# BIODIESEL PROJECT BY KOTYARK INDUSTRIES LIMITED

*Document Prepared By: Infinite Solutions*

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| **Project Title** | Biodiesel Project by Kotyark Industries Limited |
| **Version** | 03 |
| **Date of Issue** | *23/06/2022* |
| **Prepared By** | Infinite Solutions |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

Biodiesel Project by Kotyark Industries Limited (hereafter referred to as "the Project") is located within the Economic and Technological Development Zone in India[1]. The project is constructed and operated by Kotyark Industries Limited and is designated to produce biodiesel with capacity of 500 KL per day. **For the feedstock to produce biodiesel, from the vegetable oils**. The by-products produced like glycerol; bio-waste is sold out. The scenario existing prior to the implementation of the project activity was business as usual, with users consuming fossil fuel without the proposed biodiesel mix. There are not any existing alternatives to the project activity. The project's contribution to sustainable development is made through the creation of an industrial sector, biodiesel production, non-existent in the country in the baseline scenario. It will contribute to the sustainability of the agricultural activities in the country as it provides the farmers involved in the project with an additional income. Also reduces emissions from the combustion of fossil fuels. The installed production capacity of the production plant is:

| Particular | Type | Quantity with Unit |
|---|---|---|
| Bio Diesel | Product | 500,00 KL PER DAY |
| Glycerin | By Product | 70.00 KL PER DAY |

After commissioning, the Project is expected to reduce greenhouse gas emissions of approximately 1,26,559 tCO2e annually. The project will also contribute to sustainable development in the following aspects:

- Transform the waste oil/fat into useful energy resources and thus preserve limited fossil fuel resources.
- Along with CO2 reductions, the project will contribute to the sustainable development by reducing other pollutants such as SO2, NOx and CO due to fossil fuel combustion.
- Promoting the local economic development and improving the level of people's life by providing potential job opportunities to residents.

[1] These estimations are based on the preliminary feasibility study conducted for the project's eligibility to apply voluntary emission scheme. Estimated GHG emission reductions or removals (tCO2e) are going to be measured in detail and finalized in accordance with the methodologies applied to the project in the final version of this PD which will be submitted to a Designated operational Entity (DoE) for the project's validation

## 1.2 Sectoral Scope and Project Type

The project falls into sectoral scope 01: Energy industries (renewable - / non-renewable sources), sectoral scope 01: Energy industries.[2]

The project is not a grouped project.

Methodology: ACM0017: Production of biofuel, Version 03.1[3]

## 1.3 Project Eligibility

As per section 3.9.3 of the Veera Project Standard Ver. 4.2, "*Where applying a methodology with scale and/or capacity limits, it shall be demonstrated that the project is not a fragmented part of a larger project or activity that would otherwise exceed such limits. The project shall be considered a fragmented part of a larger project if within one kilometer of the project boundary*": current project produces biodiesel based on oil/fat from biogenic origin to substitute petroleum diesel for the use as fuels. **and it is noticed that current project activity is includes a single location.** Which is eligible under Version 4.2 of the VCS Standard. This project activity leads to reduction of greenhouse gas emissions by displacing conventionally used non-renewable electricity. which is eligible under Version 4.2 of the VCS Standard.

## 1.4 Project Design

The project is not a grouped project.

### Eligibility Criteria

NA

## 1.5 Project Proponent

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|---|---|
| **Organization name** | Kotyark Industries Limited |
| **Contact person** | Gaurang Shah |
| **Title** | CMD |

[2] As per https://cdm.unfccc.int/DOE/scopes.html under Approved Consolidated Methodologies

[3] https://cdm.unfccc.int/methodologies/DB/ZNCG27VU8E0ABXO6GHGKTR75U0MIWL

| | |
|---|---|
| Address | 2nd Floor, A-3 Shree Ganesh Nagar Housing Society, Ramakaka Temple Road, Chhani, Vadodara – 391740. Gujarat, India |
| Telephone | +91-9978967722 |
| Email | info@kotyark.com |

## 1.6 Other Entities Involved in the Project

| | |
|---|---|
| Organization name | Infinite Solutions |
| Role in the project | Project Consultant |
| Contact person | Mr. Jimmy Sah |
| Title | Chief Operating Officer |
| Address | Milinda's Manor, 214-215, 2, RNT Marg, Indore, Madhya Pradesh 452001 |
| Telephone | +91-9644130430 |
| Email | jimmy@infisolutions.org |

## 1.7 Ownership

The Project is owned by M/s Kotyark Industries Limited, which is the project participant of the Project. Further the Ownership is demonstrated through Commissioning certificates. it is important to note here that the Mr. Gaurang Shah, the CMD of Kotyark Industries Limited.

## 1.8 Project Start Date

The project start date is 15th September 2020, as the operation start date.

## 1.9 Project Crediting Period

Crediting Period Type: Renewable (Renewable twice for a total of 21 years)

Crediting Period Start date: 15/September / 2020

Crediting Period End date: 14/August/2027

(Start and end dates included)

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

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 $tCO_2e$/year

☐ 20,000 – 100,000 $tCO_2e$/year

☒ 100,001 – 1,000,000 $tCO_2e$/year

☐ >1,000,000 $tCO_2e$/year

As per VCS project standard Ver 4.2[4], section 3.9.1, Project size categorizations are as follows:

1) Projects: Less than or equal to 300,000 tonnes of CO2e per year.

2) Large projects: Greater than 300,000 tonnes of CO2e per year

Hence for the current project activity Estimated GHG emission reduction is less than the 300,000 tco2e thus the current project activity is falls under the Projects category.

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

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| Year 1 | 1,26,559 |
| Year 2 | 1,26,559 |
| Year 3 | 1,26,559 |
| Year 4 | 1,26,559 |
| Year 5 | 1,26,559 |
| Year 6 | 1,26,559 |
| Year 7 | 1,26,559 |
| **Total estimated ERs** | 12,65,587 |
| **Total number of crediting years** | 7 |
| **Average annual ERs** | 1,26,559 |

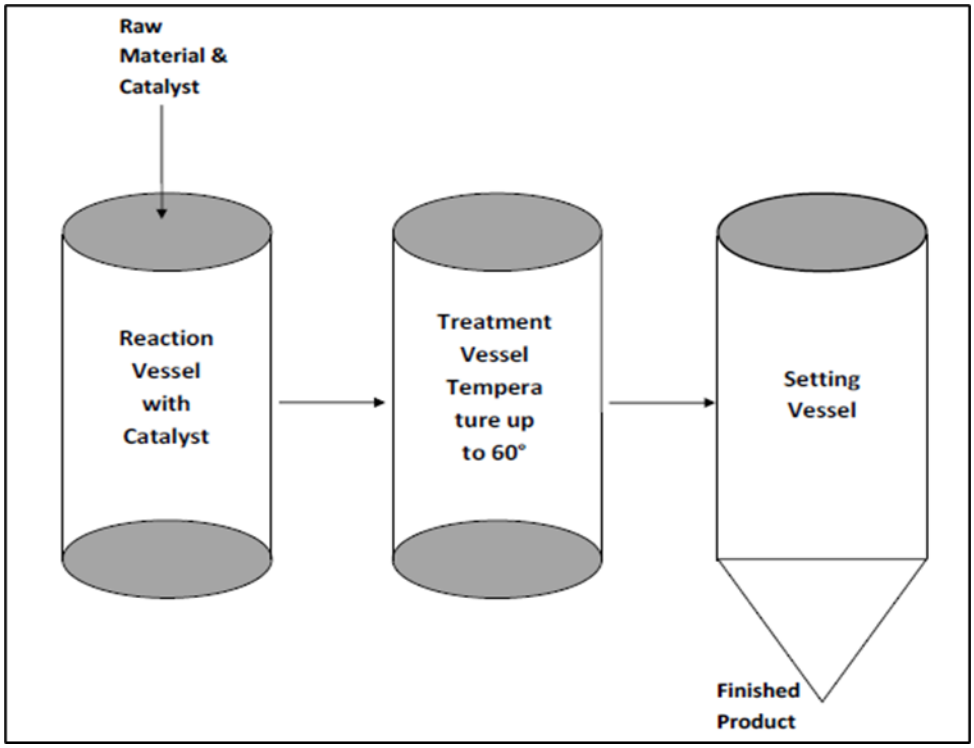
[4] https://verra.org/wp-content/uploads/2022/02/VCS-Standard_v4.2.pdf

## 1.11 Description of the Project Activity

Bio-diesel Project involves preparation of Biodiesel from vegetable oils through chemical a process. The product "Bio-diesel" is an eco-friendly and pollution free product and hence is an excellent source of renewable energy. Biodiesel refers to a non-petroleum-based diesel fuel consisting of short chain alkyl (methyl or ethyl) esters, made by transesterification of vegetable oil or animal fat (tallow), which can be used (alone, or blended with conventional Petro-diesel) in unmodified diesel-engine vehicles. Pure Biodiesel is biodegradable, nontoxic ad essentially free of Sulphur and aromatics. Chemically, Biodiesel is referred to as mono-alkyl esters of long chain fatty acids derived from renewable are carbohydrate sources as opposed to petroleum or coal, which are hydrocarbon, sources. The plant will be having an installed capacity of 500 KL per day.

Bio- Diesel can be manufactured through different processes as under:

- Vegetable oils can be converted to fatty acids, which in turn are converted to esters Vegetable oil can also be converted to methyl or ethyl esters directly, using acid or base accelerate (catalyze) the transesterification reaction.




**Steps involved in manufacturing of Bio-Diesel are:**

1. **Preparation:** Cleaning / heating bio-lipid or vegetable oil. If cleaning/heating is not done, more quantity of soap will be produced with the biodiesel, the conversion index from vegetable oil to Bio-Diesel will be smaller and will result more than triglycerides.

2. **Titration:** Optional pH for Bio-Diesel is 7 (neutral), same as that of distilled water (and most tap water). Some vegetable oil has a high level of free fatty acids which require an acid Esterification (to obtain) a pH lower than 3 before alkaline Transesterification.

3. **Mixing:** Proper ratio of Methanol and catalyst (potassium hydroxide) should be mixed to produce potassium methoxide.

4. **Combination:** The reaction temperature between potassium methoxide and Bio-lipid should be 60 ° - 70° C.

5. **Separation:**

    - Glycerol is removed from Bio-Diesel by gravity separation
    - Traces of methanol is removed from Bio-Diesel by heating

## 1.12 Project Location

| | |
|---|---|
| **Project Location** | F-86 to F-90, RIICO Industrial Area, Swaroopgunj. Dist: Sirohi, Rajasthan – 307 023 |
| **Co-ordinate** | 24.8852° N, 72.8575° E |


## 1.13 Conditions Prior to Project Initiation

The Scenario existing prior to the start of the implementation of the project activity is: The scenario existing prior to the start of the project is the equivalent fuel demand from existing stationary installations and vehicles within the project boundary satisfied by the project would

have been satisfied by petroleum diesel. For the material level, large amounts of waste oil/fat generate every day in the local area, and most are discharged into the municipal sewage system without recovery. The baseline scenario is the same as the scenario existing prior to the start of the project.

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

Legislation concerned for this current project activity there is no mandate law and enforcement mentioned as per the state level and country level. This project Is voluntary initiatives by the Project Proponent.

## 1.15 Participation under Other GHG Programs

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

The Project has not participated in any other GHG programs.

### 1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs

## 1.16 Other Forms of Credit

### 1.16.1 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

### 1.16.2 Other Forms of Environmental Credit

The Project has no intent to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

## 1.17 Sustainable Development Contributions

### 1.17.1 Sustainable Development Contributions Activity Description

Transform the waste oil/fat into useful energy resources and thus preserve limited fossil fuel resources.

| | |
|---|---|
| | • Transform the waste oil/fat into useful energy resources and thus preserve limited fossil fuel resources. |

| | |
|---|---|
|   | • Along with CO2 reductions, the project will contribute to the sustainable development by reducing other pollutants such as SO2, NOx and CO due to fossil fuel combustion. |
|   | • Promoting the local economic development and improving the level of people's life by providing potential job opportunities to residents. |

### 1.17.2 Sustainable Development Contributions Activity Monitoring

**Table 1: Sustainable Development Contributions**

| Row number | SDG Target | SDG Indicator | Net Impact on SDG Indicator | Current Project Contributions | Contributions Over Project Lifetime |
|---|---|---|---|---|---|
| 1) | 13.0 | Tonnes of greenhouse gas emissions avoided or removed | Implemented activities to increase | The project has avoided emission of 1,26,559 tCO2e in the atmosphere | Since commissioning the project has avoided emission of 1,26,559 tCO2e in the atmosphere. |
| 2) | 8.5 | Number of People Employed | Implemented activities to increase | 15 number of people employed | The project has Employed 15 peoples since commissioning. |

## 1.18 Additional Information Relevant to the Project

### Leakage Management

Where applicable, describe the leakage management plan and implementation of leakage and risk mitigation measures.

### Commercially Sensitive Information

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

### Further Information

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

# 2 SAFEGUARDS

## 2.1 No Net Harm

There was no harm identified form the project and hence no mitigations measures are applicable.

## 2.2 Local Stakeholder Consultation

All the stakeholders have been invited through invitation letters and/ or public notice to attend the stakeholders meeting.

The agenda for the meeting is as follows.

- Introduction of the project
- Implementation of solar milling plant
- Grievance Mechanism for stakeholders
- Feedback/Questions from Stakeholders
- Question and Answer session.

PP has explained how such projects help in mitigating impacts due to Global Warming. He briefly explained the gist of VCS standards prerequisites and sustainability projects in the country. Further, he explained the impacts of these projects which lead to providing clean energy, increase

in employment opportunities both long term and short term, increased income and thereby leading to improvement in living standard of the people

## 2.3 Environmental Impact

Project activity is not having any negative environmental impacts.

## 2.4 Public Comments

The project shall be listed for 30 days period. In case any comments are received they shall be incorporated during the validation.

## 2.5 AFOLU-Specific Safeguards

NA

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

ACM0017: Production of biofuel --- Version 3.1

https://cdm.unfccc.int/filestorage/I/9/8/I98X36PV0JZBEG7W2AKY4RDSUNLFM0/Production%20of%20biofuel.pdf?t=eGF8cjlhaGtlfDD97W-624Z3tVHvpP0RjSn7

Any tools and other methodologies to which the selected methodology (ies) refer:

- "Tool for the demonstration and assessment of additionality".: CDM Tool 1 Ver 07: https://cdm.unfccc.int/methodologies/Pamethodologies/tools/am-tool-01-v7.0.0.pdf
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion CDM Tool 03: Ver 03: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf

## 3.2 Applicability of Methodology

- **Applicability for ACM0017: Production of biofuel**

| | |
|---|---|
| 1. The methodology is applicable to project activities that reduce emissions through the production, of blended biofuels to be used in existing stationary installations and/or in vehicles | the biodiesel will be supplied to consumers who use biodiesel for fuel combustion in existing stationary installations and/or vehicles in local transport sector |
| 2. The biofuel is produced from one or a combination of the following feedstock:<br>(a) Waste oil/fat.<br>(b) Seeds or crops that are cultivated in dedicated plantations.<br>(c) Biomass residues (e.g., agricultural residues, wood residues, organic wastes). | the biodiesel is produced form the Waste oil/fat. |
| 3. To avoid double counting of emission reductions, the methodology ensures that the CERs can only be issued to the producer of the biofuel. The project proponent shall demonstrate that double counting of emission reductions will not occur e.g., via a contractual agreement with the end-user(s), feedstock producer or other stakeholder involved in the supply chain | Kotyark Industries is the original manufacture / producer for the biodiesel. And the VCS VERs will be claimed only by the producer. |
| 4. The conditions apply to the methodology:<br>**a) Feedstock inputs:**<br>(i) For all biofuels: if the biofuel in the project plant is only partly produced from the sources specified in paragraph 4 above, any volumes of biofuel that are also produced in the project plant but from other feedstock sources, are not included in the quantity of biofuel for which emission reductions are claimed.<br>(ii) For biodiesel: the alcohol used for esterification is methanol from fossil origin. Volumes of biodiesel produced with alcohols other than methanol (for example, ethanol) are not included in the quantity of biodiesel for which | a) **Feedstock inputs:**<br>The project only uses waste oil/fat for biodiesel production, no biomass or biofuels involved.<br>b) **Dedicated plantations:**<br>NA, as project only uses waste oil/fat for biodiesel production, no biomass or biofuels involved<br>c) **Biofuel plant and products:**<br>i. PP regular monitor the biofuel plant and product as per STANDARAD VALUE (BIODIESEL) IS: 15607. Hence it is complying with the National standard.<br>ii. the biodiesel is produced form the Waste oil/fat and has its |

| | |
|---|---|
| emission reductions are claimed.<br><br>**b) Dedicated plantations:**<br>(i) If the biofuel is produced from seeds or crops that are cultivated in dedicated plantations, the project activity shall comply with the provisions<br><br>**(c) Biofuel plant and products:**<br>(i) The fossil fuels, the biofuels and the blended biofuels comply with national regulations (if existent) or with suitable international standards.<br>(ii) The project activity involves construction and operation of a biofuel production plant.<br>(iii) Any by-product (e.g., glycerol) is not disposed of or left to decay. It should be either incinerated or used as raw material for industrial consumption or sold.<br>(iv) If biomass or biofuel is used at the project plant(s) (processing, production or blending plant) as fuel (e.g., for heat or electricity generation), then at least 95% of the biomass or biofuels used in these plants should be either biomass residues from the dedicated plantations established under the project activity or biofuel generated in the project plant. The amount of biofuel used should not be included in the quantity of biofuel for which emission reductions are claimed.<br><br>**(d) Consumption of biofuel:**<br>(i) The (blended) biofuel is used by consumers within the host country in existing stationary installations (e.g., captive generators) and/or in vehicles.<br>(ii) In case of vehicles, the target consumer group (e.g., captive fleet of vehicles, gas stations, bulk consumers) and distribution | construction and operation unit at Rajasthan, India<br>iii. the by product (glycerol) is completely sold and PP has maintain the record for the same.<br>iv. Not applicable<br>d) **Consumption of biofuel**<br>i. The biofuel is used by consumers within the host country (India)<br>ii. consumers are bound by contracts that allows monitor the consumption of blended biodiesel and states that the consumer shall not claim CERs resulting from its consumption<br>iii. The biodiesel produced will be supplied to stationary installations and vehicles, and the consumers of stationary applications<br>iv. All the vehicles' consumers of the project are captive fleets of vehicles<br>v. No mandatory regulations for biodiesel consumption. Hence this project activity is completely voluntary basis |

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| system of the biofuel shall be identified and described in the CDM-PDD.<br>(iii) If the (blended) biofuels are consumed in stationary facilities, the consumer, and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.<br>(iv) If the (blended) biofuels are sold to an identified consumer group within the host party, the buyer, and the producer of the (blended) biofuel are bound by a contract that allows the producer to monitor the sale of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.<br>(v) If the biofuel is blended but neither used in stationary facilities nor sold to an identified consumer group, the blender and the producer of the biofuel are bound by a contract that allows the producer to monitor the blending of biofuel to ensure that blending proportions and amounts are monitored and meet all regulatory requirements, and that states that no CERs resulting from its consumption will be claimed.<br>(vi) In any case where the host party exports beyond the national boundary (blended) biofuels of the same type(s) as the biofuel(s) produced in the project plant, the consumption of the produced (blended) biofuel shall be monitored to ensure that no double counting occurs. The consumer and the producer of the (blended) biofuel shall be bound by a contract that allows the producer to monitor the consumption of (blended) biofuel and that states that the consumer shall not claim CERs resulting from its consumption.<br>(vii) In case of stationary installations, biofuels with any blending fraction between | |

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|---|---|
| 0 and 100% can be used. In case of vehicles, the blending proportion must be appropriate to ensure that the technical performance characteristics of the blended biofuels do not differ significantly from those of fossil fuels;<br>(viii) For biodiesel, the condition in 6.d.vii above is assumed to be met if the blending proportion is up to 20% by volume (B20).2 If the project participants use a blending proportion of more than 20%, they shall demonstrate in the CDM-PDD that the technical performance characteristics of the blended biodiesel do not differ significantly from those of Petro diesel and comply with all local regulations.<br>(ix) Only biofuel consumed in excess of mandatory regulations is eligible for the purpose of the project activity. | |

**Applicability for CDM tool: 1: "Tool for the demonstration and assessment of additionality".[5]**

| Applicability | Justification |
|---|---|
| The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved<br>methodologies using the additionality tool | The PP has not applied to the New methodologies |
| Once the additionally tool is included in an approved methodology, its application by | PP is using the current methodology. Hence the additionality is calculated on the basis |

[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

| | |
|---|---|
| project participants using this methodology is mandatory | of CDM tool: 1: "Tool for the demonstration and assessment of additionality |

## 3.3 Project Boundary

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Vehicles and Stationary Combustion Installations Consuming Petro diesel | $CO_2$ | Yes | Main source of baseline emissions. |
| | | CH4 | No | Excluded for simplification. CH4 and N2O emissions are assumed to be very small. No systematic difference to project activity |
| | | N2O | No | |
| | | Other | - | - |
| Project | On-site energy consumption at biodiesel production plant and, if applicable, the oil production plant(s) | CO2 | Yes | Significant emission source |
| | | CH4 | No | Excluded for simplification. CH4 emissions are assumed to be very small. |
| | | N2O | No | Excluded for simplification. N2O emissions are assumed to be very small |
| | | Other | - | - |
| | Combustion of fossil fuel derived methanol in the biodiesel ester | CO2 | Yes | Significant emission source. |
| | | CH4 | No | Excluded for simplification. CH4 emissions are assumed to be very small. |
| | | N2O | No | Excluded for simplification. N2O emissions are assumed to be very small |
| | | Other | - | - |
| | Transportation of oil seeds, vegetable oils and or oil/fat wastes | CO2 | Yes | Significant emission source. |
| | | CH4 | No | Excluded for simplification. CH4 emissions are assumed to be very small. |
| | | N2O | No | Excluded for simplification. N2O emissions are assumed to be very small |
| | | Other | - | - |
| | Transportation of biodiesel to blending facility | CO2 | Yes | Significant emission source. |
| | | CH4 | No | Excluded for simplification. CH4 emissions are assumed to be very small. |
| | | N2O | No | Excluded for simplification. N2O emissions are assumed to be very small |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | Other | - | - |
| | Anaerobic Wastewater treatment in crude vegetable oil production. | CO2 | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | CH4 | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | N2O | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | Other | - | - |
| | Cultivation of land to produce oil seeds (if the feedstock is vegetable oils and / or fats from plants produced in dedicated plantations) | CO2 | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | CH4 | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | N2O | No | Not applicable, the biodiesel is produced from waste oil/fat. |
| | | Other | - | - |

## 3.4 Baseline Scenario

Petroleum diesel is widely used as fuel in the transport sector in India, so the scenario existing prior to the start of the project is the equivalent fuel demand from existing stationary installations and vehicles within the project boundary satisfied by the project would have been satisfied by petroleum diesel. For the material level, large amounts of waste oil/fat generate every day in the local area, and most are discharged into the municipal sewage system without recovery. The baseline scenario is the same as the scenario existing prior to the start of the project.

The project's contribution to sustainable development is made through the creation of an industrial sector, biodiesel production, non-existent in the country in the baseline scenario. It will contribute to the sustainability of the agricultural activities in the country as it provides the farmers involved in the project with an additional income. Also reduces emissions from the combustion of fossil fuels

According to methodology ACM0017, the baseline scenario of the project is demonstrated and determined through the following steps. Procedure for the selection of the most plausible baseline scenario:

The baseline scenario should be separately determined for the following elements:

- **Production of fuels (P):** What would have happened at the production level in the absence of the CDM project activity?

- **Consumption (C):** Which fuel would have been consumed in the absence of the CDM project activity?
- **Material (M):** What would have happened to the material used as input for production of biodiesel in the absence of the CDM project activity?

**For the fuel production(P), the most plausible baseline scenario is determined as follows:**

**Step 1:** Identify all realistic and credible alternatives for the fuel used by end consumers. At the production level the realistic and credible alternative(s) may include:

**Alternative P1:** Continuation of current practices with no investment in biodiesel production capacity.

**Alternative P2**: The project activity implemented without the Carbon revenue.

**Alternative P3:** Investment in any other alternative fuel replacing partially or totally the baseline fuel.

**Step 2:** Eliminate alternatives that are not complying with applicable laws and regulations. All the alternatives identified comply with Indian laws and regulations.
**Step 3:** Eliminate alternatives that face prohibitive barriers.

As the project without VCS support faces investment barriers will be identified during the Validation.

Investment in any other alternative fuel such as CNG, LNG and DME is not viable for the project owner. PP specializes in the research, development, and industrialization of biodiesel products, and has been pouring large amount of money into R&D to reach commercial production, thus it's impossible for PP to switch to another field.

**For the consumption of fuel (C), the most plausible baseline scenario is determined as follows:**
Step 1: Identify all realistic and credible alternatives for the fuel used by end consumers. For the intended consumer of biodiesel, the realistic and credible alternative(s) may include Alternative C1: Continuation of petroleum diesel consumption. Alternative C2: Consumption of biodiesel from other producers. Alternative C3: Consumption of other single alternative fuel such as CNG or LPG, etc.; Alternative C4: Consumption of a mix of above alternative fuels; Alternative C5: Consumption of biodiesel from the proposed project plant.

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations. All the alternatives identified comply with Indian laws and regulations.

Step 3: Eliminate alternatives that face prohibitive barriers. In India, the development of biodiesel has just started, and there're only a few biodiesel manufacturers still staying in business in India currently, so the biodiesel production is quite limited. However, the potential market demand for biodiesel is increasing due to the increasing scarcity of fossil fuel, so there's not many choices

for consumers. Thus, the Alternative C2: consumption of biodiesel from other producers is not feasible. (For detailed PP will provide the Common practice data at the time of validation). Consumption of other single alternative fuel such as CNG or LPG will require modification in the consumer stationary installations and vehicles, which needs additional expense for consumers, thus Alternative C3 is not a realistic and credible alternative.

Similarly, since alternative fuels such as CNG or LPG are not credible, thus Alternative C4: Consumption of a mix of above alternative fuels is not feasible either. The project isn't financially attractive without carbon revenue, (will be provide at the time of validation) thus Alternative C5: Consumption of biodiesel from the proposed project plant isn't feasible. Alternative C1: Continuation of petroleum diesel consumption face no prohibitive barriers and is the most plausible baseline scenario for consumption of fuel(P)

**For the material (M) level,** the most plausible baseline scenario is determined as follows: Step 1: Identify all realistic and credible alternatives for the material used by the project. For the material (M) level, the realistic and credible alternative(s) may include Alternative M1: Use of material for production of biodiesel (by the project proponent or by others); Alternative M2: Use for material production of substances other than fuel; Alternative M3: Incineration of material for the purpose of energy recovery; Alternative M4: Incineration of material without energy recovery; Alternative M5: Disposal of material in an anaerobic or aerobic manner.

**Step 2**: Eliminate alternatives that are not complying with applicable laws and regulations. All the alternatives identified comply with Indian laws and regulations

**Step 3**: Eliminate alternatives that face prohibitive barriers. Most consumers in India do not even know about biodiesel, thus, biodiesel production from waste oil/fat is far from being a common practice in India.(will be provide data at the time of validation) thus, Alternative M1: Use of material for production of biofuels (by the project proponent or by others) is not feasible. In the absence of the project, the waste oil/fat may be probably used to produce chemical substances, thus, Alternative M2: Use for material production of substances other than fuel is feasible. Incineration of waste oil/fat with energy recovery is not a common practice in India, thus Alternative M3 is not feasible. Incineration of waste oil/fat is not a common practice in india, thus Alternative M4 is not feasible. Besides recovery, part of the waste oil/fat will be treated by anaerobic or aerobic technologies until meet corresponding discharging standards. Thus, Alternative M5: Disposal of material in an anaerobic or aerobic manner is feasible

Hence, both Alternative M2 and Alternative M5 are feasible scenarios for material level. However, the market demand for substances produced from waste oil/fat is relatively small, according to "Study on Technical and policy issues of the biodiesel production based on waste oil/fat" (Ji Xing, Vol. 33 No. 9 of Energy of China, Sep 2011): "Waste oil/fat can be used as raw materials for chemicals, which has high added value but low market demand, and can be used as raw material for biodiesel, which has much lower added value but greater market demand". Moreover,

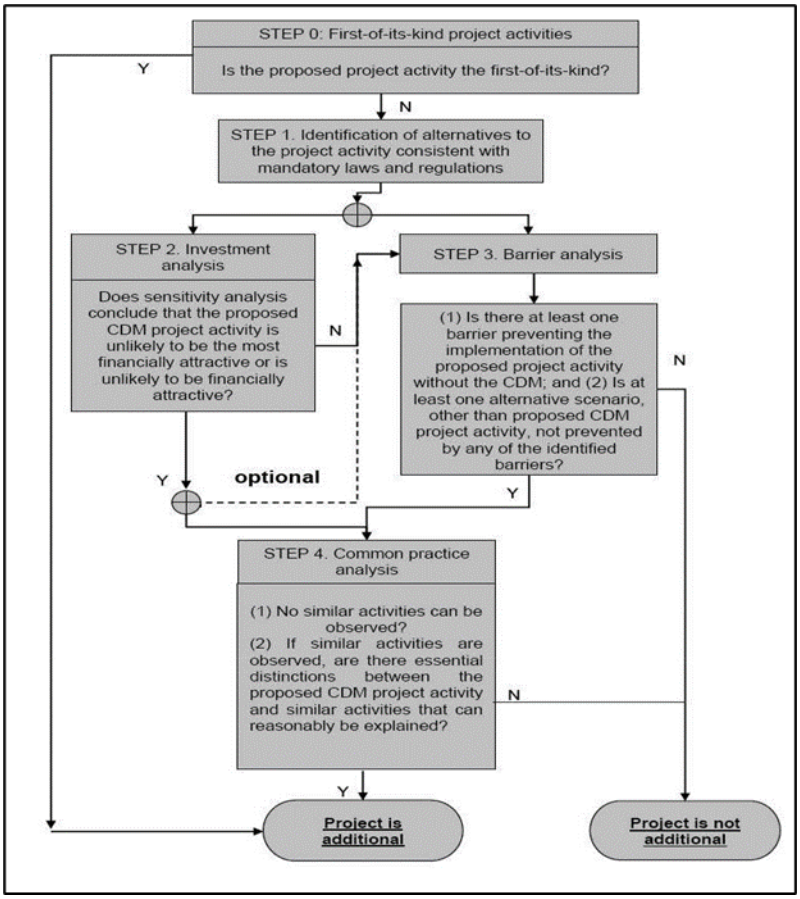
according to page 4-1 to 4-2 of FSR, “the chemical production application based on waste oil/fat is relatively rare in local region, and at least 70% of the waste oil/fat flows into the sewer and being disposed of in an anaerobic or aerobic manner, thus, Alternative M5 is selected to be the most feasible scenario for conservative principles

Therefore, the most plausible baseline scenario for the project is: P1: Continuation of current practices with no investment in biodiesel production capacity; C1: Continuation of petroleum diesel consumption; M5: Disposal of material in an anaerobic or aerobic manner.

## 3.5 Additionality

| | |
|---|---|
| Specify the methodology or activity requirement or product requirement that establish deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable). | Not Applicable |
| Describe how the proposed project meets the criteria for deemed additionality. | Not Applicable |

Thus, the project follows section 5.3.2 of the applied methodology which requires the project proponent to determine the additionality based on “Tool for the demonstration and assessment of additionality”, Version 07.0.0. The stepwise approach to establish additionality of the project activity has been followed, details of which are provided in the following paragraphs:




**Step 0: Demonstration whether the proposed project activity is the first-of-its-kind**

The proposed project activity is biodiesel production project; hence not the first of its kind. Hence, this step is not applicable.

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

As the baseline scenario is prescribed by applied methodology, hence no further analysis is carried out to identify alternatives.

**Step 2: Investment Analysis**

As per para 29 of "Tool for the demonstration and assessment of additionality" v7.0.0, it is determined that the proposed project activity is not an economically or financially feasible option. To conduct the investment analysis, Methodological tool: Investment analysis, version 10.0 (EB 105 annex 06) has been referred.

**Sub-step 2a: Determine appropriate analysis method**

As per "Tool for the demonstration and assessment of additionality" (version 07.0.0), for financial analysis of the project, the following three options are available:

Option I: Simple Cost Analysis

Option II: Investment Comparison Analysis

Option III: Benchmark Analysis

The project will generate revenues from sale of biodiesel and glycerine; therefore, Option I is not applicable. Option II also does not apply since there is no comparable investment alternative available to the project participant in line with para 32 of the Methodological tool: "Tool for the demonstration and assessment of additionality" (version 07.0.0). The most appropriate financial analysis method is therefore option III: the benchmark analysis,

Sub-step 2b: Option III. Apply benchmark analysis

The suitable financial indicator needs to be selected considering the project type and decision-making context. For this project activity as explained in above section 2.4 that the most plausible baseline scenario for the project activity is the continuation of the current practice i.e., PP has choice to invest or not to invest in Bio-Diesel project. The guidance available at the time of decision making was Guidance 19 of "Guidance on the Assessment of Investment Analysis", Version 05, EB 62, Annex 5 which states that. The benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e., cases where the choice of the developer is to invest or not to invest." Also, as per the latest available "Investment Analysis Tool" Version 10 para 7 and 9 considers NPV (Net Present Value) as one of the financial indicators designed to calculate the return on the cost of investment and as per the applicable methodology most plausible baseline scenario for the project activity is the continuation of the current practice hence the benchmark analysis is considered appropriate in context of the project activity. Hence, PP has chosen the benchmark analysis and considered NPV as the suitable indicator in context of the Bio-Diesel project.

**PP has chosen (a) Investment barrier among the barrier listed in para 10 of tool, to** demonstrate the additionality of the project activity. Hence, the additionality for the proposed project activity is established with an in-depth investment barrier analysis which may affect the successful implementation of the proposed project activity.

The results of investment analysis show the negative NPV values for all the three project instances. Hence, the sensitivity analysis has been conducted to check the robustness of the investment analysis results. Sub-step 2d: Sensitivity analysis:

To show the robustness of the financial analysis, a sensitivity analysis is carried out on key factors that may impact the performance of the project activity. As per Guidance 27 & 28 of EB 105, Annex 06, "the sensitivity analysis of the project parameters which may substantially influence" only those parameters that constitute more than 20% of either total project costs or total project revenues are subjected to

reasonable variation. The critical parameters thus identified for determination of financial viability of project are as follows:

1) Capacity Utilization

2) Raw Material

3) Project cost

4) Selling price (Bio-Diesel)

5) Selling price (Glycerine)

According to para 28 of Annex 06 EB 105, 'As a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%, unless this is not deemed appropriate in the context of the specific project circumstances".

| Probability to breach the benchmark: |
|---|
| Sensitivity Parameter 1: Capacity Utilization |
| Sensitivity Parameter 2: Raw material |
| Sensitivity Parameter 3: Project Cost |
| Sensitivity Parameter 4: Selling price (Bio Diesel) |
| Sensitivity Parameter 5: Selling price (Glycerine) |

Even in the best scenarios through decreasing the Investment cost, the project is not able to overcome the investment barrier and would require carbon benefits for its successful operations. From the above discussion of barrier analysis, it can be concluded that the project is additional in terms of investment and organization capacity to bring the project into implementation.

**Step -3: Barrier analysis**

Barrier analysis has not been used.

**Step 4: Common practice analysis**

For the concerned project activity, common Practice Analysis has been carried out. The project is developed with biodiesel production of 100 TPD. Thus, common practice analysis has been carried out for large scale project activity. The project activity is located in state of Rajasthan in India; hence, Rajasthan state is considered as Geographical area for the project activity. Stepwise approach for common practice analysis has been carried out as per Methodological tool “Common Practice”, version 03.1 EB 84, Annex 7:

Step (1): Calculate applicable capacity or output range as +/- 50% of the total design capacity or output of the proposed project activity.

Step (2): Identify similar projects (both CDM and non-CDM) which fulfil all the following conditions:

- The projects are located in the applicable geographical area:
- The projects apply same measure as the proposed project activity:
- The projects use the Same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity.
- The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g., clinker) as the proposed project plant.
- The capacity or output of the projects is within the applicable capacity range for the chosen projects.
- The projects started commercial operation before the PSF is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity

## 3.6 Methodology Deviations

There is no methodology deviation.

# 4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

## 4.1 Baseline Emissions

From the **ACM0017: Production of biofuel — Version 3.1, Paragraph 38,** States that Baseline emissions from displaced fossil fuel are determined as follows:

$$BEy = BFy \times NCVBF, y \times EFCO2, FF \qquad \text{Equation (1)}$$

With

$$BF_y = \left[ min\left\{ \left(P_{BF,y} - P_{BF,on-site,y}\right); \left( \sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right\} - P_{BF,other,y} \right] \times \left( \frac{\sum_i C_{BF,i,y} \times \left( \frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right)$$

Equation (2)

Where:

$BE_y$ = Baseline emissions during the year y (tCO2)

$BF_y$ = Quantity of biofuel eligible for crediting in year y (t)

$NCV_{BF,y}$ = Net calorific value of biofuel produced in year y (GJ/t)

$EFCO2,FF$ = Carbon dioxide emissions factor for displaced fossil fuel (tCO2/GJ)

$PBF,y$ = Quantity of biofuel produced in the project plant in year y (t)

$PBF,on-site,y$ = Quantity of biofuel consumed at the project plant(s) (biofuel production and/or feedstock processing) in year y (t)

$PDBF,other,y$ = Quantity of biofuel that is either produced with alcohols other than methanol from fossil origin or produced using feedstock or waste oil(s)/fat(s) other than those eligible under this methodology according to the applicability conditions in year y (t)

$CBF,i,y$ = Quantity of biofuel type i consumed/sold/blended in year y (t)

$fPJ,i,y$ = Fraction of biofuel in the blended biofuel type i in year y (ratio)

$freg,y$ = Fraction of biofuel in the blended biofuel which is required by mandatory regulations of the host country in year y (ratio)

$i$ = Blended biofuel type (e.g., B5, B10, B20, B50 etc.)

## 4.2 Project Emissions

Project activity emissions are calculated as follows:

$PE_Y = AF_{1,Y}.(PE_{BF,Y} + PE_{MeOH,Y} + PE_{Tr,y} + AF2_{,Y}. PE_{BC,y})$

Where:

$PE_y$ = Project emissions in year $y$ ($tCO_2$)

$PE_{BPF,y}$ = Project emissions at the biodiesel production plant and, if applicable, the oil production plant(s) in year *y* ($tCO_2$)

$PE_{MeOH,y}$ = Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin in year *y* ($tCO_2$)

$PE_{Tr,y}$ = Project emissions from transportation in year *y* ($tCO_2$)

$PE_{BC,y}$ = Project emissions associated with the cultivation of land to produce oil seeds in year *y* ($tCO_2$)

$AF_{1,y}$ = Allocation factor for the production of biodiesel in year *y* (fraction)

$AF_{2,y}$ = Allocation factor for the oil seeds cultivation in year *y* (fraction)

The Project doesn't involve the cultivation of land to produce oil seeds, so $PE_{BC,y}$ =0, and $AF_{2,y}$ =*0.*

**1. Project emissions at the biodiesel production plant and oil production plants ($PE_{BPF,y}$)** These emissions include fuel and electricity consumption that occurs at the site of the biodiesel production plant and, if applicable, emissions associated with the anaerobic treatment of wastewater in the oil production plant(s). These emissions are estimated as follows:

$$PE_{BP,Y}=\sum PE_{FC,j,y}+ PE_{EC,Y}+PE_{W,y}$$

Where:

$PE_{BPF,y}$ = Project emissions at the biodiesel production facility and, if applicable, the oil production plant(s) in year y ($tCO_2$)

$PE_{FC,j,y}$ = Project emissions from combustion of fuel type *j* in the biodiesel production plant and oil production plant(s) in year *y* ($tCO_2$)

$PE_{EC,y}$ = Project emissions from electricity consumption in the biodiesel production plant and oil production plant(s) in year *y* ($tCO_2$)

$PE_{w,y}$ = Project emissions from anaerobic treatment of waste water in year *y* ($tCO_2$)

**Emissions from fossil fuel consumption ($PE_{FC,j,y}$)**

This emission source should include $CO_2$ emissions from all fossil fuel consumption that occurs at the site of the biodiesel production plant and, if applicable, the oil production plant(s) and that is attributable to the project activity. This shall include, inter alia, fossil fuel combustion for heat and/or electricity generation. The project emissions from fossil fuel combustion ($PE_{FC,i,y}$) shall be calculated following the latest version of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". For this purpose, the processes *j* in the tool correspond to all fossil fuel combustion sources at these plants.

$$PE_{FC,i,y} = \sum_{j} FC_{i,y} \times COEF_{i,y}$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

$PE_{FC,i,y}$ = Project emissions from combustion of fuel type i in the biodiesel production plant in year y ($tCO_2$)

$FC_{i,y}$ = The quantity of fuel type i combusted during the year y (mass or volume unit/yr)

$COEF_{i,y}$ = The $CO_2$ emission coefficient of fuel type i in year y (tCO2/mass or volume unit)

$NCV_{i,y}$ = The weighted average net calorific value of the fuel type *i* in year y (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = The weighted average $CO_2$ emission factor of fuel type *i* in year y ($tCO_2$/GJ)

**Emissions from electricity consumption ($PE_{EC,y}$)**

Emissions from electricity consumption includes electricity delivered from the grid to the biodiesel production plant and, if applicable, the oil production plant(s). Electricity generated on-site should not be included here. The project emissions from electricity consumption ($PE_{EC,y}$) will be calculated following the latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

$$PE_{EC,y} = EC_y \times EF_{CO2,EL,y} \times (1 + TDL_y)$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in the biodiesel production plant in year *y* ($tCO_2$)

$EC_y$ = Quantity of electricity consumed in year y(MWh/yr)

$EF_{CO2,EL,y}$ = $CO_2$ Emission factor for electricity generation in year y (tCO2/MWh)

$TD_{Ly}$ **=** Average technical transmission and distribution losses in year y

The electricity consumed by the Project is delivered from Capro Power Limited, which belongs to Scenario B of "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption".* Thus, the conservative default value of 1.3 $tCO_2$/MWh is chosen as the emission factor ($FE_{CO2,EL,y}$) and the default value of 20% is chosen as the average technical transmission and distribution losses for providing electricity to the Project ($TDL_y$).

**Project emissions from waste water treatment ($PE_{W,y}$*)***

Emissions associated with the anaerobic treatment of wastewater in the oil production plant(s) should be estimated where applicable.

If the methane from anaerobic treatment of wastewater is vented to the atmosphere, then PEw,y is estimated as follows:

$$PE_{w,y} = Q_{COD,y} \cdot PCOD,y \cdot B_0 \cdot MCF_p \cdot GWP_{CH4}$$

$PE_{w,y}$ = Project emissions from anaerobic treatment of waste water in year *y* ($tCO_2e$)

$Q_{COD,y}$ = Amount of wastewater treated anaerobically or released untreated from the crude vegetable oil production plant in year *y* (m3)

$PCOD,_y$ = Chemical Oxygen Demand (COD) of wastewater in year *y* ($tCOD/m_3$)

$B_0$ = Maximum methane producing capacity (t CH4/t COD)

$MCF_p$ = Methane conversion factor (fraction)

$GWPCH_4$ = Global warming potential of CH4 ($tCO_2e/tCH_4$)

The Project doesn't include oil production plant, so $PE_{W,y}$ =0.

**2. Project emissions from fossil carbon in the biodiesel due to the use of methanol from fossil origin in the esterification process ($PE_{MeOH,y}$)**

Under the current applicability of the methodology, methanol of fossil origin is used for the esterification of waste oil/fats. In the esterification process, the carbon from the methanol remains in the esters. Thus, a fraction of the carbon in the biodiesel is of fossil origin and need to be accounted as project emissions. These emissions are estimated as follows:

$$PE_{MeOH,y} = MC_{MeOH,y} \cdot EF_{C,MeOH} \cdot \frac{44}{12}$$

Where:

$PE_{MeOH,y}$ = Project emissions from fossil carbon in the biodiesel due to esterification with methanol of fossil origin in year *y* (tCO2)

$MC_{MeOH,y}$ = Quantity of methanol consumed in the biodiesel plant, including spills and evaporations in year *y* (tonnes)

$EF_{C,MeOH}$ = Carbon emissions factor of methanol, based on molecular weight (tC/tMeOH)

44/12 = Molecular weight ratio to convert t of carbon into t of CO2 ($tCO_2/tC$)

**3. Project emissions from transportation ($PE_{Tr,y}$)**

Project emissions from transportation only have to be accounted if distances of more than 50km are covered.

Project emissions from transportation include the following sources, where applicable:

· Any transportation of waste oil/fats to the biodiesel production plant; and

· Any transportation of the biodiesel to the site where it is blended with petrodiesel.

Emissions are calculated based on the actual quantity of fossil fuel consumed for transportation.

$$PE_{tr,y} = \sum_{m}\sum_{i}(FC_{m,i,y} \times NCV_i \times EF_{CO2,i})$$

Where:

$PE_{Tr,y}$ = Project emissions from transportation in year $y$ ($tCO_2$)

$FC_{m,i,y}$ = Fuel consumption of type $i$ for transporting material $m$ in year $y$ (t)

$NCV_i$ = Net calorific value of fuel type $i$ (GJ/t)

$EF_{CO2,i}$ = Carbon dioxide emissions factor for fuel type $i$ ($tCO_2$/GJ)

$m$ = Material transported (e.g. oil seeds, vegetable oil and biodiesel).

## 4.3 Leakage

This methodology estimates the following sources of leakage:

- Emissions associated with the production of the methanol used for esterification;
- If the biodiesel is produced from waste oil/fat, displacement of existing uses of waste oil/fat that may result in increased demand for fossil fuels elsewhere;
- Positive leakage associated with the avoided production and transportation of petrodiesel.

Please note that the leakage emissions shall not be less than zero. In cases where, in year y, LEy is less than zero, consider it as zero. The leakage emissions are calculated as follows:

$$LE_y = LE_{MeOH,y} + LE_{WOF,y} - LE_{PD,y}$$

Where:

$LE_y$ = Leakage emissions in year y ($tCO_2$)

$LE_{MeOH,y}$ = Leakage emissions associated with production of methanol used in biodiesel production in year y ($tCO_2$)

$LE_{WOF,y}$ = Leakage emissions from displacement of existing use of waste oil/fat in year y ($tCO_2$).

$LE_{PD,y}$ = Leakage related to the avoided production of petrodiesel in year y($tCO_2$)

***Leakage related to the production of crude oil ($LE_{PROD,y}$)***

$$LE_{PROD,y} = BD_y \cdot \frac{NCV_{BD,y}}{NCV_{PD}} \cdot EF_{PROD}$$

Where:

$LE_{PROD,y}$ = Leakage related to the production of crude oil in year y ($tCO_2$)

$BD_y$ = Quantity of biodiesel eligible for crediting in year *y* (t)

$NCV_{BD,\,y}$ = Net calorific value of biodiesel produced in year y (GJ/t)

$NCV_{PD}$ = Net calorific value of petrodiesel (GJ/t)

$EF_{PROD}$ = Emission factor for production of crude oil ($tCO_2e/t$)

***Leakage related to oil refining*** ($LE_{REF,y}$)

$$LE_{REF,y} = BD_y \cdot \frac{NCV_{BD,y}}{NCV_{PD}} \cdot EF_{REF}$$

Where:

$LE_{REF,y}$ = Leakage related to refining of crude oil in year y ($tCO_2$)

$BD_y$ = Quantity of biodiesel eligible for crediting in year *y* (t)

$NCV_{BD,\,y}$ = Net calorific value of biodiesel produced in year y (GJ/t)

$NCV_{PD}$ = Net calorific value of petrodiesel (GJ/t)

$EF_{REF}$ = Emission factor related to oil refining ($tCO_2e/t$)

***Leakage related to the long distance transport*** ($LE_{LDT,y}$)

$$LE_{LDT,y} = BD_y \cdot \frac{NCV_{BD,y}}{NCV_{PD}} \cdot EF_{LDT}$$

Where:

$LE_{LDT,y}$ = Leakage related to the long distance transport in year y ($tCO_2$)

$BD_y$ = Quantity of biodiesel eligible for crediting in year *y* (t)

$NCV_{BD,\,y}$ = Net calorific value of biodiesel produced in year y (GJ/t)
$NCV_{PD}$ = Net calorific value of petrodiesel (GJ/t)
$EF_{LDT}$ = Emission factor related to long distance transportation (tCO2e/t)

**Emission reductions**

Emission reductions are calculated as follows:

$$ER_Y=(BE_Y-PE_Y-LE_Y)$$

Where:

$ER_y$ = Emission reductions in year *y* ($tCO_2$)

$BE_y$ = Baseline emissions in year *y* ($tCO_2$)

$PE_y$ = Project emissions in year *y* ($tCO_2$)

$LE_y$ = Leakage emissions in year *y* ($tCO_2$)

## 4.4 Estimated Net GHG Emission Reductions and Removals

| 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 ($tCO_2e$) |
|---|---|---|---|---|
| Year-1 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-2 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-3 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-4 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-5 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-6 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Year-7 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| Total | 13,63,850 | 98,263 | 0 | 12,65,587 |

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

| Data / Parameter | $NCV_{PD}$ |
|---|---|
| Data unit | GJ/T |
| Description | Net calorific value of Petro diesel |
| Source of data | 2006 IPCC Guidelines for GHG Inventories |
| Value applied: | 43 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | For baseline emissions calculation |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | $EF_{CO2,PD}$ |
| Data unit | *tCO2/GJ* |
| Description | *Carbon dioxide emissions factor for Petro diesel* |
| Source of data | 2006 IPCC Guidelines |
| Value applied: | 0.0741 |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | *For Baseline emission calculation* |
| Comments | *Not Applicable* |

| | |
|---|---|
| Data / Parameter | $EF_{CO2,EL,y}$ |
| Data unit | *tCO2/MWh* |
| Description | *CO2 Emission Factor for electricity generation in year y* |
| Source of data | Tool to calculate baseline, project and/or leakage emissions from electricity consumption |
| Value applied: | 1.3 |
| Justification of choice of data or description of | In line with the ACM0017: Production of biofuel --- Version 3.1 |

| | |
|---|---|
| measurement methods and procedures applied | |
| Purpose of Data | *For project emissions calculation* |
| Comments | *N*A |

| | |
|---|---|
| Data / Parameter | $TDL_Y$ |
| Data unit | - |
| Description | *Average technical transmission and distribution losses for importing electricity in year y* |
| Source of data | Tool to calculate baseline, project and/or leakage emissions from electricity consumption |
| Value applied: | 20% |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | *For Project emissions calculation* |
| Comments | - |

| | |
|---|---|
| Data / Parameter | EF C,MeOH |
| Data unit | *tC/t MeOH* |
| Description | *Carbon emission factor of methanol, based on molecular weight* |
| Source of data | |
| Value applied: | 0.375 |
| Justification of choice of data or description of | *In line with the ACM0017: Production of biofuel --- Version 3.1* |

| | |
|---|---|
| measurement methods and procedures applied | |
| Purpose of Data | *For project emissions calculation* |
| Comments | Not Applicable |

| | |
|---|---|
| Data / Parameter | $EF_{CO2,i,y}$ |
| Data unit | *tCO2/GJ* |
| Description | *Carbon di oxide emission factor for fuel type I (diesel) combusted by the project during biodiesel production* |
| Source of data | IPCC data 2006 |
| Value applied: | 0.0741 |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | *For project emissions calculation* |
| Comments | *Not Applicable* |

| | |
|---|---|
| Data / Parameter | EFMeOH_PC |
| Data unit | *tCO2/t MeOH* |
| Description | *Pre combustion (i.e. upstream) emissions factor for methanol production* |
| Source of data | 2006 IPCC Guidelines |
| Value applied: | 1.95 |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |

| | |
|---|---|
| Purpose of Data | *For leakage calculation* |
| Comments | *Based on 30 GJ/t energy requirement and average of IPCC emissions factors for natural gas and diesel oil.* |

| | |
|---|---|
| Data / Parameter | EF PROD |
| Data unit | *tCO2e/t petrodiesel* |
| Description | *Emission factor for production of crude oil* |
| Source of data | |
| Value applied: | 0.073 |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | *For leakage calculation* |
| Comments | *NA* |

| | |
|---|---|
| Data / Parameter | EFREF |
| Data unit | *tCO2e/t petro diesel* |
| Description | *Emission factor related to oil refinery* |
| Source of data | |
| Value applied: | 0.233t-Co2/t-petrodiesel |
| Justification of choice of data or description of measurement methods and procedures applied | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| Purpose of Data | *For leakage calculation* |

| | |
|---|---|
| **Comments** | *NA* |

| | |
|---|---|
| **Data / Parameter** | EFLDT |
| **Data unit** | tCO2e/t petrodiesel |
| **Description** | Emission factor related to long distance transportation Source |
| **Source of data** | |
| **Value applied:** | A conservative figure of 0 is adopted |
| **Justification of choice of data or description of measurement methods and procedures applied** | In line with the ACM0017: Production of biofuel --- Version 3.1 |
| **Purpose of Data** | For Leakage calculation |
| **Comments** | NA |

## 5.2 Data and Parameters Monitored

| | |
|---|---|
| **Data / Parameter** | Cwaste oil/fat |
| **Data unit** | *ton/yr* |
| **Description** | *Waste oil/fat purchased in year y* |
| **Source of data** | Records at the entrance of the project plant |
| **Description of measurement methods and procedures applied** | |
| **Frequency of monitoring/recording** | *Annually* |
| **Value applied:** | *12000* |
| **Monitoring equipment** | *Records at the entrance of the project plant* |

| | |
|---|---|
| QA/QC procedures applied | *The weighbridge will be calibrated periodically* |
| Purpose of data | |
| Calculation method | Every purchased waste oil/fat must be monitored |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | fPJ,i,y |
| Data unit | Ratio |
| Description | Fraction of biodiesel in the blended diesel from the project activity, with blending ratio i, in year y |
| Source of data | Records from blending operations |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | Annually |
| Value applied: | 0% |
| Monitoring equipment | Records from blending operations |
| QA/QC procedures applied | During the process of creating the blended biodiesel at the blending station, the blending operation shall be monitored to assure adequate mixing of the products in the correct proportions. |
| Purpose of data | |
| Calculation method | |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | freg,y |

| | |
|---|---|
| **Data unit** | % |
| **Description** | Fraction of biodiesel in the blended biodiesel which is required by mandatory regulations of the host country in year y |
| **Source of data** | Regulations in the Host Country |
| **Description of measurement methods and procedures applied** | - |
| **Frequency of monitoring/recording** | Annually |
| **Value applied:** | - |
| **Monitoring equipment** | - |
| **QA/QC procedures applied** | - |
| **Purpose of data** | |
| **Calculation method** | Applicability conditions |
| **Comments** | NA |

| | |
|---|---|
| **Data / Parameter** | Various parameters; Compliance of biodiesel produced with national regulations |
| **Data unit** | *Various data units* |
| **Description** | *Compliance of produced biodiesel with national regulation, biodiesel properties* |
| **Source of data** | Various measurements based on national or international standards. |
| **Description of measurement methods and procedures applied** | - |

| | |
|---|---|
| Frequency of monitoring/recording | *Annually.* |
| Value applied: | - |
| Monitoring equipment | - |
| QA/QC procedures applied | *According to national or international standards.* |
| Purpose of data | |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | MPGlyc,y |
| Data unit | *t* |
| Description | *Amount of byproduct glycerol produced during plant operation* |
| Source of data | Plant Record |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | 500 KL Day |
| Monitoring equipment | *All quantity of produced glycerol must be monitored* |
| QA/QC procedures applied | *Weighbridge will be calibrated periodically* |
| Purpose of data | *Applicability conditions* |
| Calculation method | |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | $PB_{D,y}$ |
| Data unit | *t* |
| Description | *Quantity of biodiesel produced in the project plant in year y* |
| Source of data | on-site measurements by project participants |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | *43153*[6]* |
| Monitoring equipment | |
| QA/QC procedures applied | *Cross check production and consumption data with sales records* |
| Purpose of data | *Baseline emissions* |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | PBD,on-site,y |
| Data unit | *t* |
| Description | *Quantity of biodiesel consumed at the project biodiesel production plant and/or the oil production plant(s) in year y* |
| Source of data | Metering system at fueling station |

[6] * operate at 25% of its installed capacity at present

| | |
|---|---|
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | |
| Value applied: | |
| Monitoring equipment | *Metering system at fueling station* |
| QA/QC procedures applied | *Cross check production and consumption data with sales records* |
| Purpose of data | *Baseline emissions* |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | CBBD,I,y |
| Data unit | *t* |
| Description | *Quantity of blended biodiesel with blending ratio i, consumed by the captive user in year y* |
| Source of data | Metering system at fueling station |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | *00* |
| Monitoring equipment | *Continuous recording of filling consumers' stationary combustion installations or vehicles* |
| QA/QC procedures applied | *Cross check production and consumption data with sales records* |
| Purpose of data | *Baseline emissions* |

| | |
|---|---|
| Calculation method | |
| Comments | |
| Data / Parameter | NCVBD,y |
| Data unit | GJ/t |
| Description | Net calorific value of biodiesel produced in year y |
| Source of data | Laboratory analysis |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | Annually |
| Value applied: | 41.0031 |
| Monitoring equipment | |
| QA/QC procedures applied | Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements |
| Purpose of data | Baseline emissions |
| Calculation method | - |
| Comments | - |

| | |
|---|---|
| Data / Parameter | MCMeOH,y |
| Data unit | *tMeOH* |
| Description | *Quantity of methanol consumed in the biodiesel plant, including spills and evaporations on-site in year y* |
| Source of data | Mass meters |

| | |
|---|---|
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | |
| Value applied: | |
| Monitoring equipment | |
| QA/QC procedures applied | *Crosscheck against methanol purchase receipts and calculated stoichiometric requirements* |
| Purpose of data | *Project emissions* |
| Calculation method | |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | **FCm,i,y** |
| Data unit | *t* |
| Description | *Fuel consumption of type i for transporting material m in year y* |
| Source of data | Truck operator records |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | *6562.66 t (fuel consumption by both ship and trucks)* |
| Monitoring equipment | |
| QA/QC procedures applied | *Crosscheck fuel purchase data with average consumption for the type of vehicle provided by the manufacturer* |
| Purpose of data | *Project emissions* |

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

| | |
|---|---|
| Data / Parameter | AF1,y |
| Data unit | *Fraction* |
| Description | *Allocation factor for the production of biodiesel in year y* |
| Source of data | |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | |
| Monitoring equipment | |
| QA/QC procedures applied | |
| Purpose of data | *Project emissions* |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | AF2,y |
| Data unit | *Fraction* |
| Description | *Allocation factor for the production of biodiesel in year y* |
| Source of data | |

| | |
|---|---|
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | |
| Value applied: | |
| Monitoring equipment | - |
| QA/QC procedures applied | |
| Purpose of data | *Project emissions* |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | FCI,y |
| Data unit | *t* |
| Description | *Quantity of fuel type i combusted by the project for biodiesel production in year y* |
| Source of data | On-site measurements |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | |
| Monitoring equipment | |
| QA/QC procedures applied | |
| Purpose of data | *Project emissions* |

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

| | |
|---|---|
| Data / Parameter | NCVi,y |
| Data unit | *GJ/t* |
| Description | *Net calorific value of fuel type i consumed by the project in the year y* |
| Source of data | Laboratory analysis |
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | *Annually* |
| Value applied: | |
| Monitoring equipment | |
| QA/QC procedures applied | |
| Purpose of data | *Project emissions* |
| Calculation method | |
| Comments | |

| | |
|---|---|
| Data / Parameter | ECy |
| Data unit | *MWh* |
| Description | *Quantity of electricity consumed for biodiesel production in year y* |
| Source of data | On-site measurements |

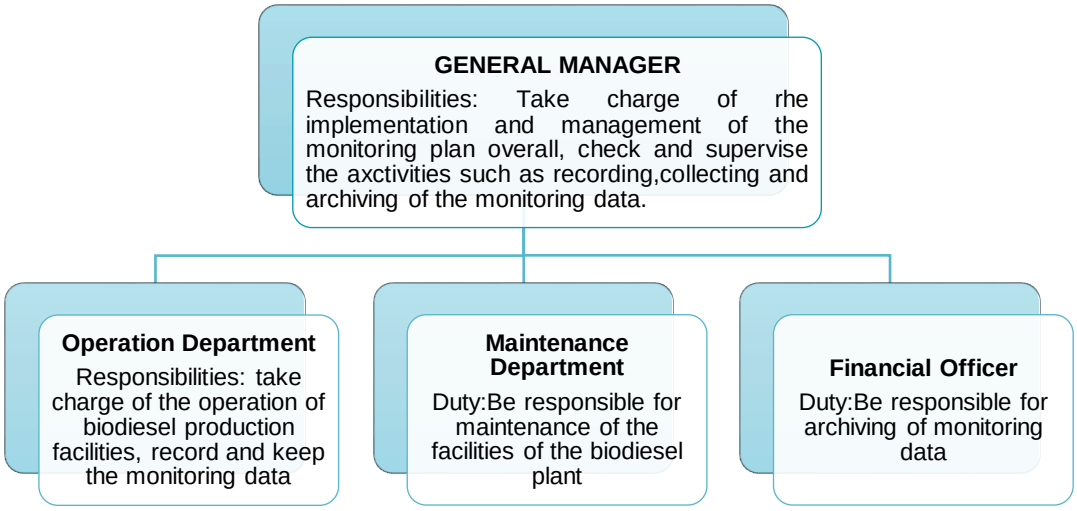
| | |
|---|---|
| Description of measurement methods and procedures applied | |
| Frequency of monitoring/recording | |
| Value applied: | *1555.1* |
| Monitoring equipment | |
| QA/QC procedures applied | |
| Purpose of data | *Project emissions* |
| Calculation method | - |
| Comments | - |

## 5.3 Monitoring Plan

**Monitoring management structure**

In order to obtain reliable monitoring data, the project owner will establish a monitoring management structure prior to the start of the crediting period. Clear responsibilities will be assigned to all staffs involved in the project activity. A general Manager will be appointed who has the overall responsibilities for the monitoring of the project, other staffs will be responsible for the data recording, data collecting, data archiving and emission reduction calculation.

The detailed structure is as follows:




**(1) Electricity Meter**

The electricity consumption from Capro Power Limited for biodiesel production will be monitored by electricity meter installed in accordance with CEA[7]. The meter will be calibrated once in 5 year by qualified entity.

**(2) Weigh Bridge**

The amount of waste oil/fat, fuel and methanol consumed for biodiesel production, the amount of biodiesel and byproduct glycerol produced and sold will be measured by weighing meter at the biodiesel plant.

**Data monitoring**

The monitoring process are as follows:

- The designated persons read the meters and record the data according to requirements described in section B.7.1 and then collect and submit the data on a monthly basis.
- The general manager is in charge of checking the accuracy and completeness of the collected data:
- The financial office is responsible of archiving the data and sale receipts.
- All the relevant data records will be kept by the project owner during the crediting period and two years after the end of crediting period.

[7] https://cea.nic.in/wp-content/uploads/2020/02/amend_15122014.pdf

**Quality control**

1. **Calibration of meters**

   The calibration of meters will be conducted in accordance with national regulations by qualified entity to ensure the accuracy. The meter will be calibrated once in 5 years.

2. **Emergency treatment**

   When the meter breaks down, the project owner should inform the qualified calibration organization to check, calibrate, test and treat the meter so as to recover the normal monitoring site.

3. **Data management**

   All monitoring data and records will be archived electronically and be kept at least for 2 years after the end of crediting period.

4. **Training program**

   The project developer will organize at least 1 training in a year regarding operational regulations, quality control (QC), data monitoring and data management regulation etc.

# 6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

## 6.1 Data and Parameters Monitored

| Data / Parameter | BDy |
|---|---|
| Data unit | *Quantity of biodiesel eligible for year y (t)* |
| Description | |
| Value applied: | *43153.05* |
| Comments | |

## 6.2 Baseline Emissions

Baseline emissions

Based on formula (1) in section B.6.1, the baseline emissions are calculated as follow:

$$BF_y = \left[ min\left\{ (P_{BF,y} - P_{BF,on-site,y}); \left( \sum_i f_{PJ,i,y} \times C_{BF,i,y} \right) \right\} - P_{BF,other,y} \right] \times \left( \frac{\sum_i C_{BF,i,y} \times \left( \frac{f_{PJ,i,y} - f_{reg,y}}{f_{PJ,i,y}} \right)}{\sum_i C_{BF,i,y}} \right)$$

BDY= 43153.05t

Thus,

BEy= BDY XNCV BD, Y X EFCO2PD,Y

= 43153.05* 42.65*0.0741= 136385 tCO2

## 6.3 Project Emissions

Based on formula (3) in section B.6.1, the baseline emissions are calculated as follow:

$PE_y = AF_{1,y} \times (PE_{BPF,y} + PE_{MeOH,y} + PE_{Tr,y} + AF_{2,y} \times PE_{BC,y})$

= 9826 $TCO_2$

Where,

$PE_{BPF,Y} = \sum PE_{FC,J,Y} + PE_{EC,Y} + PE_{W,Y}$

$= FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} + EC_y \times EF_{CO2,EL,y} \times (1+TDL_y) + PE_{W,y}$

= 5998.17 $tCO_2$

$PE_{MEOH,Y} = MC_{MeOH,Y}$ X $EF_{C,MeOH}$ X 44/12

= 3664.8783 $TCO_2$

$PE_{tr,y} = \sum\sum FC_{m,j,y} \times NCV_i \times EF_{CO2})$

= 163.2979 $tCO_2$

$AF_{2,y}$=0, and $PE_{BC,y}$=0.

## 6.4 Leakage

According to the methodology, if leakage emissions are less than zero, consider it as zero.

## 6.5 Net GHG Emission Reductions and Removals

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 15/09/2020 to 31/12/2020 | 33,629.17 | 2422.93 | 0 | 31206.24 |
| 01/01/2021 t0 31/12/2021 | 1,36,385 | 9,826 | 0 | 1,26,559 |
| 01/01/2022 To 31/03/2022 | 33,629.17 | 2422.93 | 0 | 31206.24 |
| **Total** | 2,03,643.34 | 14671.86 | 0 | 188971.48 |

# APPENDIX X: <TITLE OF APPENDIX>

*Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.*