Option 1 - For the first 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 CDM- PDD 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 first 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.

In line with 2021 Baseline Emission Factors for Regional Power Grids in China, Option 1 is chosen for the project; the BM emission factor is calculated ex ante based on the most recent information available on units already built for sample group m at the time of this project description submission. 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:

(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 ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, 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) ($SET \geqslant 20\%$) and determine their annual electricity generation($AEG_{SET} \geqslant 20\%$, in MWh);

(c) From $SET_{5\text{-units}}$ and $SET \geqslant 20\%$ select the set of power units that comprises the larger annual electricity generation ($SET_{sample}$);

Identify the date when the power units in $SET_{sample}$ started to supply electricity to the grid. If none of the power units in $SET_{sample}$ started to supply electricity to the grid more than 10 years ago, then use $SET_{sample}$ to calculate the build margin. In this case ignore Steps (d), (e) and (f). 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. $AEG_{SET-sample-CDM} \geqslant 0.2x\ AEG_{total}$), 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);

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

The BM emissions factor is the generation-weighted average emission factor ($tCO_2/MWh$) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m \left(EG_{m,y} \times EF_{EL,m,y}\right)}{\sum_m EG_{m,y}} \quad (9)$$

Where:

| | |
|---|---|
| $EF_{grid,BM,y}$ | Build margin $CO_2$ emission factor of SCPG in year y (t $CO_2$/MWh) |
| $EG_{m,y}$ | Net quantity of electricity generated and delivered to the grid by power units m in year y (MWh) |
| $EF_{EL,m,y}$ | $CO_2$ emission factor of power unit m in year y (t $CO_2$/MWh) |
| $m$ | Power units included in the build margin |
| y | The most recent year for which the generation data is available |

As it is difficult to obtain the detailed data on the power generation, fuel consumption and thermal efficiency of each newly built power unit from public documents, a deviation of Tool 07 (Version 07.0) is adopted following the clarifications given by the CDM EB concerning the BM emission factor calculation:

(1) The CDM EB suggested using the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin.

(2) The EB agreed the use of capacity additions during last 1~3 years for estimating the build margin emission factor for grid electricity.

(3) The EB also agreed to use of weights estimated using installed capacity in place of annual electricity generation. The newly built power plants in the past few years are bundled into "grouped new power plant" according to their construction year, their province, and their fuel type. The annual net electricity generation in the year y of each "grouped new power plant" $EG_{m,y}$ is estimated according to their total capacity and the average utilization hours, as the following equation:

$$EG_{m,y} = CAP_m \times H_{m,y} \quad (10)$$

Where:

| | |
|---|---|
| $EG_{m,y}$ | Annual net electricity generation the unit m in year y (MWh) |
| $CAP_m$ | Installed capacity of the unit m (MW) |
| $EF_{EL,m,y}$ | Utilization hour of the unit m in the year y (h), determined according to the average utilization hour of the same type of unit in the same province |
| $m$ | The most recent year for which the generation data is available. |
| $y$ | grouped new power plant |

Since the newly built power plants in the same province (A), in the same year (t) and using the same fuel type (k) are grouped into "a grouped new power plant", $CAP_m$ represents the total installed capacity of fuel type k power plants located in the provinces A and in the year t:

$$CAP_m = CAP_{A,t,k} \quad (11)$$

Where:

| | |
|---|---|
| $CAP_m$ | Installed capacity of the unit m (MW), with m representing the specified combination of A, t, and k |
| $CAP_{A,t,k}$ | Installed capacity of the unit m (MW) |
| $A$ | Provinces covered by the SCPG, namely, Guangdong Province, Yunan Province, Guizhou Province, Hainan Province and Guangxi Autonomous Region. |
| $t$ | Years related to the grouped new power plants, for the 2021 calculation, t represents 2019, 2018, 2017…. Until the aggregated electricity generation of the grouped new power plants reaches 20% of the total electricity generation of the SCPG |
| $k$ | Fuel type of the grouped new power plants, including hydro, thermal (coal, gas, oil, waste incineration, other thermal), nuclear, wind, solar and others. |

The emission factors of each fuel type are determined according to the Option A2 in the TOOL07, as the following equation:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (12)$$

Where:

| | |
|---|---|
| $EF_{EL,m,y}$ | $CO_2$ emission factor of power unit m in year y (t $CO_2$/MWh) |
| $EF_{CO2,m,i,y}$ | Average $CO_2$ emission factor of fuel type *i* used in power unit m in year y (t $CO_2$/GJ) |
| $\eta_{m,y}$ | Average net energy conversion efficiency of power unit m in year y (ratio) |
| $m$ | All power units serving the grid in year y except low-cost / must-run power units |
| 3.6 | Conversion factor (GJ/MWh) |

Among the fuel types, the emission factors of hydro, nuclear, wind, solar, other thermal and others are 0. Concerning the emission factors of coal, gas, oil and waste incineration, the formula (13) takes the following form due to conservativeness:

$$EF_{best,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{best,y}} \quad (13)$$

Where:

| | |
|---|---|
| $EF_{best,m,y}$ | Emission factor of power unit m with the best technology commercially available in year y (t $CO_2$/MWh) |
| $\eta_{best,y}$ | Power generation efficiency of the best technology commercially |
| $m$ | Power units serving the grid with coal, gas, oil or waste incineration in year y |

Based on the most recent available data published by China DNA at the time of this PD submission, 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 DNA[52], which uses official national statistics.

$EF_{grid,BM,y}$ = 0.1880 t$CO_2$/MWh

**Step 6: Calculate the combined margin (CM) emission factor.**

The combined margin (CM) emission factor of the baseline scenario is calculated as follows:

(a) Weighted average CM; or

[52] http://www.ditan.com/static/upload/file/20231121/1700533899201781.pdf

(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:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (14)$$

Where:

| | |
|---|---|
| $EF_{grid,OM,y}$ | Build margin $CO_2$ emission factor in year y ($tCO_2/MWh$) |
| $EF_{grid,BM,y}$ | Operating margin $CO_2$ emission factor in year y ($tCO_2/MWh$) |
| $w_{OM}$ | Weighting of build margin emissions factor (%) |
| $w_{BM}$ | Weighting of operating margin emissions factor (%) |

As per TOOL07, the weights of OM and BM for all other projects except wind and solar power generation project activities are as follows:

$\omega_{OM}$ =0.5 $\omega_{BM}$ = 0.5

Therefore, the baseline CM emission factor:

$$EF_{grid,CM,y} = 0.7722 \times 0.5 + 0.1880 \times 0.5 = 0.4801\ tCO_2/MWh$$

Therefore:

$$EF_{el,PJ,y} = EF_{BL,grid,k,y} = EF_{grid,CM,y} = 0.4801\ tCO_2/MWh$$

## 4.2 Project Emissions

Project emissions include emissions associated with the energy use at recycling facility and at the processing facility, and are calculated based on the equation below.

According to Methodology AMS-III.AJ, for project activities where the recycling facility includes both waste sorting and processing, project emissions are calculated using equation below:

$$PE_y = EC_{PJ,y} \times EF_{el,PJ,y} + \sum_f \left(FC_{f,PJ,y} \times NCV_{f,y} \times EF_{f,CO2,y}\right) \quad (15)$$

Where:

| | |
|---|---|
| $PE_y$ | Project emissions in year y (t $CO_2$/y) |
| $EC_{PJ,y}$ | Electricity consumed by the recycling facility in year y (MWh/t) |
| $EF_{el,PJ,y}$ | Emission factor of the electric grid supplying electricity to the recycling facility in year y ($tCO_2/MWh$) |
| $FC_{f,PJ,y}$ | Fuel type f consumed by the recycling facility in year y (unit mass or volume/t) |

| | |
|---|---|
| $NCV_{f,y}$ | Net calorific value of the fossil fuel type y consumed in the recycling facility in year y (GJ/unit mass or volume) |
| $EF_{f,CO2,y}$ | $CO_2$ emission factor of the fossil fuel type y consumed at the recycling facility in year y ($tCO_2/GJ$) |

Grid electricity is consumed at most of the sub-units of the recycling facility. Two types of fossil fuel are involved in the project: natural gas and diesel. Equation (15) takes the following form:

$$PE_y = EC_{PJ,y} \times EF_{el,PJ,y} + FC_{gas,PJ,y} \times NCV_{gas,y} \times EF_{gas,CO2,y} + FC_{diesel,PJ,y} \times NCV_{diesel,y} \times EF_{diesel,CO2,y}$$

Natural gas is used for the washing unit, diesel is used for forklifts transportation within the recycling facility, as shown in Section 1.11.

According to the applied methodology AMS-III.AJ. (Version 09.0), emissions associated with transportation of recyclable materials and processing/manufacturing under the project activity are considered as equivalent to the corresponding emissions for the virgin materials and therefore ignored in this methodology. This means that diesel consumed in the Project is not required by the methodology in the calculation of project emissions. However, the Project still decides to take into account diesel use, and this is conservative.

For project activities that fall under Case A, the parameters $EC_{PJ,y}$ and $FC_{f,PJ,y}$ may be estimated based on the nameplate specific energy consumption of the equipment used and the average time of operation and level of service delivered, or based on measurement campaigns of the energy consumption under typical operation conditions.

The project activity falls under Case A and chooses to directly measure electricity consumption and natural gas consumption calculation of project emissions. For the consumption of diesel, as diesel is purchased directly from filling stations and the fueling equipment and its calibration are under the control of the filling stations. There is no other metering equipment available in the recycling facility, thus, the Project will use diesel purchase receipts for recording the amount of diesel consumption to calculate the project emissions since the purchase receipts are the only available and reliable data source of diesel consumption.

## 4.3 Leakage

As per AMS-III.AJ. (Version 09.0), "if it is demonstrated that organic biogenic waste segregated in the recycling facility would otherwise have been deposited in a landfill without methane recovery in the baseline scenario, or if the baseline scenario is the incineration of the wastes, then no leakage calculation is required."

For the project, no organic biogenic waste is involved, the waste recycled is only plastic, prior to project initiation, the post-consumer PET bottles were disposed in the landfill or incineration without being recovered, therefore, in the project situation, no leakage calculation is required.

## 4.4 Net GHG Emission Reductions and Removals

Emission reduction due to the project activity during the year y are calculated as follows:

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

**Baseline Emissions ($BE_y$)**

It was planned that the project would recycle 65,000 tons of post-consumer PET bottles each year.

Based on the equation (5), the baseline emissions for plastic recycling are:

$$BE_{plastic,y} = Q_{i,y} \times L_i \times (1 - DF) \times \left(\left(SEC_{BL,i} \times EF_{BL,el,y} + SFC_{BL,i} \times EF_{BL,FF,CO2}\right) \times 99\% + B_i \times \left(SEC_{BL,i} \times EF_{el,imported,y} + SFC_{BL,i} \times EF_{FF,imported,CO2}\right) \times 1\%\right) = 65{,}000 \times 0.75 \times (1 - 30\%) \times ((1.11\ \text{MWh/t} \times 0.4801\ \text{tCO}_2\text{/MWh} + 15\ \text{GJ/t} \times 0.0543\ \text{tCO}_2\text{/GJ}) \times 99\% + 0.6 \times (1.11\ \text{MWh/t} \times 0.24\ \text{tCO}_2\text{/MWh} + 15\ \text{GJ/t} \times 0.0543\ \text{tCO}_2\text{/GJ}) \times 1\%)$$

$$= 45{,}741\ \text{tCO}_2\text{e}$$

**Table 4.1** Ex-ante calculation of $BE_{plastic,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| $SEC_{BL,i}$ | 1.11 | MWh/ti | Default value for plastic type *i* PET from AMS-III.AJ V09.0 |
| $EF_{grid,OM,y}$ | 0.7722 | $tCO_2/MWh$ | 2021 Baseline Emission Factors for Regional Power Grids in China (SCPG) |
| $EF_{grid,BM,y}$ | 0.1880 | $tCO_2/MWh$ | 2021 Baseline Emission Factors for Regional Power Grids in China (SCPG) |
| $EF_{BL,el,y}$ | 0.4801 | $tCO_2/MWh$ | Calculated |
| $SFC_{BL,i}$ | 15 | GJ/t | Default value for plastic type *i* PET from AMS-III.AJ V09.0 |
| $EF_{BL,FF,CO2}$ | 0.0543 | $tCO_2/GJ$ | IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines[53] on National GHG Inventories which is conservative. It is assumed that the baseline fuel is natural gas. |
| $EF_{FF,imported,CO2}$ | 0.0543 | $tCO_2/GJ$ | IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 |

[53] The Effective $CO_2$ emission factor for natural gas was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

| | | | |
|---|---|---|---|
| | | | (Energy) of the 2006 IPCC Guidelines[54] on National GHG Inventories which is conservative.<br>It is assumed that the baseline fuel is natural gas. |
| $L_i$ | 0.75 | / | Default value for plastic type *i* PET from AMS-III.AJ V09.0 |
| $EF_{el,imported}$ | 0.24 | $tCO_2/MWh$ | Default value from AMS-III.AJ., V09.0. |
| $B_i$ | 0.6 | / | Default value from AMS-III.AJ., V09.0. |
| DF | 30 | % | Default value from VMR0007 Revision to AMS-III.AJ V09.0 |
| $W_{i,in\text{-}country,y}$ | 99 | % | From the public information |
| $W_{i,imported,y}$ | 1 | % | From the public information |
| $Q_{i,y}$ | 65,000 | t | FSR |
| $BE_{plastic,y}$ | 45,741 | t $CO_2e$ | Calculated |

**Project Emissions ($PE_y$)**

It was estimated that the project would consume 16,300 MWh electricity, 850,000 $Nm^3$ natural gas and 30 tons of diesel each year.

$$PE_y = EC_{PJ,y} \times EF_{el,PJ,y} + \sum_f \left(EC_{f,PJ,y} \times NCV_{f,y} \times EF_{f,CO2,y}\right) = 16{,}300\ \text{MWh} \times 0.4801 \frac{tCO_2}{MWh} + 850{,}000 \times 38{,}931 \times 0.0583 \times 10^{-6} \frac{tCO_2}{GJ} + 30\ \text{t} \times 42{,}652 \times 10^{-3} \frac{GJ}{t} \times 0.0748 \frac{tCO_2}{GJ} = 9{,}851\ CO_2e$$

**Table 4.2** Ex-ante calculation of $PE_y$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| $EC_{PJ,y}$ | 16,300 | MWh | According to the FSR of the project |
| $EF_{el,PJ,y}$ | 0.4801 | $tCO_2/MWh$ | Calculated |
| $FC_{gas,PJ,y}$ | 850,000 | $Nm^3$ | According to the FSR of the project |
| $NCV_{gas,y}$ | 38,931 | $kJ/Nm^3$ | China Energy Statistical Yearbook |
| $EF_{gas,CO2,y}$ | 0.0583 | $tCO_2/GJ$ | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines[55] on National GHG |

[54] The Effective $CO_2$ emission factor for natural gas was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

[55] The Effective $CO_2$ emission factor for natural gas was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

| | | | |
|---|---|---|---|
| | | | Inventories as per the requirement of latest TOOL03, v03.0. |
| $FC_{diesel,PJ,y}$ | 30 | t | According to the FSR of the project |
| $NCV_{diesel,y}$ | 42,652 | MJ/t | China Energy Statistical Yearbook |
| $EF_{diesel,CO2,y}$ | 0.0748 | $tCO_2/GJ$ | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines[56] on National GHG Inventories as per the requirement of latest TOOL03, v03.0. |
| $PE_{,y}$ | 9,851 | t $CO_2e$ | Calculated |

**Leakage ($LE_y$)**

As discussed before, $LE_y$=0.

**Emission Reductions ($ER_y$)**

The emission reductions ($ER_y$) of the project activity are calculated as:

$ER_y = BE_y - PE_y - LE_y$ =45,741 $tCO_2e$ - 9,851 $tCO_2e$ - 0 $tCO_2e$ =35,890 $tCO_2e$

| Year | Estimated baseline emissions or removals ($tCO_2e$) | Estimated project emissions or removals ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 2022 (06-April-2022 to 31-December-2022) | 33,836 | 7,287 | 0 | 26,549 |
| 2023 | 45,741 | 9,851 | 0 | 35,890 |
| 2024 | 45,741 | 9,851 | 0 | 35,890 |
| 2025 | 45,741 | 9,851 | 0 | 35,890 |
| 2026 | 45,741 | 9,851 | 0 | 35,890 |
| 2027 | 45,741 | 9,851 | 0 | 35,890 |
| 2028 | 45,741 | 9,851 | 0 | 35,890 |

[56] The Effective $CO_2$ emission factor for diesel was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

| | | | | |
|---|---|---|---|---|
| 2029<br>(01-January-2029 to 05-April -2029) | 11,905 | 2,564 | 0 | 9,341 |
| **Total** | **320,187** | **68,957** | **0** | **251,230** |
| **Annual average** | **45,741** | **9,851** | **0** | **35,890** |

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

| | |
|---|---|
| **Data / Parameter** | $L_i$ |
| **Data unit** | - |
| **Description** | Net to gross adjustment factor to cover degradation in material quality and material loss in the production process of the final product using the recycled material |
| **Source of data** | AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| **Value applied:** | 0.75 |
| **Justification of choice of data or description of measurement methods and procedures applied** | Default value from AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| **Purpose of Data** | Calculation of baseline emissions |
| **Comments** | N/A |

| | |
|---|---|
| **Data / Parameter** | $B_i$ |
| **Data unit** | - |
| **Description** | Correction factor based on share of production in non-Annex I countries |
| **Source of data** | AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |

| | |
|---|---|
| Value applied: | 0.6 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value from AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

| | |
|---|---|
| Data / Parameter | DF |
| Data unit | % |
| Description | Discount factor for upstream displacement |
| Source of data | VMR0007 Revision to AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0), V1.0 |
| Value applied: | 30 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value from VMR0007 Revision to AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $SEC_{BL,i}$ |
| Data unit | MWh/$t_i$ |
| Description | Specific electricity consumption in the production of virgin material type i |
| Source of data | AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Value applied: | 1.11 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Default value for PET from the methodology AMS-III.AJ., Recovery and recycling of materials from solid wastes (Version 09.0) |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $SFC_{BL,i}$ |
| Data unit | GJ/$t_i$ |
| Description | Specific fuel consumption in the production of virgin material type i |
| Source of data | AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Value applied: | 15 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value for PET from the methodology AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{BL,FF,CO2}$ |
| Data unit | $tCO_2/GJ$ |
| Description | $CO_2$ emission factor of the baseline fossil fuel. |
| Source of data | 2006 IPCC Guidelines[57] for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4 |

[57] The Effective $CO_2$ emission factor for natural gas was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

| | |
|---|---|
| Value applied: | 0.0543(for natural gas) |
| Justification of choice of data or description of measurement methods and procedures applied | It is assumed that the baseline fossil fuel involved in the production of PET is natural gas, which is in line with the methodology.<br>IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories which is conservative. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

| | |
|---|---|
| Data / Parameter | $EF_{FF,imported,CO2}$ |
| Data unit | $tCO_2/GJ$ |
| Description | $CO_2$ emission factor of the baseline fossil fuel. |
| Source of data | 2006 IPCC Guidelines[58] for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4 |
| Value applied: | 0.0543 (for natural gas) |
| Justification of choice of data or description of measurement methods and procedures applied | It is assumed that the baseline fossil fuel involved in the production of PET is natural gas, which is in line with the methodology.<br>IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories which is conservative. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

| | |
|---|---|
| Data / Parameter | $EF_{grid,OM,y}$ |
| Data unit | $tCO_2/MWh$ |

[58] The Effective $CO_2$ emission factor for natural gas was not updated in the 2019 refinement to the 2006 IPCC guidelines, thus, table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is still the latest source.

| | |
|---|---|
| Description | Operating margin emission factor of the grid connected (SCPG) |
| Source of data | 1. 2021 Baseline Emission Factors for Regional Power Grids in China[59], and Calculation Instructions for 2021 Baseline OM Emission Factors for Regional Power Grids in China published by the NCSC;<br>2. TOOL07: "Tool to calculate the emission factor for an electricity system" (version 07.0) |
| Value applied: | 0.7722 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated as per TOOL07 (version 07.0) based on official data published by the Ministry of Ecology and Environment of China |
| Purpose of Data | Calculation of baseline emissions and project emissions |
| Comments | The value is calculated ex ante and fixed during the crediting period. |

| | |
|---|---|
| Data / Parameter | $EF_{grid,BM,y}$ |
| Data unit | $tCO_2/MWh$ |
| Description | Build margin emission factor of the grid connected (SCPG) |
| Source of data | 1. 2021 Baseline Emission Factors for Regional Power Grids in China;<br>2. TOOL07: "Tool to calculate the emission factor for an electricity system" (version 07.0) |
| Value applied: | 0.1880 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated as per TOOL07 (version 07.0) based on official data published by the Ministry of Ecology and Environment of China |
| Purpose of Data | Calculation of baseline emissions and project emissions |

[59] http://www.ditan.com/static/upload/file/20231121/1700533899201781.pdf

| | |
|---|---|
| Comments | The value is calculated ex ante and fixed during the crediting period. |

| | |
|---|---|
| Data / Parameter | $w_{OM}$ |
| Data unit | - |
| Description | Weighting of operating margin emission factor |
| Source of data | TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0) |
| Value applied: | 0.5 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of Data | Calculation of baseline emissions and project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $w_{BM}$ |
| Data unit | - |
| Description | Weighting of build margin emission factor |
| Source of data | TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0) |
| Value applied: | 0.5 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value |
| Purpose of Data | Calculation of baseline emissions and project emissions |

| | |
|---|---|
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $\boldsymbol{EF_{grid,CM,y}}$ $(EF_{BL,el,y}, EF_{el,PJ,y})$ |
| Data unit | $tCO_2$/MWh |
| Description | Combined margin emission factor for the grid (SCPG) in year y |
| Source of data | 1. 2021 Baseline Emission Factors for Regional Power Grids in China<br>2. TOOL07: "Tool to calculate the emission factor for an electricity system" (version 07.0) |
| Value applied: | 0.4801 |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated as per TOOL07 (version 07.0) based on official data published by the Ministry of Ecology and Environment of China |
| Purpose of Data | Calculation of baseline emissions and project emissions |
| Comments | The ex-ante option is selected to calculate $EF_{grid,OM,y}$ and $EF_{grid,BM,y,}$ and hence $EF_{grid,CM,y}$ , which will be fixed throughout the crediting period; therefore, both parameters $EF_{BL,el,y}$ and $EF_{el,PJ,y}$ are fixed throughout the crediting period. |

| | |
|---|---|
| Data / Parameter | $\boldsymbol{EF_{el,imported}}$ |
| Data unit | $tCO_2$/MWh |
| Description | Emission factor for the baseline electricity consumption for the portion of plastic that is imported |
| Source of data | AMS-III.AJ.: Recovery and recycling of materials from solid wastes (Version 09.0) |
| Value applied: | 0.24 |
| Justification of choice of data or description of measurement methods | Default value |

| | |
|---|---|
| and procedures applied | |
| Purpose of Data | Calculation of baseline emissions |
| Comments | - |

## 5.2 Data and Parameters Monitored

| | |
|---|---|
| Data / Parameter | $Q_{i,y}$ |
| Data unit | t/y |
| Description | Quantity of waste PET bottles recycled in year y |
| Source of data | Truck scale installed at the project site |
| Description of measurement methods and procedures applied | The weight of vehicles with and without PET flakes are weighed by the truck scale, so that the load carried by the vehicle can be calculated and recorded. |
| Frequency of monitoring/recording | Recorded at the time of receiving each consignment of waste PET bottles entering the project site. |
| Value applied: | 65,000 (ex-ante estimated value) |
| Monitoring equipment | Truck scale with the following technical information:<br>Monitoring instrument: **Truck scale**<br>Equipment type: XK3910-DS10<br>Serial No.: 1609002201<br>Accuracy: 20 kg<br>Manufacturer: Shenzhen Shuxing Xinghengqi Technology Co. LTD. |
| QA/QC procedures applied | This parameter can be sourced from monthly production record recorded by project proponent. The truck scale is regularly maintained and calibrated every year in accordance with the national standard JJG 539-2016. PP signed contract with third party Guangdong Xingning City quality technical supervision and testing institute which is accredited by Guangdong Xingning City quality and technical supervision bureau in truck scale calibrating. Guangdong Xingning City quality technical supervision and testing institute will be responsible for calibration of truck scales in accordance with national standard JJG 539-2016 every year at the project site and supply the calibration reocrds to PP and the calibration records will be archived and supplied to VVB during verification. The recorded weight of waste PET will be cross-checked with waste PET purchase invoices or other payment documents, and |

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| | conservative values will be applied in calculation.<br>All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later |
| **Purpose of data** | Calculation of baseline emissions |
| **Calculation method** | - |
| **Comments** | - |

| | |
|---|---|
| **Data / Parameter** | $EC_{PJ,y}$ |
| **Data unit** | MWh |
| **Description** | Electricity consumed by the recycling facility in year y |
| **Source of data** | Electricity meter's reading records |
| **Description of measurement methods and procedures applied** | Measured by an electricity meter |
| **Frequency of monitoring/recording** | Measured continuously and recorded monthly |
| **Value applied:** | 16,300 (ex-ante estimated value) |
| **Monitoring equipment** | Electricity meter with the following technical information:<br>Monitoring instrument: Electricity meter<br>Equipment type: PEC-H3A<br>Serial No.: 311700021450<br>Accuracy: 0.5s<br>Manufacturer: Jiangsu Linyang Electronics Co., LTD. |
| **QA/QC procedures applied** | The monitored values will be cross checked with electricity purchase receipts, and conservative values will be applied in calculation.<br>Electricity meter will be calibrated every five years by officially accredited entity in compliance with the accuracy of 0.5s of DL/T448-2016 "Specification for technical management of electric energy metering devices" in China. According to the power supply contract signed between PP and the grid company, the grid company is responsible for the calibration of electricity meter of this project. Grid company will calibrate the electricity meter in accordance with national standard DL/T448-2016 every |

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| | five year at the project site and supply the calibration records to the PP and the calibration records will be archived and supplied to VVB during verification.<br><br>All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later |
| **Purpose of data** | Calculation of project emissions |
| **Calculation method** | - |
| **Comments** | - |

| | |
|---|---|
| **Data / Parameter** | $FC_{gas,PJ,y}$ |
| **Data unit** | $Nm^3$ |
| **Description** | Quantity of natural gas consumption of the recycling facility in year y |
| **Source of data** | Flow meter |
| **Description of measurement methods and procedures applied** | Measured by a flow meter |
| **Frequency of monitoring/recording** | Monitored continuously and recorded regularly |
| **Value applied:** | 850,000 (ex-ante estimated value) |
| **Monitoring equipment** | Flow meter with the following technical information:<br><br>Monitoring instrument: **Flow meter**<br>Equipment type: XK3910-DS10<br>Serial No.: 1609002201<br>Accuracy: ±0.5%<br>Manufacturer: Shenzhen Shuxing Xinghengqi Technology Co. LTD. |
| **QA/QC procedures applied** | The monitored values will be cross checked with natural gas purchase receipts, and conservative values will be applied in calculation.<br><br>Flow meter will be calibrated every year by officially accredited entity in compliance with JJG1033-2007 “Verification regulation of electromagnetic flow meter” in China. PP signed contract with third party Guangdong Xingning City quality technical supervision |

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| | and testing institute which is accredited by Guangdong Xingning City quality and technical supervision bureau in flow meter calibrating. Guangdong Xingning City quality technical supervision and testing institute will be responsible for calibration of flow meter in accordance with national standard JJG1033-2007 every year at the project site and supply the calibration reocrds to PP and the calibration records will be archived and supplied to VVB during verification.<br>All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later |
| Purpose of data | Calculation of project emissions |
| Calculation method | - |
| Comments | - |

| | |
|---|---|
| Data / Parameter | $FC_{diesel,PJ,y}$ |
| Data unit | t |
| Description | Diesel consumption of the recycling facility in year y |
| Source of data | Diesel purchase receipts |
| Description of measurement methods and procedures applied | Diesel purchase receipts will be collected to record the diesel consumption. |
| Frequency of monitoring/recording | Monitored continuously and recorded continuously |
| Value applied: | 30 (ex-ante estimated value), which sourced from FSR. |
| Monitoring equipment | Diesel used for transportation by vehicles within the recycling facility is purchased directly from the filling stations and no metering equipment is available in the recycling facility, the Project uses diesel purchase receipts for recording the amount of diesel consumption. |
| QA/QC procedures applied | The fueling equipment and its calibration is controlled by the filling stations.<br>All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later |
| Purpose of data | Calculation of project emissions |

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|---|---|
| Calculation method | - |
| Comments | - |

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|---|---|
| Data / Parameter | $w_{i,in-country,y}$ |
| Data unit | % |
| Description | Percentage of plastics produced in the host party out of total plastic consumed in year y |
| Source of data | For the ex-ante estimation, the source is a public sectoral report for 2021: https://xueqiu.com/1973934190/222035951<br>For the monitoring, the source will be: Sectoral reports, peer-reviewed studies or national/sectoral statistics |
| Description of measurement methods and procedures applied | Obtained from sectoral reports, peer-reviewed studies or national/sectoral statistics |
| Frequency of monitoring/recording | Annual |
| Value applied: | 99 (ex-ante) |
| Monitoring equipment | - |
| QA/QC procedures applied | Data are obtained annually from publicly available sources |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | - |
| Comments | - |

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|---|---|
| Data / Parameter | $w_{i,imported,y}$ |
| Data unit | % |
| Description | Percentage of plastics produced in the host party out of total plastic consumed in year y |
| Source of data | For the ex-ante estimation, the source is a public sectoral report for 2021: http://m.100ppi.com/focus/detail-forecast-166188.html<br>For the monitoring, the source will be: Sectoral reports, peer- |

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|---|---|
| | reviewed studies or national/sectoral statistics |
| Description of measurement methods and procedures applied | Obtained from sectoral reports, peer-reviewed studies or national/sectoral statistics |
| Frequency of monitoring/recording | Annual |
| Value applied: | 1 (ex-ante) |
| Monitoring equipment | - |
| QA/QC procedures applied | Data are obtained annually from publicly available sources |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | - |
| Comments | - |

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|---|---|
| Data / Parameter | **Intrinsic Viscosity** |
| Data unit | decilitres/gram (dL/g) |
| Description | Intrinsic Viscosity of PET |
| Source of data | Testing reports issued by a qualified third party |
| Description of measurement methods and procedures applied | Test method for determining intrinsic viscosity is as per ASTM D 4603 "Standard test method for determining Viscosity of Polyethylene Terephthalate" for PET. |
| Frequency of monitoring/recording | Every batch of Polymerisation |
| Value applied: | The intrinsic viscosity of PET detected in each batch is greater than 0.75 (dL/g). |
| Monitoring equipment | / |
| QA/QC procedures applied | Every batch of polymer will be tested for intrinsic viscosity, and polymers that do not meet the standard will be excluded from the calculation of emission reduction.<br>All data and records will be archived at least 2 years after the end of the final crediting period or 2 years after the final issuance of VCUs whichever occurs later. |
| Purpose of data | Demonstrate that the properties of the materials produced from |

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| | waste recycling are within the typical range and are the same as those from virgin materials |
| Calculation method | - |
| Comments | - |

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|---|---|
| Data / Parameter | $NCV_{gas,y}$ |
| Data unit | kJ/Nm$^3$ |
| Description | Net calorific value of natural gas consumed in the recycling facility in year *y* |
| Source of data | China Energy Statistical Yearbook |
| Description of measurement methods and procedures applied | The parameter will be updated if future version of China Energy Statistical Yearbook updates the value of net calorific value (NCV) of natural gas. |
| Frequency of monitoring/recording | The parameter will be updated if future version of China Energy Statistical Yearbook updates the value of net calorific value (NCV) of natural gas. |
| Value applied: | 38,931 |
| Monitoring equipment | - |
| QA/QC procedures applied | - |
| Purpose of data | Calculation of project emissions |
| Calculation method | - |
| Comments | - |

| | |
|---|---|
| Data / Parameter | $NCV_{diesel,y}$ |
| Data unit | MJ/t |
| Description | Net calorific value of diesel consumed in the recycling facility in year *y* |
| Source of data | China Energy Statistical Yearbook |
| Description of measurement methods | The parameter will be updated if future version of China Energy Statistical Yearbook updates the value of net calorific value |

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| and procedures applied | (NCV) of diesel. |
| Frequency of monitoring/recording | The parameter will be updated if future version of China Energy Statistical Yearbook updates the value of net calorific value (NCV) of diesel. |
| Value applied: | 42,652 |
| Monitoring equipment | - |
| QA/QC procedures applied | - |
| Purpose of data | Calculation of project emissions |
| Calculation method | - |
| Comments | - |

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|---|---|
| Data / Parameter | $EF_{gas,y}$ |
| Data unit | $tCO_2/GJ$ |
| Description | CO2 emission factor of natural gas consumed at the recycling facility in year y |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4 |
| Description of measurement methods and procedures applied | The parameter will be updated according to any future revision of the IPCC Guidelines |
| Frequency of monitoring/recording | The parameter will be updated according to any future revision of the IPCC Guidelines |
| Value applied: | 0.0583 |
| Monitoring equipment | - |
| QA/QC procedures applied | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories as per the requirement of latest TOOL03, v03.0 |
| Purpose of data | Calculation of project emissions |
| Calculation method | - |
| Comments | - |

| | |
|---|---|
| Data / Parameter | $EF_{diesel,CO2,y}$ |
| Data unit | $tCO_2/GJ$ |
| Description | $CO_2$ emission factor of diesel consumed at the recycling facility in year y |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, Table 1.4 |
| Description of measurement methods and procedures applied | The parameter will be updated according to any future revision of the IPCC Guidelines |
| Frequency of monitoring/recording | The parameter will be updated according to any future revision of the IPCC Guidelines |
| Value applied: | 0.0748 |
| Monitoring equipment | - |
| QA/QC procedures applied | IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories as per the requirement of latest TOOL03, v03.0 |
| Purpose of data | Calculation of project emissions |
| Calculation method | - |
| Comments | - |

## 5.3 Monitoring Plan

This section describes the process and schedule for obtaining, recording, and analysing the monitored data set out in Section 5.2 above.

1) Data and parameters monitored

As stated in Section 5.2, quantity of waste PET bottles recycled in year y ($Q_{i,y}$), electricity consumed by the recycling facility in year y ($EC_{PJ,y}$), diesel and natural gas consumed by the recycling facility in year y ($FC_{gas,PJ,y}$ and $FC_{diesel,PJ,y}$) are the parameters to be monitored. Note that diesel consumption monitoring is not required by the methodology (refer to Section 4.2); only diesel purchase receipts will be used for recording the amount of diesel consumption. The other three parameters ($Q_{i,y}$, $EC_{PJ,y}$ and $FC_{gas,PJ,y}$) are monitored by a truck scale, an electricity meter and a flow meter, respectively. Technical information of the monitoring instruments installed for the Project is shown in Table 5.1 and Figure 5.1.

A team of monitoring officers (as shown in Figure 5.2) are responsible for monitoring and recording, which include recording the truck scale readings at the time of receiving each consignment of waste PET bottles entering the project site, recording the electricity meter readings every month and recording the flow meter readings regularly

**Table 5.1** Technical information of the monitoring instruments installed

| Equipment | Location | Model | Serial No. | Accuracy |
|---|---|---|---|---|
| Truck scale | Entrance/Exit of the plant | XK3910-DS10 | 1609002201 | 20 kg |
| Electricity meter | At the power supply line connecting the plant to the grid | PEC-H3A | 311700021450 | 0.5s |
| Flow meter | At the natural gas pipeline supplying the plant | WKLD-150 | 2012126 | ±0.5% |

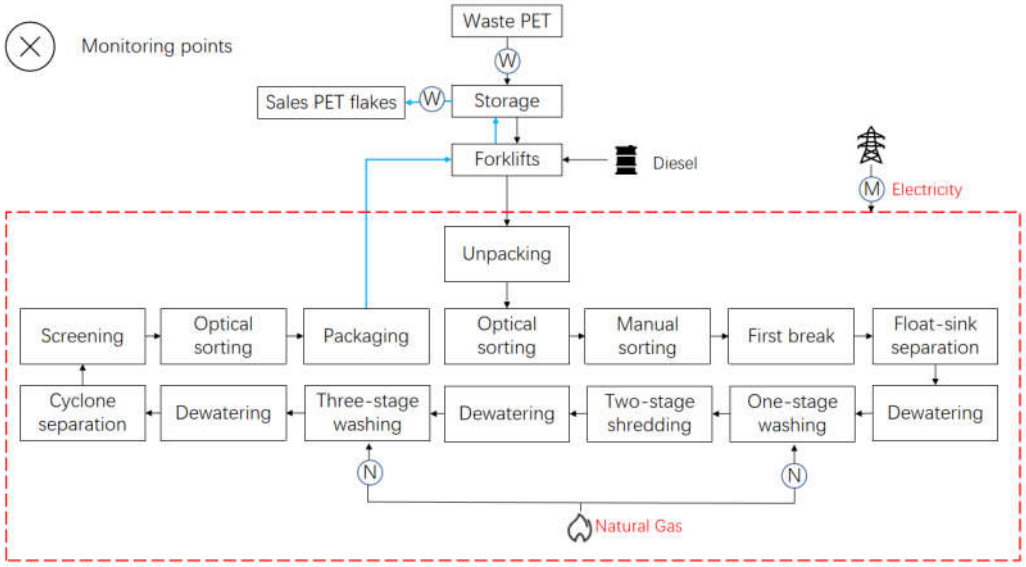


**Figure 5.1** Diagram of the project boundary showing the monitoring instruments

2) Management of the monitoring plan

The project proponent has established a VCS monitoring team in charge of measuring and recording of the parameter values, collecting relevant documents (such as sales/purchase receipts) as well as calculating emission reductions.

**Figure 5.2** shows the operation and management structure of the monitoring team. The VCS manager takes full responsibility for the overall implementation of the monitoring plan. The monitoring activities, including recording and document collecting, are carried out by a team of monitoring officers. In addition, the internal verifiers are in charge of internal check of the data and files as well as calculation of emission reductions. A monitoring manual regarding the project, which stipulates detailed duties and responsibilities of all members of the monitoring

team, has been developed and serves as the basis of the monitoring plan and monitoring staff being trained annually to ensure their capability to conduct the monitoring work.

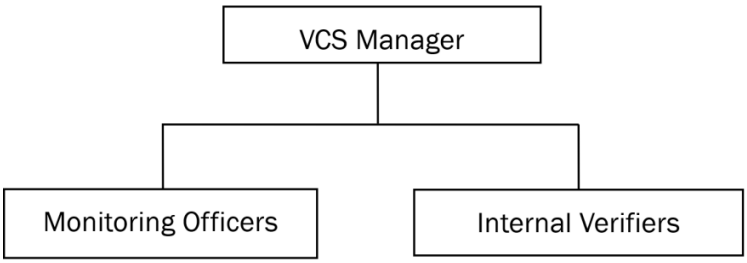


**Figure 5.2** Management structure of the monitoring team

All the relevant data files will be kept by the project proponent during the crediting period and at least for two years after the end of the last crediting period.

3) Quality assurance and quality control

The monitoring data will be cross checked with corresponding sales/purchase receipts to ensure the data quality.

Calibration of the monitoring instruments should be conducted in compliance with relevant national or industry standards and rules, and all the calibration records should be documented and archived by the project proponent for verification.

4) Procedures of exception handling and reporting

The monitoring staff will continuously monitor the operation status of the measuring instruments to ensure that any abnormity could be detected as soon as possible and that the corresponding trouble-shooting measures will be taken in time. The measuring instrument will be repaired immediately and must be calibrated by a qualified third-party before being put into use again.

Problem that occurred in monitoring and measurement process will be recorded and reported to company administrator or supervisor; measures will be adopted to avoid the same problem reoccurring in the future.

5) Emergency procedure

In case of any failure or malfunction of any monitoring instrument, the project participant and the equipment suppliers will repair or displace it as soon as possible, and the emission reductions achieved during the troubleshooting period will be calculated conservatively.