COMPONENT PROJECT DESIGN DOCUMENT FORM FOR SMALL-SCALE COMPONENT PROJECT ACTIVITIES (F-CDM-SSC-CPA-DD) Version 02.0

COMPONENT PROJECT ACTIVITIES DESIGN DOCUMENT (CPA-DD)

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

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National Biogas Programme of Activities in Fiji

A.2. Title of the CPA

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(a) Navakai Wastewater Treatment Plant, Unique identification code: Fiji-WTP-CPA-01
(b) Version: 01
(c) Date of CPA-DD completion: 15/11/2012

A.3. Description of the CPA

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The Navakai Wastewater Treatment Plant (hereafter referred as “proposed CPA”) will be developed by Water Authority of Fiji (WAF). It is the first CPA under Sewerage Treatment Project in Fiji (hereafter referred as “proposed PoA”) coordinated and managed by WAF which also acts as Coordinating/Managing Entity (CME) of the proposed PoA.

The proposed CPA will be implemented at Nadi, Western Division, Fiji. It aims to reduce the biogas (mainly methane) emissions, a highly potential Greenhouse Gas (GHG) source resulting from anaerobic digestion of wastewater in the Nadi Sewerage system, by introducing biogas recovery and combustion system to the existing wastewater treatment system of the proposed CPA. There is currently no methane recovery in Nadi Sewerage System. The CPA therefore involves an AMS-III.H. technology/measure 1(d) of introducing of biogas recovery and combustion to an anaerobic wastewater treatment system. There is currently no legislation and regulation in Fiji that limits emission of biogas into atmosphere.

This SSC-CPA will utilize the wastewater that is collected in Nadi wastewater pipeline network. All the wastewater in pipeline network is mainly generated from local residents’ daily life activities and local industries. Currently, wastewater is mainly treated by two covered lagoon digesters, two lagoons and one final effluent lagoon, sludge is composted. None of the biogas from the proposed CPA is recovered and utilized at the moment.. The proposed CPA is designed to combusted recovery biogas in biogas engines for electricity generation. The proposed CPA is expected to process 123,750 m^3 wastewater per year. All the captured biogas will be accessed to biogas engines and generate 27,750MWh per year.

It is estimated that the proposed CPA will reduce methane emissions by 25,295 tCO_2e by avoiding it being emitted to the atmosphere. In addition to this, all the captured biogas will be supplied to two biogas engines for electricity generation, which will be supplied to Fiji National Grid (FEA Grid). By displacing electricity from FEA Grid that would have otherwise been generated by fossil fuels plants connected to the grid, a further 12,612 tCO_2 emission reductions will be reduced.

A.4. Entity/individual responsible for CPA

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WAF will be the implementing entity for proposed CPA.

A.5. Technical description of the CPA
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The main equipment and facilities of WTP in operation under the existing scenario prior to the implementation of CPA are listed as following table:

Equipment/facilities	Quantity
Pasveer ditches	2
Clarifier	1
Digester lagoon	2
Lagoons	2
Final effluent lagoon	1
Belt press system	1

All the equipment and facilities have been operated more than three years.

Biogas recovery and combustion system will be introduced to the existing anaerobic wastewater treatment system. All the raw wastewater will be supplied from the Nadi wastewater pipeline network and connected to Navakai WTP. All the influent will be preliminary treated by acid pond, then transferred to the covered lagoon digesters. Gas handling system removes biogas from the digester and transports it to two 1.03 MW biogas engines on site for electricity generation. Gas handling includes: piping; gas pump or blower; gas meter; pressure regulator; and condensate drain(s). All the generated electricity will be supplied to the FEA Grid.

Two wastewater flow meters will be installed at the influent pipeline to the covered lagoon digesters. At the inflow and outflow of the lagoon digesters system, there are two Chemical Oxygen Demand (COD) measurement point. At the final effluent lagoon, the COD will be measured as the treated wastewater discharged into final effluent lagoon. Two biogas flow meters will be installed at the inflow of gas engine pipeline for biogas production measurement. Meanwhile, the methane content, temperature and pressure of the recovered biogas will be monitored near the biogas flow meter. Methane content will be directly measured by a gas analyzer, temperature and pressure will be recorded at the same time. All the generated electricity will be directly supply to FEA Grid. Two electricity meters will be installed at 33kV/132kV power line.

All the equipment and facilities will be properly certified by CME and technology supplier before installation. In terms of relevant standard, all the types and level of services shall be applied as Fiji National Standard.

Prior to the implementation of the proposed CPA, baseline scenario is stated as following:
Emissions from electricity delivered to the grid by the CPA would have otherwise been generated by the operation of grid-connected power plants in FEA-Grid. WTP is continuous operated; all the generated biogas from wastewater treatment systems will be emitted into atmosphere continuously.

A.6. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) CPA implementer(s) (as applicable)	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Republic of Fiji	Water Authority of Fiji	No

A.7. Geographic reference or other means of identification
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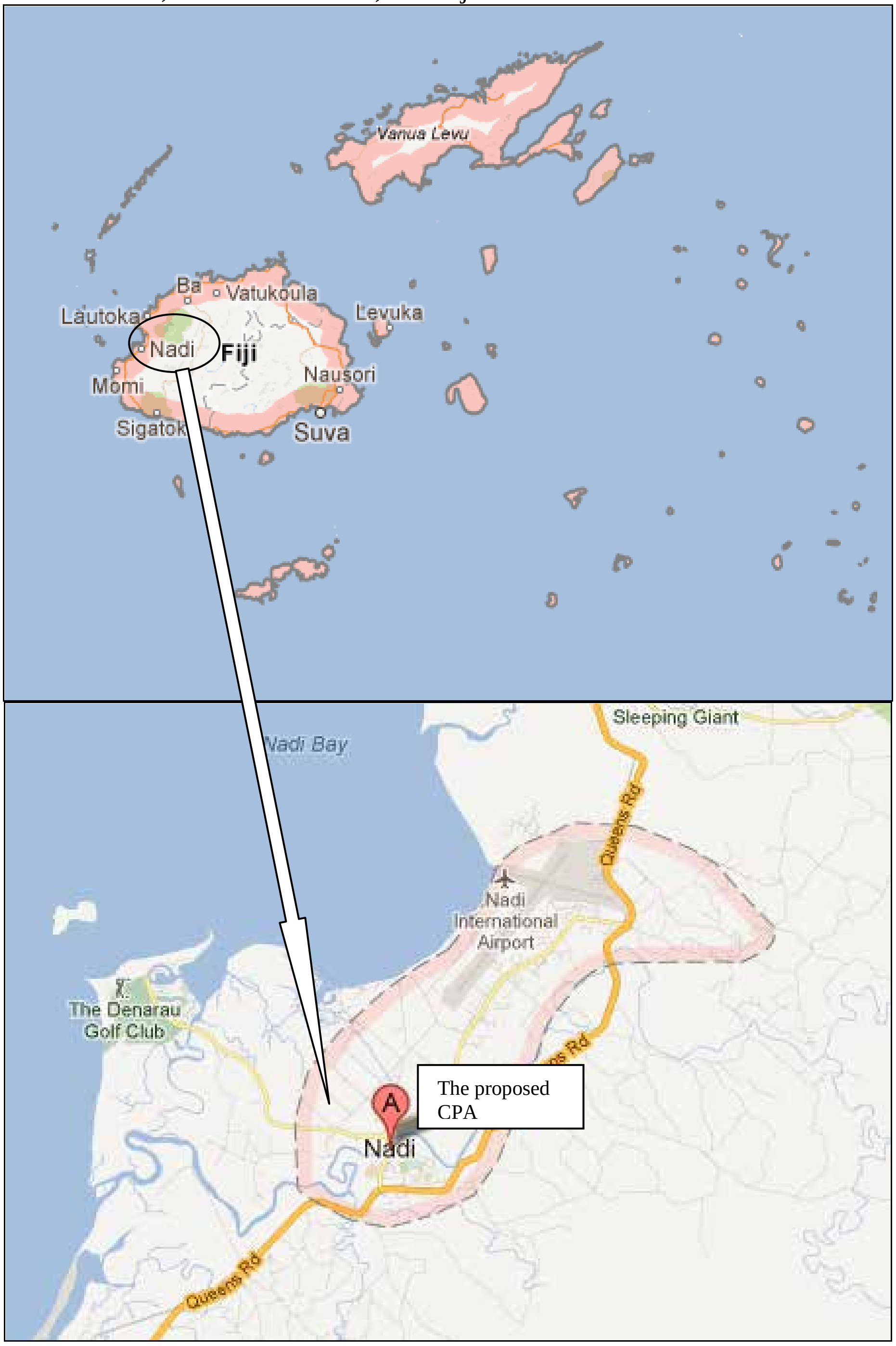
The CPA is located in Nadi, Western Division, and Fiji.



A.8. Duration of the CPA

A.8.1. Start date of the CPA

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01/01/2014 (expected or the start date of PoA whichever is later)

A.8.2. Expected operational lifetime of the CPA

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The expected operational lifetime of the proposed CPA is 28 years 0 months.

A.9. Choice of the crediting period and related information

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Type of crediting period is renewable

A.9.1. Start date of the crediting period
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Start date of the crediting period will be the start date of CPA.

A.9.2. Length of the crediting period
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7 years and renewable twice
Any CPA is limited to the end date of the PoA regardless of when the CPA was added.

A.10. Estimated amount of GHG emission reductions

Emission reductions during the crediting period	
Years	**Annual GHG emission reductions (in tonnes of CO_2e) for each year**
01/01/2014-31/12/2014	37,907
01/01/2015-31/12/2015	37,907
01/01/2016-31/12/2016	37,907
01/01/2017-31/12/2017	37,907
01/01/2018-31/12/2018	37,907
01/01/2019-31/12/2019	37,907
01/01/2020-31/12/2020	37,907
Total number of crediting years	7
Annual average GHG emission reductions over the crediting period	37,907
Total estimated reductions (tonnes of CO_2e)	265,349

A.11. Public funding of the CPA
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There is not any public funding from Parties included in Annex I and official development assistance (ODA).

A.12. Debundling of small-scale component project activities
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According to the ‘GUIDELINES ON ASSESSMENT OF DEBUNDLING FOR SSC PROJECT ACTIVITIES’ Version 03 section II GUIDANCE FOR DETERMINING THE OCCURRENCE OF DEBUNDLING UNDER A PROGRAMME OF ACTIVITIES (PoA), for the purposes of registration of a Programme of Activities (PoA), a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below:

(a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;

(b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

Both conditions (a) and (b) are not satisfied by the proposed CPA, therefore, the proposed CPA is not a debundling component of a large-scale activity.

If a proposed small-scale CPA of a PoA is deemed to be a de-bundled component in accordance with paragraph 2 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM and small-scale A/R project activities as set out in Annex II of the decision 4/CMP.1 and 5/CMP.1 respectively, the CPA of a PoA can qualify to use simplified modalities and procedures for small-scale CDM and small-scale A/R CDM project activities.

Not applicable for the proposed CPA.

If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity.

Not applicable for the proposed CPA.

A.13. Confirmation for CPA

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CME will manage the each CPA under the proposed PoA. Each CPA will be carefully selected based on the project database of UNFCCC website. Currently, there is no registered PoA in Republic of Fiji and only one registered CDM wastewater treatment project which is Kinoya WTP in Fiji. CME will assure the Kinoya WTP will not be developed as a CPA under the PoA. In addition, CME will confirm that the Navakai WTP is neither an individual CDM project activity nor is part of another registered PoA.

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

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According to Environment Management (Waste disposal and Recycling) Regulation 2007, the proposed PoA does not fall under the requirements of Environmental Impact Assessment (EIA) in host country. As the operation of WTP must keep a waste liquid disposal permit, which means the WTP had been approved through EIA by host country Department of Environment. The proposed PoA will recover and capture the waste biogas which used to be directly emitted into atmosphere. Rather than causing negative impacts to the environment, the CPA will provide the following environmental benefits:

- Reduce the methane emissions;
- Encourage the multiple utilization of recovered biogas rather than emitted into atmosphere;
- Improve the air quality of local area.

According to the CME’s Information, the proposed CPA is officially exempted from Department of Environment in host country. Therefore, the EIA will not be carried out for the proposed CPA. Documentation evidences will be provided to Designated of Entity (DoE) during the validation process of the proposed CPA.

SECTION C. Local stakeholder comments

C.1. Solicitation of comments from local stakeholders

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The detailed local stakeholder consultation will be carried out as following process:

1. Post stakeholder consultation notice

Publish the meeting information and project advertisements in the local newspaper, television or public media mainly around the villages and towns which near the project site (For instance, the Stakeholders Meeting for one PoA in the local newspaper).

2. Hand out and collect the questionnaires

Requirements:

- Hand out around 50-100 questionnaires to local residents or citizens around the project site; every stakeholder shall complete the questionnaire before the meeting.
- The specific number of questionnaires will depend on the number of people who attends the Stakeholders Meeting.
- Recovery rates of questionnaires shall reach 90% of total quantity of questionnaires.

3. Hold a project stakeholders meeting

Hold the Project Stakeholders Meeting. Project participants shall describe the PoA in a manner that allows the local stakeholders to understand the PoA. All the comments provided by local stakeholders shall be collected, solicited and properly answered.

4. Stakeholders' composition

- The stakeholders shall involve the following people; they shall be invited to attend the meeting.
- Project participants (who describes the detailed information of the PoA in an open and transparent manner.)
- The local governmental officials (who involves in the approval of PoA.)
- Local environmental department officials (who involves in the approval of PoA and environmental impact evaluation.)
- Local residents (who are living around the proposed CPAs site, likely to be impacted by the PoA. Therefore, they are the most relevant group and shall be involved in the decision making process.)
- Employees of local companies (if applicable)
- Companies and employees are likely to be influenced by the PoA.
- Local students (if applicable)
  The Schools are likely to be impacted by the PoA.

5. Minutes of meeting

By the end of meeting, minutes of meeting must be formed. Meeting photographs are recommended to take. Project participants shall prepare a summary of the comments provided by local stakeholders.

6. Outcomes of meeting

Project participants shall consider all comments received for the PoA. Following documents shall be properly kept by project participants in hard copy and electronic devices:

- Questionnaires
- All the questionnaires shall be scanned and archived both in computer and hard copy.
- Minutes of meeting or stakeholder meeting report
- Photographs of the meeting
- Summary of the stakeholders meeting

7. Outcomes of stakeholder consultation process

This Process is essential in the validation of the proposed project and project design. The results and outcomes will be used to evaluate the project influence on local communities or other groups which likely to be impacted. All the survey results will be summarized in the PoA-DD.

The general questions in the questionnaire as follows:

Please select your favourite options and make a choice based on your personal view. Please use '√' to select the options in the following box.		**Yes**	**No**	**Not clear**
1	The proposed project will have positive influences on my daily life.			
2	The proposed project will promote the local water quality.			
3	The proposed project will not create any noise pollution.			
4	The proposed project will help us to dispose the wastewater.			
5	Land expropriation of the proposed project **will not** influence my life.			
6	The clean energy technologies will be transferred to our country by the proposed project.			
7	The proposed project will improve the energy supply to my hometown.			
8	The project will provide more working opportunities to local people.			
9	Local residents will be benefited by the proposed project.			

C.2. Summary of comments received

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Comments will be added into the CPA-DD when they are available.

C.3. Report on consideration of comments received

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Comments will be added into the CPA-DD when they are available.

SECTION D. Eligibility of CPA and Estimation of emissions reductions

D.1. Title and reference of the approved baseline and monitoring methodology(ies) selected:

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The following methodology and tools shall be considered according to the implemented technology in the proposed CPA: All the recovered biogas will be utilized for electricity generation, therefore, the combination of the methodology AMS III.H. "Methane recovery in wastewater treatment" (version 16) under the type III project activities "Scope 13 – Waste Handling and Disposal" and methodology AMS I.D. "Grid connected renewable electricity generation" (version 17.0) will be applied in the proposed CPA.

"Tool for the demonstration and assessment of additionality" (version 6.1.0);
"Project and leakage emissions from anaerobic digesters" (version 1);
"Tool to calculate baseline, project, and/or leakage emission from electricity consumption" (version 01);
"Tool to calculate the emission factor for an electricity system" (version 02.2.1).

D.2. Application of methodology(ies)

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The CPA shall apply the AMS III.H and applicable for following requirements:

No.	AMS-III.H version 16 applicability requirement	Compliance of the proposed SSC-CPA
1	Measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options: a. Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion;	The proposed CPA will introduce biogas recovery system to an existing anaerobic wastewater treatment system without biogas recovery. Option 1(d) will be applied in the proposed CPA.

	b. Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; c. Introduction of biogas recovery and combustion to a sludge treatment system; d. Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on-site industrial plant e. Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; f. Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).	
2	In cases where baseline system is anaerobic lagoon the methodology is applicable if: a. The lagoons are ponds with a depth greater than two meters, without aeration. b. Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; c. The minimum interval between two consecutive sludge removal events shall be 30 days.	For the baseline system of CPA is anaerobic lagoon, CME will confirm that the lagoons are ponds with a depth greater than two meters without aeration; Ambient temperature above 15°C and minimum interval between two consecutive sludge removal events is 30 days. And all the measurement records will be supplied to Designated Operational Entity during validation process.
3	The recovered biogas from the above measures may also be utilized for the following applications instead of combustion/flaring: a. Thermal or electrical energy generation directly; b. Thermal or electrical energy generation after bottling of upgraded biogas; or c. Thermal or electrical energy generation after upgrading and distribution: i. Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; ii. Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or iii. Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. d. Hydrogen production e. Use as fuel in transportation application after upgrading	As the proposed CPA is designed to utilize captured biogas for electricity generation, hence the application 3 (a) thermal or electrical energy generation directly will be utilized in the proposed CPA. It shall cover the applicability of methodology AMS-I.D. which will be demonstrated in table below. Other recovered biogas utilizations 3(b), 3(c), 3(d) and 3(e) are not designed in the proposed PoA and CPA.

4	The location of wastewater treatment plants as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	CME will record Navakai WTP location and GPS coordinates, source of wastewater which is Nadi wastewater pipeline network will also be identified by CME.
5	Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	The emissions reductions of the CPA shall be less than or equal to 60,000t CO_2 equivalent annually from Type III components. The estimated emission reductions from type III of the proposed CPA are 25,295 tCO_2e annually, therefore, it is applicable.

The CPA shall apply the AMS I.D. and applicable for following requirements:

<table>
<tr><th>No.</th><th>AMS I.D version 17 applicability requirement</th><th>Compliance of the proposed SSC-CPA</th></tr>
<tr><td>1</td><td>This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:
(a) Supplying electricity to a national or a regional grid; or
(b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.</td><td>The recovered biogas will be utilized for electricity generation and directly supply to FEA Grid in the CPA. Therefore, the option 1(a) is applicable for the proposed CPA.</td></tr>
<tr><td>2</td><td>Illustration of respective situations under which each of the methodology (i.e. AMS-I.D., AMS-I.F. and AMS-I.A.) applies is included in Table 2.
Table 2 in the methodology AMS-I.D;
<table>
<tr><th></th><th>Project type</th><th>AMS-I.A.</th><th>AMS-I.D.</th><th>AMS-I.F.</th></tr>
<tr><td>1</td><td>Project supplies electricity to a national/regional grid</td><td></td><td>ü</td><td></td></tr>
<tr><td>2</td><td>Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)</td><td></td><td></td><td>ü</td></tr>
<tr><td>3</td><td>Project supplies electricity to an</td><td></td><td>ü</td><td></td></tr>
</table></td><td>All the generated electricity will be directly supplied to FEA Grid (National Grid in Fiji). Therefore, the AMS-I.D is applicable under the proposed CPA.</td></tr>
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<tr><td></td><td>
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<tr><td></td><td>identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)</td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>Project supplies electricity to a mini grid[17] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel</td><td></td><td></td><td>ü</td></tr>
<tr><td>5</td><td>Project supplies electricity to household users (included in the project boundary) located in off grid areas</td><td>ü</td><td></td><td></td></tr>
</table>
</td><td></td></tr>
<tr><td>3</td><td>This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement[5] of (an) existing plant(s).</td><td>The CPA is designed to install biogas recovery system to Navakai wastewater treatment plant where there was no renewable energy power plant operating prior to the implementation of this CPA. The option (a) is applicable for this CPA.</td></tr>
<tr><td>4</td><td>Hydro power plants with reservoirs[6] that satisfy at least one of the following conditions are eligible to apply this methodology:
· The project activity is implemented in an existing reservoir with no change in the volume of reservoir;
· The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2;
· The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.</td><td>Not applicable. As the CPA is not a hydro power plant.</td></tr>
</table>

5	If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Not applicable. As CPA is not designed to install non-renewable components.
6	Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable. Only electricity is generated in the proposed CPA.
7	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[9] from the existing units.	Not applicable. There were no renewable energy generation units at the facility prior to the development of this CPA. And no capacity addition occurred in the CPA.
8	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable. As the CPA is not a retrofit or replacement activity.

D.3. Sources and GHGs

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In terms of AMS-III.H., the sources and GHGs included in the project boundary as following table:

	Source	Gas	Included ?	Justification / Explanation
Baseline	Emissions on account of electricity or fossil fuel used	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from the wastewater treatment systems	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
Project activity	Emissions from electricity and fuel used by project facilities	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from methane release in capture systems	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification

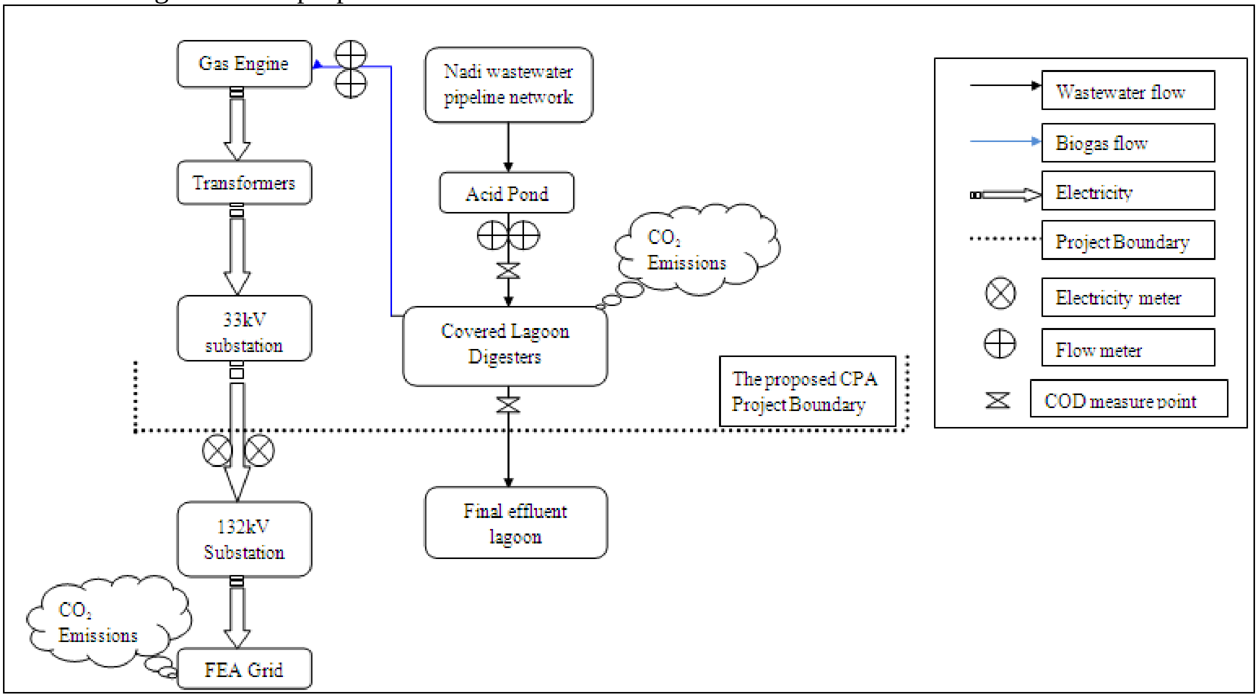
In terms of AMS-I.D., the sources and GHGs included in the project boundary as following table:

	Source	Gas	Included ?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the CPA	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project activity	CO_2 emissions from combustion of fossil fuels for electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

As per guidance set out in AMS-III.H, project boundary is the physical, geographical site where the wastewater and sludge treatment takes place, in the baseline and project situations. It covers all facilities affected by the proposed CPA including sites where processing, transportation and application or disposal of waste products as well as biogas takes place. In the proposed CPA, the project boundary of Navakai WTP is the geographical site. All the treatment systems remain unaffected as a result of wastewater treatment system will be continued to operate under the same conditions in the baseline scenario. The methane generation potential remains unaltered.

As per guidance set out in AMS-I.D, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CPA is connected to. In the proposed CPA, the generated electricity will be delivered to the FEA Grid on Viti Levu, the spatial extent of the project boundary includes all power plants connected physically to the FEA Grid on Viti Levu, to which the proposed project is connected to. The FEA Grid on Viti Levu is defined as the project electricity system, which is mainly comprised of a range of diesel plants (such as Nadi plant, Deuba and Vuda plant.), plus three hydropower plants and one wind power plant (Butoni wind farm).

The flow diagram of the proposed CPA as below:



D.4. Description of the baseline scenario

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In terms of electricity generation, as described in the methodology AMS-I.D., the baseline scenario is defined as following:

The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

Therefore, the baseline scenario of the proposed CPA is the electricity delivered to the grid by the CPA would have otherwise been generated by the operation of grid-connected power plants in FEA-Grid.

In terms of biogas recovery, as described in the methodology AMS-III.H., the baseline scenario is defined as following:

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

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

The baseline emissions of the proposed CPA may consist of following:

(i) Emissions from electricity delivered to the grid by the CPA would have otherwise been generated by the operation of grid-connected power plants in FEA-Grid.
(ii) The baseline scenario will be continuous operations of wastewater treatment system, all the generated biogas from wastewater treatment systems will be emitted into atmosphere continuously.
(iii) There is no sludge treatment system at the proposed CPA, methane emissions from sludge treatment systems is excluded in baseline emissions.
(iv) All the treated wastewater is discharged into final effluent lagoon. Therefore, methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea is excluded in the project boundary.
(v) Sludge is composted and used for solid application; it is excluded in the project boundary.

D.5. Demonstration of eligibility for a CPA

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In line with Annex 3, CDM EB 65, "*Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities*[1]*"*, the formulation of the eligibility criteria takes into account the following:

1) Guidelines on the demonstration of additionality of small-scale project activities.
2) The compliance with the additionality-related eligibility criteria and the additionality-related guidelines, tools or any requirements embedded in the applied methodology (ies) shall be shown;
3) For PoAs involving combinations of technologies and/or methodologies, the eligibility criteria relative

[1] Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities, EB65, Annex3.

to each of them shall be proposed to demonstrate additionality;

4) The eligibility criteria shall be verifiable.

The eligibility criteria shall cover as a minimum the following:

No.	Eligibility criteria for inclusion of a CPA in the PoA	How each CPA meets the eligibility criteria for inclusion of the PoA
(a)	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA;	The CPA will be developed within the geographical boundary of Fiji.CME will managed all CPAs and confirm that they are within the geographical boundary of Fiji.
(b)	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	The CPA will be managed by CME with a unique identification code to avoid double counting of emission reductions. This identification code will be properly archived by CME electronically and in hard copy. For example, Navakai WTP will be developed as a CPA with Fiji-WTP-CPA-01 which is the unique identification code under the proposed PoA.
(c)	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	The level and type of service, performance specifications of the CPA will be checked/tested by both CME and facilities supplier. It is designed to utilize recovered biogas for electricity generation, all the generated electricity will be supplied to FEA Grid.
(d)	Conditions to check the start date of the CPA through documentary evidence;	The accurate start date of the CPA will be recorded by CME. The start date of CPA can be sourced from the contract which has been signed for the equipments and facilities.
(e)	Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs;	In the CPA, the methane recovery component emissions reductions are 25,295 t CO_2e/year which is not exceed 60,000t CO_2e/year. The CPA complies with the applicability criteria of AMS-III.H version 16 and comprises measures that recover biogas from biogenic matter in wastewater. In terms of different technologies combination, the CPA comprises measures in AMS-I.D.
(f)	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality;	The CPA is facing the prevailing practice barrier. There is no mandatory law for the biogas recovery. The Navakai WTP can be operated without biogas capture system legally. Therefore, there is no way for the PCA implementer to carry out the proposed CPA without CER revenues.
(g)	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	Local stakeholder consultation will be carried out at each CPA level. Environment Impact Analysis was exempted by Department of Environment in host country. As the Navakai WTP had waste emit permit,

		no further permit is required for the CPA.
(h)	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	There is no public funding for the proposed CPA.
(i)	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid connected/off-grid) and distribution mechanisms (e.g. direct installation);	Target group will be the Navakai WTP.
(j)	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys;	Not applicable.
(k)	Where applicable, the conditions that ensure that every CPA in aggregate meets the throughout the crediting period of the CPA;	CME will confirm that the CPA will be started after date of the registration of PoA.
(l)	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or micro scale project categories.	The proposed CPA is not a debundled component of a large project activity. As it was not registered within previous 2 years; project boundary is not within 1 km of the project boundary of other projects.

The anaerobic lagoons system is an effective and low-tech solution that can readily meet the discharge limits as imposed by local regulation.

Investment is required and necessary to implement a biogas recovery and collection system with combustion of methane produced from the wastewater treatment system. The project participant (PP) has taken up an initiative to implement the project voluntarily in order to reduce the GHG emissions at the WTP and contribute to global GHG emission reductions. In the absence of the proposed CPA, the baseline scenario for Navakai WTP is likely to continue to use the anaerobic lagoons/ponds as a preferred solution.

D.6. Estimation of emission reductions
D.6.1. Explanation of methodological choices
>>
The key methodological steps are as follows:

1. Calculating the Baseline Emission (BE_y)
2. Calculating the Project Emission (PE_y)
3. Calculating the Leakage Emission (LE_y)
4. Calculating the Emission Reduction (ER_y)

For the emission reduction calculation within AMS-III.H
1. Calculating the baseline emissions

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

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

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

Where:

BE_y	Baseline emissions in year *y* (tCO_2e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year *y* (tCO_2e)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year *y* (tCO_2e)
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year *y* (tCO_2e)
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y* (tCO_2e). The value of this term is zero for the case 1 (b)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline scenario, this term shall be neglected

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

According to the methodology AMS-III.H., baseline emissions from electricity consumption ($BE_{power,y}$) are determined as per the procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

$$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

Where:

$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y* (m^3).
$COD_{inflow,i,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *i* in year *y* (t/m^3). Average value may be used through sampling with the confidence/precision level 90/10
$\eta_{COD,BL,i}$	COD removal efficiency of the baseline treatment system *i*
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i*
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH_4/kg COD)[2]

[2] Project activities may use the default value of 0.6 kg CH_4/kg BOD, if the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case, baseline and project emissions calculations shall use BOD

UF_{BL}	Model correction factor to account for model uncertainties (0.89)[3]
GWP_{CH4}	Global Warming Potential for methane (value of 21)

(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

There are no baseline emissions from the sludge treatment system because sludge treatment is not a part of the baseline activity

(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

There are no baseline emissions from the degradable organic carbon in treated wastewater discharged into sea/river/lake because it is not a part of the baseline activity.

(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

There are no baseline emissions from the anaerobic decay of final sludge produced because the final sludge produced is sun dried and used for soil application.

2. Calculating the project emissions

Project activity emissions from the systems affected by the project activity are:

(i) CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);

(ii) Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);

(iii) Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);

(iv) Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);

(v) Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);

(vi) Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);

(vii) Methane emissions due to incomplete flaring ($PE_{flaring,y}$);

(viii) Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).[4]

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instead of COD in the equations, and the monitoring of the project activity shall be based in direct measurements of $BOD_{5,20}$, i.e. the estimation of BOD values based on COD measurements is not allowed.

[3] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

[4] For instance in the baseline situation Palm Kernel Shells (PKS) are used as fuel in a boiler. In the project situation PKS is replaced by biogas captured at a wastewater treatment system. The PKS will no longer be used as fuel in

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

Where:

PE_y Project activity emissions in the year y (tCO_2e)

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year y (tCO_2e). These emissions shall be calculated as per paragraph 19, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use

$PE_{ww,treatment,y}$ Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 20, using an uncertainty factor of 1.12 and data applicable to the project situation ($MCF_{ww,treatment,PJ,k}$ and $\eta_{,PJ,k,y}$) and with the following changed definition of parameters:

$MCF_{ww,treatment,PJ,k}$ Methane correction factor for project wastewater treatment system k (MCF values as per Table III.H.1)

$\eta_{,PJ,k,}$ Chemical oxygen demand removal efficiency of the project wastewater treatment system k in year y (t/m^3), measured based on inflow COD and outflow COD in system k

$PE_{s,treatment,y}$ Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equations 3 and 4 in paragraph 22, using an uncertainty factor of 1.12 and data applicable to the project situation ($S_{l,PJ,y}$, $MCF_{s,treatment,l}$) and with the following changed definition of parameters:

$S_{l,PJ,y}$ Amount of dry matter in the sludge treated by the sludge treatment system l in the project scenario in year y (t)

$MCF_{s,treatment,l}$ Methane correction factor for the project sludge treatment system l (MCF values as per Table III.H.1)

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e). These emissions shall be calculated as per equation 6 in paragraph 24, using an uncertainty factor of 1.12 and data applicable to the project conditions ($COD_{ww,discharge,PJ,y}$, $MCF_{ww,PJ,discharge}$) and with the following changed definition of parameters:

$COD_{ww,discharge,PJ,y}$ Chemical oxygen demand of the treated wastewater discharged into the sea, river or lake in the project scenario in year y (t/m^3)

$MCF_{ww,PJ,discharge}$ Methane correction factor based on the discharge pathway of the wastewater in the project scenario (e.g. into sea, river or lake) (MCF values as per Table III.H.1)

the boiler, but sold on the market. Before it is sold it is likely it will be stored for a period of time (few months or longer) on site which might lead to methane emissions from anaerobic decay.

$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). These emissions shall be calculated as per equation 7 in paragraph 25, using an uncertainty factor of 1.12 and data applicable to the project conditions ($MCF_{s,PJ,final}$, $S_{final,PJ,y}$). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in aerobic conditions in the project activity, this term shall be neglected, and the sludge treatment and/or use and/or final disposal shall be monitored during the crediting period with the following revised definition of the parameters: $MCF_{s,PJ,final}$ Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" $S_{final,PJ,y}$ Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year *y* (t)
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year *y*, calculated as per paragraph 30 (tCO_2e)
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y* (tCO_2e). For *ex ante* estimation, baseline emission calculation for wastewater and/or sludge treatment (i.e. equation 2 and/or equation 3) can be used but without the consideration of GWP for CH4. However, the *ex post* emission reduction shall be calculated as per the "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions. If storage of biomass under anaerobic conditions takes place in the project and does not occur in the baseline , methane emissions due to anaerobic decay of this biomass shall be considered and be determined as per the procedure in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e)

(i) *CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);*

According to the methodology AMS-III.H., project emissions from electricity consumption ($BE_{power,y}$) are determined as per the procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

(ii) *Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);*

As per AMS-III.H. paragraph 16, if the treatment systems continue to operate with the same conditions in the baseline scenario, the treatment systems are defined not affected by the project activity. Therefore, there are no methane emissions from the wastewater treatment systems affected by the project activity and not equipped with biogas recovery in the project scenario.

(iii) *Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);*

There is no project emissions from the sludge treatment system affected by the project activity because the sludge system is excluded from the project boundary.

(iv) *Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);*

There are no project emissions from the degradable organic carbon in treated wastewater discharged because it is not a part of the project activity.

(v) *Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);*

There are no project emissions from the anaerobic decay of final sludge produced because the final sludge produced is sun dried and used for soil application.

(vi) *Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);*

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$

Where:

$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year *y* (tCO_2e)
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year *y* (tCO_2e)

$$PE_{fugitive,ww,y} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$$

Where:

CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a default value of 0.9 shall be used)
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year *y* (t)

$$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum_k COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}$$

Where:

$COD_{removed,PJ,k,y}$	The chemical oxygen demand removed[5] by the treatment system *k* of the project activity equipped with biogas recovery in the year *y* (t/m^3)
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the project wastewater treatment system *k* equipped with biogas recovery equipment (*MCF* values as per Table III.H.1)
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)

The project activity emissions from methane release in capture systems are determined as follows:

(a) Based on the methane emission potential of wastewater and/or sludge.

(b) Optionally a default value of 0.05 m^3 biogas leaked/m^3 biogas produced may be used as an alternative to calculations.

There are no fugitive emissions through capture inefficiency in anaerobic sludge treatment system because sludge treatment is not a part of the project activity. The project activity emissions from methane release in capture systems are determined as option (a).

[5] Difference between the inflow COD and the outflow COD.

(vii) *Methane emissions due to incomplete flaring (* $PE_{flaring,y}$ *);*

Not applicable. There are no flaring units in the CPA.

(viii) *Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation (*$PE_{biomass,y}$*).*

There is no methane emissions from biomass stored under anaerobic conditions because there is no biomass displaced or stored in the project activity

3. Leakage

In line with the methodology AMS-III.H., if the technology is using equipment transferred from another activity, leakage effects at the site of the other activity are to be considered and estimated (LE_y)

There are no equipment transferred from another activity, therefore, the leakage emissions are not to be considered.

4. Emission Reduction

Emission reductions are estimated ex ante as following:

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

Where:

$ER_{y,ex\,ante}$	*Ex ante* emission reduction in year *y* (tCO_2e)
$LE_{y,ex\,ante}$	*Ex ante* leakage emissions in year *y* (tCO_2e)
$PE_{y,ex\,ante}$	*Ex ante* project emissions in year *y* (tCO_2e)
$BE_{y,ex\,ante}$	*Ex ante* baseline emissions in year *y* (tCO_2e)

For the emission reduction calculation within AMS-I.D.

1. Calculating the Baseline emissions

The baseline emissions (BE_y) is the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) calculated, times the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh), as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

1.1 Calculation of the baseline emissions factor

Following AMS-I.D., the baseline emission factor is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors according to the following six steps defined in the “Tool to calculate the emission factor for an electricity system” (version 02.2.1)..

Step 1. Identify the relevant electricity system

As per section D.4., the identified baseline scenario is the continued generation of power by the FEA grid on Viti Levu, and the baseline emissions are those produced as a result of this. Thus, the FEA grid on Viti Levu is identified as the relevant electric power system.

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

The proposed CPA does not include off-grid power plants in the project electricity system; only grid power plants are included in the calculation apply to "Tool to calculate the emission factor for an electricity system".

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

The operating margin emission factor is calculated based on one of the following four methods:

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

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

The Simple OM method can only be used where low cost/must run power plants[6] constitute less than 50% of total grid generation. According to the historical generating capacity data of FEA in the last 5 years, power generation from low cost/must run power plants accounted for a 50%[7] or more of the total generation capacity (see Table B. 6).

Table B. 1. Contribution of low cost/must run source to overall power generation in Fiji

Year	2007	2008	2009	2010	2011	Average
Percentage share of low cost/must run power station	70.8%	69.9%	64.2%	54.6%	62.5%	64.4%

On the basis of the information provided in Table B. 6, option a) Simple OM is not applicable for calculating the project's operating margin emission factor. Therefore, the project will use option d) Average OM to calculate the OM emission factor.

According to the "Tool to calculate the emission factor for an electricity system", the average OM can be calculated using either of the two following data vintages:

(1) Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period, or;

(2) Ex-post option: year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor in year *y* are usually only available later than six months after the end of year *y*, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Based on the most recent statistics available at the time of CAP-DD completed, the first data vintage (option 1 – Ex-ante) for the calculation of OM emission factor is chosen for this project. The years used are therefore 2009 to 2011 (3 year period).

[6] As defined in the "*Tool to calculate the emission factor for an electricity system*" (Version 2.2.1), Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

[7] Fiji Electricity Authority electricity generation data by source

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

The average OM emission factor is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance as described for the simple OM, but including in all equations also low-cost/must-run power plants.

Thus the Average OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit of net electricity generation (tCO_2/MWh) of all generating power plants serving the system, including low-cost/must-run power plants/units. It may be calculated by using either:

- Option A: Based on net electricity generation and a CO_2 emission factor of each power unit[8]; or
- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (Option B only to be used if data for Option A is not available).

In Fiji, the Fiji Electricity Authority has provided the data for the calculation using Option A, thus this is the Option used in this CAP-DD.

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

$$EF_{grid,OM-ave,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid, OM-ave, y}$	=	Average operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FE_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
$EF_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m	=	All power units serving the grid in year y, including low-cost/ must-run power units;
y	=	The relevant year as per the vintage chosen in Step 3.

The calculation of the CO_2 emission factor of each power unit *m* in year *y* can be calculated using Option A1, A2 or A3. These options should be used according to the following:

- Option A1 – if for a power unit m data on fuel consumption and electricity generation is available;
- Option A2 – If for a power unit m only data on electricity generation and the fuel types used is available; and
- Option A3 – if for a power unit m only data on electricity generation is available.

In this PDD both option A1 and A3 were used. In these two cases $FE_{EL,m,y}$ was calculates as follows:

<u>Option A1:</u>

[8] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group of low-cost/must-run units.

$$EF_{EL,m,y} = \frac{\sum_i EG_{m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
$FC_{i,m,y}$	=	Amount of fossil fuel type *i* consumed by power unit m in year *y* (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO_2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ);
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
i	=	All fossil fuel types combusted in power unit *m* in year *y*;
y	=	The relevant year as per the vintage chosen in Step 3.

Option A3: in case only generation data is available for a power unit *m*, $FE_{EL,m,y}$ = 0 tCO_2/MWh can be assumed as a simple and conservative approach.

$EF_{grid,\ OM\text{-}ave,\ y}$ = **0.2706 tCO_2/MWh**

Appendix 4 presents the detailed datasheets and calculations.

Step 5. Calculate the build margin emission factor

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

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 CPA-DD 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.

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 this CPA-DD, Option1 is chosen to calculate the build margin emission factor.

The build margin 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 power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh);
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* in (MWh);
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* should be determined as per the guidance in step 4 (a) for the average OM, using Options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using *m* for the power *units* included in the build margin.

In this PDD, the A1 Option of the average OM method was chosen for this calculation.

$EF_{grid,BM,y}$= **0.6384 tCO_2/MWh**

Step 6. Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM\text{-}ave,y} + w_{BM} \times EF_{grid,BM,y}$$

Where:

w_{OM}	=	Weighting of operating margin emission factor (%)
w_{BM}	=	Weighting of build margin emission factor (%)

The default values used for ω_{OM} and ω_{BM} for this PDD are 0.5 and 0.5.
Based on $EF_{grid,OM\text{-}ave,y}$ and $EF_{grid,BM,y}$ calculated in the previous steps, the combined margin emission factor is:
$EF_{grid,CM,y}$= 0.5×0.2706 + 0.5×0.6384 = **0.4545 tCO_2/MWh**

Table B. 2. Summary of the OM, BM and CM

Parameter	Value
Operating margin emission factor ($EF_{grid,OM\text{-}ave,y}$, in tCO_2/MWh)	0.2706
Build margin emission factor ($EF_{grid,BM,y}$, in tCO_2/MWh)	0.6384
Baseline emission factor ($EF_{grid,CM,y}$, in tCO_2/MWh)	0.4545

Appendix 3 presents the detailed datasheets and calculations.

The OM and BM emission factors fixed for the duration of the first crediting period yield a baseline emissions factor fixed for the first crediting period. These parameters will be re-calculated at any renewal of the crediting period using the above steps and the latest data available then.

Baseline emissions (BE_y) now can be calculated as the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) multiplied by the annual net generation of the proposed project ($EG_{PJ,y}$).

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$

Where:

BE_y = Baseline emissions in year y (tCO2 /yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for the project electricity system in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

Calculation of $EG_{PJ,y}$

The proposed project is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$EG_{PJ,y} = EG_{facility,y}$

where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

2. Calculating the Project Emission (*PE_y*)

As per the guidance in the methodology AMS-I.D., for most renewable energy project activities, $PE_y = 0$. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

· *Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);*

Not applicable for the proposed CPA. As it is a wastewater treatment plant but geothermal power plant.

· *Emissions from water reservoirs of hydro power plants.*

Not applicable for the proposed CPA. As it is not a hydro power plant.

Therefore, the project emission from AMS-I.D. is zero.

$\boldsymbol{PE_y = 0}$

3. Calculating the Leakage Emission (*LEy*)

According to the AMS-I.D.Version 17, leakage emission is not to be considered. There is not any energy generating equipment which is transferred from another activity.

Therefore: $\mathbf{LE_y=0}$

4. Calculating the Emission Reduction (*ERy*)

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where:

ER_y = Emission reductions in year y (tCO_2e/yr)

BE_y = Baseline emissions in year y (tCO_2e/yr)

PE_y = Project emissions in year y (tCO_2e/yr)

D.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$FC_{i,m,y}$
Unit	tonnes or m^3
Description	Amount of fossil fuel type *i* consumed by power plant / unit *m* in year *y*
Source of data	Fiji Electricity Authority
Value(s) applied	See Appendix 4 for details
Choice of data or Measurement methods and procedures	Data are used from the Fiji Electricity Authority (FEA), the only source for this information.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ / mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Appendix4 for details
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
Unit	tCO_2e/GJ
Description	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Appendix 4 for details
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	***$MCF_{ww,treatment,BL,i}$***
Unit	-
Description	The methane correction factor for baseline wastewater treatment system
Source of data	AMS-III.H. version 16: Table III.H.1.
Value(s) applied	0.8
Choice of data or Measurement methods and procedures	Table III.H.1, for baseline emission. The lagoon depths are more than 2m. MCF value of 0.8 for anaerobic deep lagoon (depth > 2 m)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	***$B_{o,ww}$***
Unit	kg CH_4 / kg COD
Description	Methane producing capacity of the wastewater
Source of data	AMS-III.H. version 16 Paragraph 20
Value(s) applied	0.25
Choice of data or Measurement methods and procedures	Corrected IPCC (2006) default value.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	***UF_{BL}***
Unit	
Description	Model correction factor to account model uncertainties
Source of data	AMS-III.H. version 16 Paragraph 20
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	This is default value applied to estimate the methane emission from the baseline wastewater treatment system affected by the project.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global warming potential (GWP) of methane
Source of data	AMS-III.H. version 16
Value(s) applied	21
Choice of data or Measurement methods and procedures	As per meth AMS-III.H. version 16
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	CFE_{ww}
Unit	Fraction
Description	Capture efficiency of the biogas recovery equipment in the wastewater treatment system
Source of data	AMS-III.H. version 16 Paragraph 20
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	Corrected IPCC (2006) default value.
Purpose of data	Calculation of baseline emissions
Additional comment	-

D.6.3. Ex-ante calculation of emission reductions

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As described in section D.6.1., the ex-ante calculation of emission reductions as following:

For the Baseline Emission from AMS-III.H.

$EF_{grid,OM,y}$ =0.2706 tCO_2/ MWh
$EF_{grid,BM,y}$ =0.6384 tCO_2/ MWh
$EF_{grid,CM,y}$=0.2706 *0.5 + 0.6384 * 0.5 =0.4545 tCO_2/MWh
Baseline electricity consumption is estimated as: 5394.58 MWh
$BE_{power,y}$ = 5394.58 * 0.4545 = 2,452 tCO_2e

$$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} * COD_{\inf low,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

= 123,750 * 0.062140 * 0.8 * 0.89 * 21 = 28,745 tCO_2e

$$BE_y = BE_{power,y} + BE_{ww,treatment,y}$$

BE_y = 2,452 + 28,745 = 31,196 tCO_2e
Annual Baseline Emssions: 31,196 tCO_2e

For the Project Emissions from AMS-III.H.

$$MEP_{ww,treatment,y} = Q_{ww,y} * B_{o,ww} * UF_{PJ} * \sum_{k} COD_{removed,PJ,k,y} * MCF_{ww,treatment,PJ,k}$$

$MEP_{ww,treatment,y}$ = 123,750 *0.25*1.12*0.062140*0.8 = 1,723 t

$$PE_{fugitive,ww,y} = (1 - CFE_{ww}) * MEP_{ww,treatment,y} * GWP_{CH4}$$

$PE_{fugitive,ww,y}$ = (1-0.9)*1,723*21 = 3,617 tCO_2e

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$

$PE_{fugitive,y}$ = 3,617 + 0 = 3,617 tCO_2e

Project electricity consumption: 4,880.2 MWh/year

$PE_{power,y}$ = 4880.2* 0.4545*(1 + 3%) = 2,284 tCO_2e

Average Technical Transmission & Distribution Loss is 3% as per as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 1, Section III, Page 12.

$$PE_y = PE_{power,y} + PE_{fugitive,y}$$

PE_y = 2,284 + 3,617 = 5,901 tCO_2e

For the Leakage Emissions from AMS-III.H

There are no equipment transferred from another activity, therefore, the leakage emissions are not to be considered. Hence, $\mathbf{LE_y}$ = 0 tCO_2e

<u>The Emission Reductions from AMS-III.H</u>

$ER_y = BE_y – (PE_y + LE_y)$ = 31,196 – (5,901+0) = 25,295 tCO_2e

<u>For the Baseline Emissions from AMS-I.D</u>

Baseline electricity consumption is estimated as: 27,750 MWh

BE_y = 27,750× 0.4545 =12,612 tCO_2e

Baseline Emissions from AMS-I.D is 12,612 tCO_2e

<u>For the Project Emissions from AMS-I.D.</u>

Project emissions: 0 tCO_2e

<u>For the Leakage Emissions from AMS-I.D.</u>

Leakage emissions: 0 tCO_2e

<u>The Emission Reductions from AMS-I.D.</u>

$ER_y = BE_y – PE_y - LE_y$ = 12,612 – 0 - 0) = 12,612 tCO_2e

<u>For the CPA</u>

<u>Baseline Emissions from AMS-III.H. and AMS-I.D..:</u> 12,612 + 31,196 = 43,808 tCO_2e

<u>Project Emissions from AMS-III.H. and AMS-I.D.:</u> 5,901 + 0 = 5,901 tCO_2e

<u>Leakage Emissions from AMS-III.H. and AMS-I.D.:</u> 0 tCO_2e

<u>Emission Reductions for the CPA:</u> 37,907 tCO_2e

D.6.4. Summary of the ex-ante estimates of emission reduction

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/01/2014-31/12/2014	43,808	5,901	0	37,907
01/01/2015-31/12/2015	43,808	5,901	0	37,907
01/01/2016-31/12/2016	43,808	5,901	0	37,907
01/01/2017-31/12/2017	43,808	5,901	0	37,907
01/01/2018-31/12/2018	43,808	5,901	0	37,907
01/01/2019-31/12/2019	43,808	5,901	0	37,907
01/01/2020-31/12/2020	43,808	5,901	0	37,907
Total	306,656	41,307	0	265,349
Total number of crediting years	7			
Annual average over the crediting period	43,808	5,901	0	37,907

D.7. Application of the monitoring methodology and description of the monitoring plan

D.7.1. Data and parameters to be monitored

Data / Parameter	***Q ww,i,y***
Unit	m^3
Description	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y*.
Source of data	Measured
Value(s) applied	123,750
Measurement methods and procedures	The effluent inflow will be monitored continuously using a flow meter.
Monitoring frequency	The data are monitored continuously (at least hourly measurements are undertaken).
QA/QC procedures	The data will be measured directly. Data are recorded and stored electronically in a data log file. The flow meter undergoes maintenance/calibration as per manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Confidence and precision levels of 90/10 shall be attained if the measurements are less than hourly.

Data / Parameter	$COD_{ww,untreated,y}$
Unit	mg/L
Description	Chemical oxygen demand of raw wastewater entering the anaerobic treatment system with methane capture in the year *y*.
Source of data	Measured
Value(s) applied	62,580
Measurement methods and procedures	The COD sampling and measurements will be onsite or by a third party laboratory. COD measurements must be in accordance with national or international standards. The COD is measured through representative sampling.
Monitoring frequency	Monthly measurements or shorter interval.
QA/QC procedures	COD reports are recorded manually and stored in a data log file. COD measurement cross checks are done at least once a year in an external laboratory to confirm onsite measurements. The COD measurement equipment undergoes maintenance/calibration per manufacturer's specifications. A trained and qualified person will be in charge of the COD measurements.
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	$COD_{ww,treated,y}$
Unit	mg/L
Description	Chemical oxygen demand of wastewater leaving the anaerobic treatment system with methane capture in the year *y*.
Source of data	Measured
Value(s) applied	2,754
Measurement methods and procedures	The COD sampling and measurements will be onsite or by a third party laboratory. COD measurements must be in accordance with national or international standards. The COD is measured through representative sampling.
Monitoring frequency	Monthly measurements or shorter interval.
QA/QC procedures	COD reports are recorded manually and stored in a data log file. COD measurement cross checks are done at least once a year in an external laboratory to confirm onsite measurements. The COD measurement equipment undergoes maintenance/calibration per manufacturer's specifications. A trained and qualified person will be in charge of the COD measurements.
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	$COD_{ww,discharged,PJ,y}$
Unit	mg/L
Description	Chemical oxygen demand of the treated wastewater discharged to the final effluent lagoon in the project scenario in year *y*. It is measured in the last anaerobic pond or after the aerobic pond (in case existence).
Source of data	Measured
Value(s) applied	
Measurement methods and procedures	The COD sampling and measurements will be onsite or by a third party laboratory. COD measurements must be in accordance with national or international standards. The COD is measured through representative sampling.
Monitoring frequency	Monthly measurements or shorter interval.
QA/QC procedures	COD reports are recorded manually and stored in a data log file. COD measurement cross checks are done at least once a year in an external laboratory to confirm onsite measurements. The COD measurement equipment undergoes maintenance/calibration per manufacturer's specifications. A trained and qualified person will be in charge of the COD measurements.
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Biogas volume in year y
Source of data	Measured
Value(s) applied	Ex-post monitoring. Not used in ex-ante estimated.
Measurement methods and procedures	The mass flow rate will be measured with a mass flow meter with internal pressure & temperature measurements.
Monitoring frequency	The data are monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained).
QA/QC procedures	The data will be measured directly from the mass flow meter. Data are recorded and stored electronically in a data log file. The flow meter undergoes maintenance/calibration per manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Additional comment	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network) shall be monitored ex-post, using continuous flow meters. If the biogas streams used as fuel and flared are monitored separately, the two fractions can be added together, without the need to monitor the recovered biogas before the separation. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place.

Data / Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in year y
Source of data	Measured
Value(s) applied	Ex-post monitoring. Not used in ex-ante estimated.
Measurement methods and procedures	The methane content in biogas will be directly measured with a gas analyzer with internal pressure & temperature measurements.
Monitoring frequency	The data are monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained).
QA/QC procedures	The data will be measured directly from the gas analyzer. Data are recorded and stored electronically in a data log file. The gas analyzer undergoes maintenance/calibration per manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Additional comment	Confidence and precision levels of 90/10 shall be attained if the measurements are less than hourly.

Data / Parameter	***T***
Unit	°C
Description	Temperature of biogas
Source of data	Measured
Value(s) applied	Ex-post monitoring. Not used in ex-ante estimated.
Measurement methods and procedures	The temperature will be measured with a mass flow meter at the same time.
Monitoring frequency	The data are monitored continuously.
QA/QC procedures	The data will be measured directly from with mass flow meter at the same time. Data are recorded and stored electronically in a data log file. The flow meter undergoes maintenance/calibration per manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	***P***
Unit	Pa
Description	Pressure of the biogas
Source of data	Measured
Value(s) applied	Ex-post monitoring. Not used in ex-ante estimated.
Measurement methods and procedures	The pressure of the biogas will be measured with a mass flow meter at the same time.
Monitoring frequency	The data are monitored continuously.
QA/QC procedures	The data will be measured directly with the mass flow meter at the same time. Data are recorded and stored electronically in a data log file. The flow meter undergoes maintenance/calibration per manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity supplied to the Grid by the project activity in year *y*.
Source of data	On-site measurement by project participant
Value(s) applied	27,750
Measurement methods and procedures	Quantity of net electricity generation supplied by the proposed project activity will be monitored continuously by two multifunction meters (a main meter and a back-up meter) at the substation. It is calculated by quantity of generated electricity supplied to grid minus quantity of electricity imported from grid). $EG_{facility,y} = EG_{export,y} - EG_{import,y}$
Monitoring frequency	Monthly recorded
QA/QC procedures	· Continuous measurement and monthly recording will take place · The second meter (backup metering system) will be installed which can be used in the event of failure of the first (main metering system). · The data from electricity sales receipts will be cross checked against meter readings taken at the project site. · All data collected as part of monitoring should be archived electronically and be kept for at least 2 years after the end of the last crediting period. · Monthly net generation data will be approved and signed off by the Project Director prior to being accepted and stored. · Testing as per manufacturer's recommendation (every year or at least once every three years)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{export,y}$
Unit	MWh
Description	Quantity of generated electricity supplied to the Grid by the project activity in year y.
Source of data	On-site measurement by project participant
Value(s) applied	27,750
Measurement methods and procedures	Quantity of net electricity generation supplied by the proposed project activity will be monitored continuously by two multifunction meters (a main meter and a back-up meter) at the substation. The quantity of electricity supplied by the project plant/unit to the grid; and The quantity of electricity delivered to the project plant/unit from the grid Multifunction meters will be suitable for accurately measuring 3-phase, 50-Hz quantities. The maximum allowable error shall not exceed ±0.25% of full scale at 25°C. The meter modules will have electrical isolation between input, output, power supply, and the case ground connection. The meter module will have a minimum dielectric test voltage rating of 1500-V AC rms for 1 minute. This equipment will be calibrated according to relevant National Standards.
Monitoring frequency	Monthly recorded
QA/QC procedures	· Continuous measurement and monthly recording will take place · The second meter (backup metering system) will be installed which can be used in the event of failure of the first (main metering system). · The data from electricity sales receipts will be cross checked against meter readings taken at the project site. · All data collected as part of monitoring should be archived electronically and be kept for at least 2 years after the end of the last crediting period. · Monthly net generation data will be approved and signed off by the Project Director prior to being accepted and stored. · Testing as per manufacturer's recommendation (every year or at least once every three years)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{import,y}$
Unit	MWh
Description	Quantity of electricity imported to the Grid by the project activity in year y.
Source of data	On-site measurement by project participant
Value(s) applied	0
Measurement methods and procedures	Quantity of net electricity generation supplied by the proposed project activity will be monitored continuously by two multifunction meters (a main meter and a back-up meter) at the substation. The quantity of electricity supplied by the project plant/unit to the grid; and The quantity of electricity delivered to the project plant/unit from the grid Multifunction meters will be suitable for accurately measuring 3-phase, 50-Hz quantities. The maximum allowable error shall not exceed ±0.25% of full scale at 25°C. The meter modules will have electrical isolation between input, output, power supply, and the case ground connection. The meter module will have a minimum dielectric test voltage rating of 1500-V AC rms for 1 minute. This equipment will be calibrated according to relevant National Standards.
Monitoring frequency	Monthly recorded
QA/QC procedures	· Continuous measurement and monthly recording will take place · The second meter (backup metering system) will be installed which can be used in the event of failure of the first (main metering system). · The data from electricity sales receipts will be cross checked against meter readings taken at the project site. · All data collected as part of monitoring should be archived electronically and be kept for at least 2 years after the end of the last crediting period. · Monthly net generation data will be approved and signed off by the Project Director prior to being accepted and stored. · Testing as per manufacturer's recommendation (every year or at least once every three years)
Purpose of data	Calculation of baseline emissions
Additional comment	-

D.7.2. Description of the monitoring plan

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1. Monitoring Object

The monitoring is to justify the realistic amount of emission reduction from the CDM project. The monitoring plan will provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

2. Management Structure

WAF, the owner of the proposed CPA under the PoA, will use this document as guideline in monitoring of the project emission reduction performance and will adhere to the guidelines set out in this monitoring plan to ensure that the monitoring is credible, transparent and conservative.

The responsibilities of the project staff are as follow:

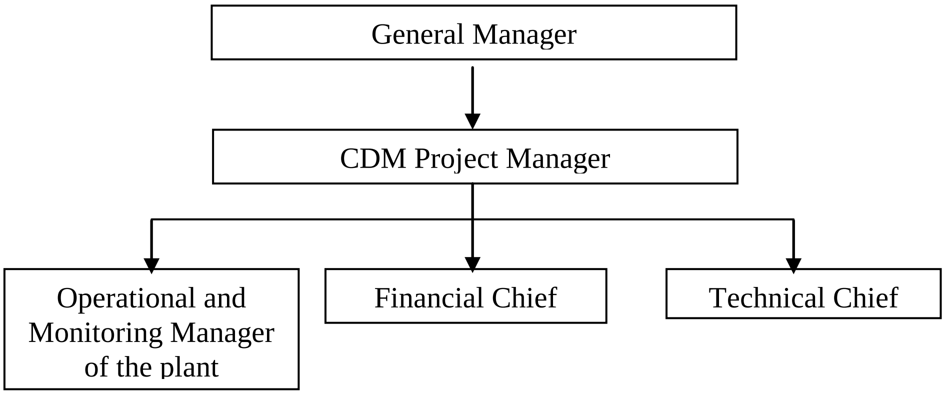
General Manager: To be responsible for supervising the whole monitoring procedure.

CDM Project Manager: To be responsible for data management of this CPA and compiling monitoring report.

Operational and monitoring manager: To be responsible for collecting data and do internal audit.

Financial chief: To be responsible for collection of sales receipts.

Technical chief: To be responsible for preparing operational reports of the project activity, recording the daily operation of the plant, including operating periods, equipment defects, etc.



3. Monitoring Equipment

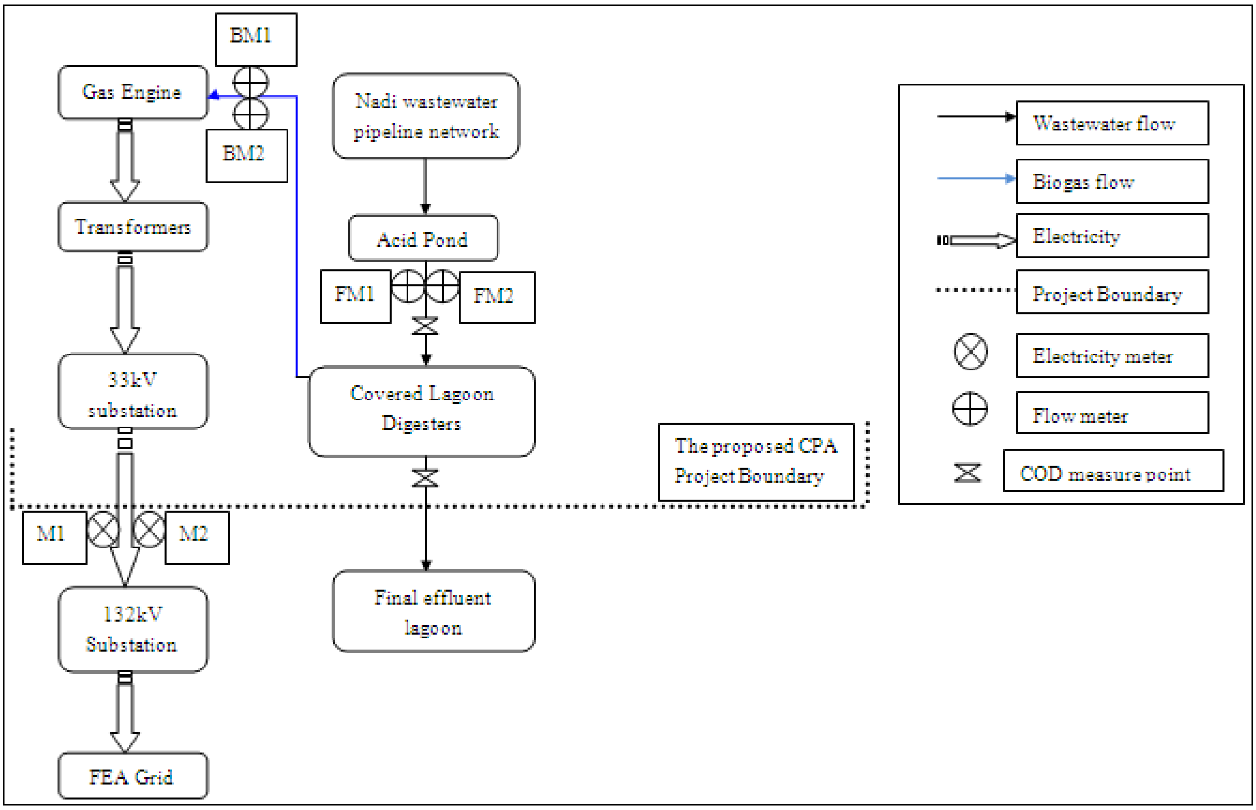
The inflow of wastewater will be measured by two flow meters which are installed at the influent pipeline to the covered lagoon digesters. At the inflow and outflow of the lagoon digesters system, there are two COD measurement point. At the final effluent lagoon, the COD will be measured as the treated wastewater discharged into final effluent lagoon. The COD of raw wastewater, treated wastewater and discharged wastewater will be continually measured. Biogas flow meters will be installed at the inflow of gas engine pipeline and the actual biogas produced in digester lagoon will be measured. Meanwhile, the methane content, temperature and pressure of the recovered biogas will be monitored near the flow meter.

Methane content will be directly measured by a gas analyzer, temperature and pressure will be recorded at the same time.

Electricity generated by the proposed CPA will be delivered to the Nadi power station and sent at 33kV to the Nadi switching station where it will be stepped up to 132kV, and then transmitted to the FEA Grid finally.

Electricity supplied by the proposed CPA will be monitored through the multifunction electricity meter(s) (the main meter M1 and the backup meter M2). Both the electricity exported to the grid by the CPA and the electricity imported from the grid to the CPA will be monitored by the meter(s). The maximum allowable error of the meters will not exceed ±0.25% of full scale at 25°C. The meter modules will have electrical isolation between input, output, power supply, and the case ground connection. The modules will have a minimum dielectric test voltage rating of 1500-V AC rms for 1 minute.

A diagram shows how parameters are monitored is presented as follows:



4. Monitoring procedure

The data of wastewater flow meter and biogas flow meter will be monitored based on the flow meters. At two COD measurement point and COD measurement of final effluent lagoon, the COD of raw wastewater, treated wastewater and discharged wastewater will be sampled and measured in laboratory on the CPA site.

The electricity exported to the grid and the electricity imported from the grid will be monitored based on the meter. The net electricity generation supplied to the grid ($EG_{facility,\ y}$) is calculated through electricity supplied to the grid ($EG_{export,y}$) minus electricity imported from the grid ($EG_{import,y}$). The electricity exchanged between the proposed project and FEA Grid is both checked by the project owner and the grid company.

Monthly net on-grid supplied electricity for the purpose of emission reduction calculations will be cross-checked against sales receipts issued by Fiji Electricity Network Authority, approved and signed off by the Project Manager prior to being accepted and stored.

5. Quality Assurance and Quality Control

The workers will be trained to be competent and the metering equipment are calibrated and sealed as per the manufacturer's recommendation at regular intervals, with the purpose to provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

Monthly net on-grid electricity supplied data will be approved and signed off by the Project Manager before it is accepted and stored. This audit will check compliance with monitoring procedures in this monitoring plan. This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. The purpose of training is to assure those staffs are competent to conduct the monitoring plan, thus to make the monitored data accurate.

Emergency Procedure:

(1) When the main meter (M1) is in normal operation state, the reading of it will be measured continuous and recorded monthly. The net electricity supplied to the grid will be calculated based on the readings of the main meter.

(2) If the readings of the main meter in a certain month is so inaccurate as to be out of the error range or the meter does not work normally, the net electricity supplied to the grid will be calculated based on the readings of the backup meter (M2).

(3) If the readings of the main meter and the backup meter are both beyond allowable error, the emission reduction occurred in the period will be abandoned.

In terms of flow meters:

(1) When the main wastewater flow meter (FM1) is in normal operation state, the reading of it will be measured continuous. The flow of wastewater will be based on the readings of the main meter.

(2) If the readings of the main flow meter in a certain month is so inaccurate as to be out of the error range or the meter does not work normally, the flow of wastewater will be based on the readings of the backup flow meter (FM2).

(3) If the readings of the main flow meter and the backup flow meter are both beyond allowable error, the emission reduction occurred in the period will be abandoned.

In terms of biogas volume meters:

(1) When the main biogas flow meter (BM1) is in normal operation state, the reading of it will be measured continuous. The flow of biogas will be based on the readings of the main biogas flow meter.

(2) If the readings of the main flow meter in a certain month is so inaccurate as to be out of the error range or the meter does not work normally, the flow of biogas will be based on the readings of the backup biogas flow meter (BM2).

(3) If the readings of the main flow meter and the backup flow meter are both beyond allowable error, the emission reduction occurred in the period will be abandoned.

6. Calibration of Meters & Metering

The metering equipment are calibrated and checked for accuracy so that the metering equipment shall have sufficient accuracy within the agreed limits. The metering equipments are calibrated and checked annually according to the manufacturer's recommendation for accuracy. The records will be supplied to the plant operator, and maintained by the operator.

If any error is detected, the Party owning the meter shall repair, recalibrate, or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

7. Data Management System

To keep safely the record of the data collected during monitoring, this project will set up a complete data management system. The project owner will perfect the whole monitoring procedure by developing the CDM manual, tracking information from the primary source to the end-data calculations. It is the responsibility of the proposed project owner to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan.

Furthermore, the project owner collects the records of electricity sold and purchased as a cross-check, and compiled the monitoring report including the monitoring data and relevant evidence at the end of each crediting year.

All the data will be kept for two years following the end of the last crediting period.

8. Monitoring Report
After the CDM project manager collects and sorts the monitored data, the monitoring report is prepared by the project owner. The project owner has to make sure that the format and content of the monitoring report are consistent with the monitoring methodology in the registered CPA-DD.

SECTION E. Approval and authorization
>>
The letter (s) of approval from Party (ies) for the project activity is not available at the time of submitting the CPA-DD to the validating DOE.

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Appendix 1: Contact information on entity/individual responsible for the CPA

Organization	Water Authority of Fiji
Street/P.O. Box	
Building	Mahoan Complex, Center point.
City	Suva, Republic of Fiji
State/Region	
Postcode	
Country	Republic of Fiji
Telephone	+679 3346777
Fax	+ 679 3343262
E-mail	
Website	
Contact person	Mr Opetai Ravai
Title	Chief Executive Officer
Salutation	
Last name	Ravai
Middle name	-
First name	Opetai
Department	Water Authority
Mobile	
Direct fax	+679 3343262
Direct tel.	
Personal e-mail	-

Appendix 2: Affirmation regarding public funding

There is no public funding for the Navakai Wastewater Treatment Plant.

Appendix 3: Applicability of the selected methodology(ies)

Please refer to section D.2 in the CPA DD.

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

All the tables related to the calculation of baseline emission reduction are presented below:

Calculation of Operating Margin (OM)

Table A1 Thermal Power Plants: data supplied by FEA (2009-2011)

Plant	Technology	Installed Capacity (MW)	Electricity Generated (MWh)			Fuel Type	Fuel Consumption (l)			Year Plant Online
			2009	2010	2011		2009	2010	2011	
Kinoya 1	Internal Combustion	28	85929	130737	124141	Diesel	21243564	33078313	31409639	2001
Kinoya 2	Internal Combustion	20	113918	126237	83540	HFO	24103656	33460241	22143373	2007
Vuda	Internal Combustion	22.4	53818	79723	67311	Diesel	13379843	20171084	17030120	76 to 2001
Nadi	Internal Combustion	2	106	4902	3587	Diesel	85684	1239759	885542	68 to 2009
Sigatoka	Internal Combustion	4	8016	14167	9500	Diesel	2145350	3584337	2403614	2003
Deuba	Internal Combustion	4.2	2195	3256	3277	Diesel	603274	824096	828916	2007
Rakiraki	Internal Combustion	2	2239	3559	3774	Diesel	660500	900000	955422	2008
Korovou	Internal Combustion	0.87	33	14	26	Diesel	10711	3614	7229	2007
Rokobili	Internal Combustion	8	0	0	0	Diesel	0	0	0	2003
Monasavu	Internal Combustion	0	0	0	0	Diesel	0	0	0	2003
Vatuwaqa	Internal Combustion	0	0	0	0	Diesel	0	0	0	2003

Plant	Technology	Installed Capacity (MW)	Electricity Generated (MWh)			Fuel Type	Fuel Consumption (l)			Year Plant Online
			2009	2010	2011		2009	2010	2011	
Total		**91.47**	**266254**	**362595**	**295156**		**62232582**	**93261444**	**75663855**	

Table A2 Renewable Power Plants: data supplied by FEA (2009-2011)

Plant	Technology	Installed Capacity (MW)	Electricity Generated (MWh)			Fuel Type	Fuel Consumption (tons)			Year Plant Online
			2009	2010	2011		2009	2010	2011	
Wailoa	Hydro	80	436081	382963	424818	Water	0	0	0	1983
Wainikasou & Nagado	Hydro	9.2	24048	29758	29683	Water	0	0	0	2004 & 2006
Buttoni	Wind	10	7210	6420	5491	Wind	0	0	0	2007
FSC Lautoka	Biomass	6	7068	10806	13545	Sugarcane fibre	87011	0	0	2007
Tropik Drasa	Biomass	9	3665	5401	17587	Wood Chip	No data available			2003
Total		**114.2**	**478072**	**435348**	**491124**					

Table A3 Total Installed capacity and energy generation: data supplied by FEA (2009-2011)

	Installed Capacity (MW)	Electricity generated (MWh)		
		2009	2010	2011
Thermal Power Plants	91.47	266254	362595	295156
RE Power Plants	114.2	478072	435348	491124
Total	**205.67**	**744326**	**797943**	**786280**

Calculation of the Operation Margin Emission Factor for the Fiji Electricity Authority grid: EF_{OM}

Table A4 Average OM Emission of FEA Grid in 2009

Power Plants (m)	Fuel Consumption (l)	NCV (TJ/Gg)[1]	CO_2 emission factor of the fossil fuel type ($kgCO_2/TJ$)[2]	Density (kg/l)	Fuel used (kg)	Carbon emission (tCO_2)
	A	B	C	D	E=A*D	$F=(B*C*E)*10^{-9}$
Kinoya 1	21243564	41.4	72600	0.83	17,632,158	52995.92
Kinoya	24103656	41.4	72600	0.83	20,006,034	60130.94
Vuda	13379843	41.4	72600	0.83	11,105,270	33378.44
Nadi	85684	41.4	72600	0.83	71,118	213.75
Sigatoka	2145350	41.4	72600	0.83	1,780,641	5351.96
Deuba	603274	41.4	72600	0.83	500,717	1504.98
Rakiraki	660500	41.4	72600	0.83	548,215	1647.74
Korovou	10711	41.4	72600	0.83	8,890	26.72
Rokobili	0	41.4	72600	0.83	0	0.00
Monasavu	0	41.4	72600	0.83	0	0.00
Vatuwaqa	0	41.4	72600	0.83	0	0.00
Wailoa	0	0	0		0	0.00
Wainikasou & Nagado	0	0	0		0	0.00
Buttoni	0	0	0		0	0.00
FSC Lautoka (kg)	87011	5.9[3]	84700	1000	87,011,000	43482.01
Total						**198732.46**

Source:

[1] *IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories*

[2] *IPCC default values at the lower limit of 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*

[3] *IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for “other solid biomass”*

Table A5 Average OM Emission of FEA Grid in 2010

Power Plants (m)	Fuel Consumption (l)	NCV (TJ/Gg)[1]	CO_2 emission factor of the fossil fuel type ($kgCO_2/TJ$) [2]	Density (kg/l)	Fuel used (kg)	Carbon emission (tCO_2)
	A	B	C	D	E=A*D	$F=(B*C*E)*10^{-9}$
Kinoya	33078313	41.4	72600	0.83	27,455,000	82519.85
Kinoya	33460241	41.4	72600	0.83	27,772,000	83472.63
Vuda	20171084	41.4	72600	0.83	16,742,000	50320.42
Nadi	1239759	41.4	72600	0.83	1,029,000	3092.80
Sigatoka	3584337	41.4	72600	0.83	2,975,000	8941.78
Deuba	824096	41.4	72600	0.83	684,000	2055.86
Rakiraki	900000	41.4	72600	0.83	747,000	2245.21
Korovou	3614	41.4	72600	0.83	3,000	9.02
Rokobili	0	41.4	72600	0.83	0	0.00
Monasavu	0	41.4	72600	0.83	0	0.00
Vatuwaqa	0	41.4	72600	0.83	0	0.00
Hydro – Wailoa	0	0	72600		0	0.00
Hydro - Wainikasou & Nagado)	0	0	72600		0	0.00
Buttoni	0	0	72600		0	0.00
FSC Lautoka (kg)	0	5.9[3]	84700	1000	0	0.00
					Total	**232657.57**

Source:

[1] IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

[2]IPCC default values at the lower limit of 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

[3]IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for "other solid biomass"

Table A6 Average OM Emission of FEA Grid in 2011

Power Plants (m)	**Fuel Consumption (l)**	**NCV (TJ/Gg)[1]**	**CO_2 emission factor of the fossil fuel type ($kgCO_2$/TJ) [2]**	**Density (kg/l)**	**Fuel used (kg)**	**Carbon emission (tCO_2)**
	A	**B**	**C**	**D**	**E=A*D**	**F=(B*C*E)*10^{-9}**
Kinoya	31409639	41.4	72600	0.83	26,070,000	78357.04
Kinoya	22143373	41.4	72600	0.83	18,379,000	55240.66
Vuda	17030120	41.4	72600	0.83	14,135,000	42484.72
Nadi	885542	41.4	72600	0.83	735,000	2209.14
Sigatoka	2403614	41.4	72600	0.83	1,995,000	5996.25
Deuba	828916	41.4	72600	0.83	688,000	2067.88
Rakiraki	955422	41.4	72600	0.83	793,000	2383.47
Korovou	7229	41.4	72600	0.83	6,000	18.03
Rokobili	0	41.4	72600	0.83	0	0.00
Monasavu	0	41.4	72600	0.83	0	0.00
Vatuwaqa	0	41.4	72600	0.83	0	0.00
Hydro – Wailoa	0	0	0		0	0.00
Hydro - Wainikasou & Nagado)	0	0	0		0	0.00
Buttoni	0	0	0		0	0.00
FSC Lautoka (kg)	0	5.9	84700	1000	0	0.00
					Total	**198732.46**

Source:

[1] IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

[2]IPCC default values at the lower limit of 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

[3]IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for "other solid biomass"

Table A7 Operating Margin Emission Factor of FEA Grid

	2009	2010	2011	Average
Total OM (tCO_2)	0.2670	0.2916	0.2528	
Total Net generation (MWh)	744326	797943	786280	
OM (tCO_2/MWh)				**0.2706**

Calculation of the Build Margin Emission Factor for the Fiji Electricity Authority grid: EF_{BM}

Table B1 Build Margin Emission of FEA Grid in 2009

Power Plants (m) [4]	**Fuel Consumption (l)**	**NCV (TJ/Gg)**[1]	**CO_2 emission factor of the fossil fuel type ($kgCO_2$/TJ)** [2]	**Density (kg/l)**	**Fuel used (kg)**	**Carbon emission (tCO_2)**	**Electricity Generated (MWh)**
	A	**B**	**C**	**D**	**E=A*D**	**F=(B*C*E)*10^{-9}**	
Kinoya 1	21243564	41.4	72600	0.83	17,632,158	52995.92	85929
Sigatoka	2145350	41.4	72600	0.83	1780640.5	5351.96	8016
Rokobili	0	41.4	72600	0.83	0	0.00	0
Monasavu	0	41.4	72600	0.83	0	0.00	0
Vatuwaqa	0	41.4	72600	0.83	0	0.00	0
Korovou	10711	41.4	72600	0.83	8890.13	26.72	33
Kinoya 2	24103656	41.4	72600	0.83	20006034.48	60130.94	113918
Deuba	603274	41.4	72600	0.83	500717.42	1504.98	2195
Buttoni	0	0	0	0.83	0	0.00	7210
FSC Lautoka	87011	5.9[3]	84700	1000	87011000	43482.01	7068
Rakiraki	660500	41.4	72600	0.83	548215	1647.74	2239
					Total	**165140.26**	**226608.00**

Source:

[1] IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

[2] IPCC default values at the lower limit of 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

[3]IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for "other solid biomass"
[4] Plants correspondent to 20% of generation capacity built most recently

Table B2 Build Margin Emission of FEA Grid in 2010

Power Plants (m) [4]	Fuel Consumption (l)	NCV (TJ/Gg)[1]	CO_2 emission factor of the fossil fuel type ($kgCO_2/TJ$) [2]	Density (kg/l)	Fuel used (kg)	Carbon emission (tCO_2)	Electricity Generated (MWh)
	A	B	C	D	E=A*D	$F=(B*C*E)*10^{-9}$	
Kinoya 1	33078313	41.4	72600	0.83	27,455,000	82519.85	130737
Sigatoka	3584337	41.4	72600	0.83	2,975,000	8941.78	14167
Rokobili	0	41.4	72600	0.83	0	0.00	0
Monasavu	0	41.4	72600	0.83	0	0.00	0
Vatuwaqa	0	41.4	72600	0.83	0	0.00	0
Korovou	3614	41.4	72600	0.83	3,000	9.02	14
Kinoya 2	33460241	41.4	72600	0.83	27,772,000	83472.63	126237
Deuba	824096	41.4	72600	0.83	684,000	2055.86	3256
Buttoni	0	0	0	0	0	0.00	6420
FSC Lautoka	0	5.9[3]	84700	1000	0	0.00	10806
Rakiraki	900000	41.4	72600	0.83	747,000	2245.21	3559
					Total	**179244.34**	**295196.00**

Source:
[1] IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
[2]IPCC default values at the lower limit of 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
[3]IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for "other solid biomass"
[4] Plants correspondent to 20% of generation capacity built most recently

Table B3 Build Margin Emission of FEA Grid in 2011

Power Plants (m) [4]	Fuel Consumption (l)	NCV (TJ/Gg)[1]	CO_2 emission factor of the fossil fuel type ($kgCO_2/TJ$) [2]	Density (kg/l)	Fuel used (kg)	Carbon emission (tCO_2)	Electricity Generated (MWh)
	A	**B**	**C**	**D**	**E=A*D**	**F=(B*C*E)*10^-9**	
Kinoya 1	31409639	41.4	72600	0.83	26,070,000	78357.04	124141
Sigatoka	2403614	41.4	72600	0.83	1,995,000	5996.25	9500
Rokobili	0	41.4	72600	0.83	0	0.00	0
Monasavu	0	41.4	72600	0.83	0	0.00	0
Vatuwaqa	0	41.4	72600	0.83	0	0.00	0
Korovou	7229	41.4	72600	0.83	6,000	18.03	26
Kinoya 2	22143373	41.4	72600	0.83	18,379,000	55240.66	83540
Deuba	828916	41.4	72600	0.83	688,000	2067.88	3277
Buttoni	0	0	0	0.83	0	0.00	5491
FSC Lautoka	0	5.9[3]	84700	1000	0	0.00	13545
Rakiraki	955422	41.4	72600	0.83	793,000	2383.47	3774
					Total	**144063.33**	**243294.00**

Source:

[1] *IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories*

[2]*IPCC default values at the lower limit of 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*

[3]*IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories for "other solid biomass"*

[4] *Plants correspondent to 20% of generation capacity built most recently*

Table B4 Build Margin Emission Factor of FEA Grid

	2009	2010	2011	Average
Total BM (tCO_2)	0.7287	0.6072	0.5921	
Total Net generation (MWh)	226608.00	295196.00	243294.00	
BM (tCO_2/MWh)				**0.6384**

1) Calculation of the Combined Margin Emission Factor for the Fiji Electricity Authority grid: EF_{CM}

EF_{CM}= 0.5 x OM + 0.5 x BM = 0.5×0.2706+0.5×0.6384=**0.4545 tCO_2/MWh**

Appendix 5: Further background information on monitoring plan

Please refer to Section D 7.2 in the CPA DD.

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project design document form for small-scale component project activities" (EB 66, Annex 17).
01	EB33, Annex44 27 July 2007	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		