**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Fiji Tourism Energy Efficiency Investment Project
Version number of the PDD	01
Completion date of the PDD	7/11/2012
Project participant(s)	World Wildlife Fund for Nature (WWF) South Pacific
Host Party(ies)	Fiji
Sectoral scope(s) and selected methodology(ies)	Sectoral Scope : 03, Energy Demand Methodology: AMS–II.C. (Version 14.0), Demand-side energy efficiency activities for specific technologies
Estimated amount of annual average GHG emission reductions	4,714 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The objective of the proposed project activity is to implement energy efficiency upgrades and retrofits in hotels (including resorts) in Fiji. Given the prominence of tourism to Fiji's economy, significant benefits can be achieved from changing Fiji into a low carbon tourism destination and showing leadership and a model for other Pacific and Small Island Nations.

World Wildlife Fund for Nature (WWF) South Pacific has initiated the proposed energy efficiency project activity in the tourism sector in Fiji. The project activity aims at working with the tourism sector to identify solutions to increase energy efficiency in hotels and resorts and reduce the sector's impacts on the environment. The project is being developed by WWF South Pacific in collaboration with tourism building owners and occupiers across Fiji, and builds on the low carbon tourism initiative between the Fiji Government and the Fiji Islands Hotel and Tourism Association. The proposed Project will upscale the energy efficiency promotion activities being implemented by WWF South Pacific.

Prior to the implementation of the project activity (existing scenario) hotels in Fiji widely rely on inefficient technologies for lighting, chilling and air-conditioning. These inefficient technologies mean higher energy consumption and constitute the baseline for the proposed project activity. Proposed project activity involves replacement of inefficient technologies used for lighting, chillers and air conditioners with energy efficient technologies and measures in buildings in Fiji's hotel sector. Approximately 24 hotels are expected to participate in this project. .

The installation and commissioning of energy efficient technologies and measures, including investment, will be undertaken by the hotel owners or their agents with guidance from the project proponent (WWF). Inefficient devices/ equipment will be collected at time of installation.

The devices/equipment replaced will be securely stored and destroyed/recycled in a manner that allows for third party verification. All equipment distributed under the project, will be marked for clear unique identification as part of the program[1].

The implementation of the proposed project is expected to achieve average CO_2 emission reductions of the order of 4,741 tCO_2e annually which totals to 47,140 tCO_2e for the entire 10-year crediting period.

Contribution of the Project Activity to Sustainable Development
Following sustainable benefits are envisaged from the project activity:

Social:

- Ø Reduce national electricity consumption (equivalent to 7,555 MWh/year) and alleviate stress on energy infrastructure, hence reducing blackouts and immediately "freeing up" electricity for other uses.
- Ø The tourism and related sectors will benefit through the transition towards ecotourism and related marketing benefits.
- Ø An estimated 24 participating hotel owners / users will save money on their electricity bills through reduced use of electricity.
- Ø The project will include an education component. This education component will aim to

[1] Information will be provided during validation.

raise awareness of the benefits of energy efficiency.

Environment:

Ø Abatement of greenhouse gases and other airborne pollutants from fossil fuel power generation through avoided electricity usage.

Economy:

Ø Energy conservation can have significant impact to Fiji's economy as it will make energy more readily available and cheaper for domestic commodity production.

Technology:

Ø The project will result in a significant transfer of technology. Whilst the technologies may not be new, uptake by consumers remains relatively low due to their comparatively high cost.

A.2. Location of project activity

A.2.1. Host Party(ies)

Fiji

A.2.2. Region/State/Province etc.

Hotel buildings in all areas in Fiji, either grid-connected or off-grid, on the main or outer islands, will be eligible to participate in the project[2].

A.2.3. City/Town/Community etc.

Entire Fiji

A.2.4. Physical/ Geographical location

The project plans to cover 24 hotels in this project. The detailed information on hotels included in the project activity along with hotel location shall be provided at the time of validation.

A.3. Technologies and/or measures
Technology Description:

Under the project activity key areas of energy efficiency improvement have been identified as below:

Lighting:

[2] Exact hotel location will be provided later at the time of validation

The required lighting is supplied with light sources, which are made up of lamps and luminaries. The choice of light source in hotel industry depends on various criteria such as: efficiency, colour temperature, colour rendering index, lamp life and emission mode. Lighting in the different areas of the hotels has different requirements and it is planned that the most efficient lamp will be chosen for each application in the project activity. For example, for corridors in large hotels with many guests using the same corridor, the lights stay on 24/7 year round, so here the CFLs (compact fluorescent lights) are the best option to save energy. For corridors in small hotels, where less guests use the corridor, a motion detector with incandescent lamps could be a better option.

Energy efficient lighting will include fluorescent tubes, CFLs, LEDs, and IRC lamps and may involve simple up-lamping, a change of luminaires, or a complete lighting system redesign. Details of lamps replaced will be provided at verification stage.

Air Conditioners

The most common cooling technology used in hotels in Fiji is split system air conditioners. Based on the information provided by participating hotels, most of these air conditioners are in individual guest rooms. An easy way to reduce the energy use of these air conditioners is to install occupancy based guestroom controls. These are controls that only enable the air conditioners to work when the guest is present. There are a range of technologies that can be used, including electronic key cards, motion sensors and door switches. The technology typically works by opening/closing the fan coil valve.
There is a range of studies that estimate the effectiveness of these controls. These controls are estimated to reduce guest room electricity by between 25% and 44%. In considering this measure individual room characteristics will be taken into account, including:

- **Humidity:** Air conditioning may be required to some extent for humidity level control purposes
- **Guest expectation of comfort:** some guests expect their room to be cool when they walk in. Signs alerting guests about the environmental considerations for the measure can often help in such circumstances.

Details of exact control system deployed will be provided at verification stage.

Chillers and Refrigeration Systems

Large chillers and refrigeration systems are hotels' most important source of energy consumption. However, as the type of system varies significantly, it is not possible to recommend one single energy efficiency measure. Instead, a range of measures are considered. Individual hotels would need to conduct an energy audit to determine which type of measures could be used to improve the energy efficiency of their chillers and large-scale refrigerators.

These measures include:

- **Variable Speed Drives (VSDs):** - VSDs modulate the frequency of the power supplied to the electric motors on the condenser fans and rack compressors, reducing peaks in power consumption, and in addition ensures more stable condensing and suction pressures, holding the effective value around the set point without continuous compressor stops and starts.

- **Electronic Expansion Valves (EEVs):** - EEVs can be fitted to refrigeration utilities (display cases and cold rooms) for the control of the flow of refrigerant to the evaporator coils so as to optimise operation and efficiency when the outside temperatures are especially favourable (eg. at night and in winter). The use of EEVs also increases the performance of the evaporators in the refrigeration units and greater internal temperature stability; the result is better quality product storage.

- **New Chiller:** New chillers are 25 – 50% more efficient than a chiller from around 10 years ago. New chillers typically have more efficient motors, better controls and reduce maintenance requirements when compared to older models.

- **Building Management System:** This is a holistic solution enabling centralized control, real time status for chiller and air conditioning units and overview of equipment performance including maintenance problems. This is typically a large investment but can result in energy savings of 5 – 15%.

Details of chilling and refrigeration measures implemented in each of the hotels participating in this project will be provided at verification stage.

The technologies mentioned above are market proven and environmentally safe. Project activity may involve technology transfer to Fiji.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Fiji (host)	World Wildlife Fund for Nature (WWF) South Pacific	No

A.5. Public funding of project activity

The project activity does not receive any public funding for its financing.

A.6. Debundling for project activity

The project activity is not a de-bundled component of a large project activity as there are no small scale CDM project activities or an application to register another small-scale CDM project activity by Project Proponent (PP) in the same project category and technology in the last two years.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

The project activity uses the following approved baseline and monitoring methodology and available at the UNFCC website:

Title	Reference	Version
Demand - Side Energy Efficiency Activities for specific Technologies[3]	AMS-II.C., EB 68	Version 14

[3] http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

Tool to determine the remaining lifetime of equipment[4]	EB 50, Annex 15	Version 01

B.2. Project activity eligibility

Para No	Applicability Criteria as per AMS-II.C ver. 14.0	Project Scenario
1	This methodology comprises activities that involve the installation of new, energy-efficient equipment (e.g. lamps, ballasts, refrigerators, motors, fans, air conditioners, pumping systems, and chillers) at one or more project sites. Retrofit as well as new construction (Greenfield) projects are included under this methodology. In the case of new construction projects, a stepwise approach is indicated for determining the baseline under paragraph 19 of version 17.0 of the general guidelines to SSC CDM methodologies.	The project activity involves installation of energy efficient equipment/appliance such as lamps, air conditioners, chillers and refrigeration systems in hotels in Fiji. Hence the project activity meets the eligibility criteria.
2	This methodology is only applicable if the service level (e.g. rated capacity or output) of the installed, project energy-efficient equipment is between 90% and 150% of the service level of the baseline equipment. Examples of service levels are light output for lighting equipment, water output and temperature for water heating systems, and rated thermal output capacity of air conditioners. The relationship of the service level of the project energy-efficient equipment to the baseline equipment can be one to one replacement (e.g. replacement of inefficient refrigerator with new and efficient refrigerator) or many-to-one (e.g. replacement of small multiple chillers with a central chiller plant). In the latter case, the service \ level of the project and baseline can be compared on an aggregate basis.	In the project activity each replaced appliance/ equipment/ system will have similar rated capacity or output or level of service as in baseline scenario. Hence the project activity meets the eligibility criteria.
3	Requirements pertaining to the baseline of the retrofit projects and projects involving capacity increase are indicated in paragraphs 20 to 21 in the above cited general guidelines to SSC CDM methodologies. In the event that project output in year *y* is greater than the average historical output (average of the three most recent years prior to the project implementation[5] and the demonstration of the baseline for the incremental capacity is not undertaken, the value of the output in year *y* is	Project activity does not involve retrofit or capacity increase. In event that project output in year *y* is greater than the average historical output (average of the three most recent years prior to the project implementation), the value of the output in year *y* will be capped at the value of the historical average output level.

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

[5] A maximum of +10% variation is permitted.

	capped at the value of the historical average output level.	
4	If the energy-efficient equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	The project activity may involve use of efficient refrigeration systems which will be CFC free. Fiji is has already phased out its CFC consumption[6]. To be conservative and for simplicity no emission reductions from use of refrigerants is being claimed under the proposed project activity. Project activity only claims emission reduction due to the reduction in electricity consumption from use of more efficient equipment/appliances. Thus the project activity meets the eligibility criteria.
5	This methodology credits emission reductions only due to the reduction in electricity and/or fossil fuel consumption from use of more efficient equipment. However, the calculation of project emissions shall include any incremental emissions, as compared to the baseline, associated with refrigerants used in the project equipment.	In the project emissions are claimed only for reduction in electricity consumption by installing efficient equipment. No incremental emissions from use of refrigerants are envisaged in the project activity. (This further needs to be confirmed once the technology is finalized). Hence the project activity meets the eligibility criteria.
6	The aggregate energy savings by a single project may not exceed the equivalent of 60 GWh per year for electrical end-use energy efficiency technologies. For fossil fuel end-use energy efficient technologies, the limit is 180 GWh thermal per year in fuel input.	The aggregate energy savings by a single project is estimated to be 7,555 MWh per year. Hence the project activity meets the eligibility criteria.

B.3. Project boundary

According to the paragraph 7 of the small scale methodology AMS-II.C. version 14 "The project boundary is the physical, geographical location of all equipment and systems affected by the project activity."

Consistent with the methodology used, the project boundary is the physical, geographical location of all equipment and systems installed at participating hotel under the project activity.

The GHG emission sources included in or excluded from the project boundary are as follows:

Scenario	Source	Gas	Included/ Excluded	Justification/Explanation
Baseline scenario	Electricity Delivered to the grid by the	CO_2	Included	Main Emission Source.
		N_2O	Excluded	Not Significant. Excluded for simplification and conservativeness.

[6] http://www.unep.org/ozonaction/RegionalNetworks/SouthEastAsiaPacific/tabid/6210/Default.aspx

	project activity that otherwise would have been generated by the operation of grid connected power plants and by the addition of new generation sources.	CH_4	Excluded	Not Significant. Excluded for simplification and conservativeness.
Project activity	Emissions associated with the operation of the project	CO_2	Excluded	Not Significant. Excluded for simplification and conservativeness.
		N_2O	Excluded	Not Significant. Excluded for simplification and conservativeness.
		CH_4	Excluded	Not Significant. Excluded for simplification and conservativeness.

B.4. Establishment and description of baseline scenario

According to the paragraph 23 of the small scale methodology AMS-II.C. version 14 under Baseline calculation for project involving fossil fuel savings:

If the energy displaced is fossil fuel-based, the energy baseline is the existing level of fuel consumption or the amount of fuel that would be used by the technology that would have been implemented otherwise. The emissions baseline is the energy baseline multiplied by an emission factor for the fossil fuel displaced. Reliable local or national data for the emission factor shall be used; IPCC default values should be used only when country or project-specific data are not available.

There is a lack of energy conservation and efficiency planning, guidelines and effective implementation programmes in Fiji. The Fiji electricity grid, operated by the state-owned utility Fiji Energy Agency (FEA), operates across the islands of VitiLevu, Vanua Levu and Levuka (Ovalau). Fiji, like any other country in the region, is heavily dependent on imported fossil fuel to meet a major component of its energy demand.

Like other small island countries in the Pacific, Fiji relies on imported fuels for transportation and electricity production. Fiji also faces challenges in the development of the energy sector to satisfy the increasing electricity demand and growing fuel import.

There are a number of well-documented barriers to the uptake of energy efficient technologies including: high initial price of purchase; lack of consumer information on, and confidence in, the benefits of energy efficient technologies; and consumer bias to replacing “like with like” technologies. These barriers limit “autonomous” replacement of more efficient equipment, particularly in developing countries.

Given the above barriers prohibit “autonomous” replacement of more efficient equipment, the other potential driver in shifting the baseline scenario to a more efficient one is mandatory policy or regulation that introduces some form of energy performance standards on lighting, chilling or air conditioning products and effectively “bans” inefficient technologies. Currently no

such policies are in place in Fiji. In addition, these polices are unpopular and problematic in developing countries as they pass the economic burden for upgrading technologies to the users (who may have limited capacity to pay) and also if introduced they are seldom systematically enforced.

Hence without the proposed CDM project, the emissions associated with energy use from lighting, chillers and air conditioners will not decrease in the baseline scenario.

B.5. Demonstration of additionality

Project additionally is demonstrated using "Guidelines for Demonstrating Additionally of Micro-Scale Project Activities" (EB 68, version 04)**.**

As per the paragraph 3 of the guidelines:

Energy Efficiency project activities that aim to achieve energy savings at a scale of no more than 20 GWh per year are additional if any one of the conditions below is satisfied:

(a) The geographic location of the project activity is in LDC/SID or special underdeveloped zone of the host country identified by the Government before 28 May 2010;

(b) The project activity is an energy efficiency activity with both conditions (i) and (ii) satisfied;

(i) Each of the independent subsystems/measures in the project activity achieves an estimated annual energy savings equal to or smaller than 600 MWh; and
(ii) End users of the subsystem or measures are households /communities/ SMEs

According to the United Nations, Fiji is classified as Small Island Developing State (SIDS)[7]. Hence proposed project, which is having energy savings of tune of 7.5 GWh is considered to be automatically additional as per the above EB guidelines.

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

Emission Reductions

The Emission Reductions are calculated by using the following algorithm:

$ER_y = BE_y – PE_y - LE_y$

Where,
ER_y : Emission Reductions in the year y (tones of CO_2e)
BE_y : Baseline emissions in the year y (tones of CO_2e)
PE_y : Project emission in year y (tones of CO_2e)
LE_y : Leakage Emissions in year y (tones of CO_2e)

Baseline emissions:

[7] http://www.unohrlls.org/en/sids/44/

Baseline emissions the proposed project activity involving electrical savings are calculated using "Option -1 Constant Load Equipment" of applicable methodology AMS-II.C. (Version 14) This option is applicable to retrofit and Greenfield projects. It applies to equipment that requires the same power (kW) to operate whenever it is energized within specified limits, i.e. is (are) constant load equipment, which is the scenario in project activity[8].

$$BE_y = E_{BL,y} * EF_{CO2,ELEC,y} + Q_{ref,BL} \acute{} \ GWP_{ref,BL} \quad \textbf{(1)}$$

$$E_{BL,y} = \sum_i (n_i * r_i * o_i)/(1 - l_y) \quad \textbf{(2)}$$

Where:

BE_y	Baseline emissions in year *y* (tCO2e)
$E_{BL,y}$	Energy consumption in the baseline in year *y* (kWh)
$EF_{CO2,ELEC,y}$	Electricity Emissions Factor
S_i	Sum over the group of *"i"* devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year, implemented as part of the project activity
n_i	Number of devices of the group of *"i"* devices (e.g., 40W incandescent bulb, 5hp motor) replaced, for which the project energy efficient equipment is operating during the year
p_i	Power of the devices of the group of *"i"* baseline devices (e.g., 40W incandescent bulb, 5hp motor). In the case of a retrofit activity, "power" is the weighted average of the devices replaced. In the case of new installations, "power" is the weighted average of devices on the market
o_i	Average annual operating hours of the devices of the group of *"i"* baseline devices
l_y	Average annual technical grid losses (transmission and distribution) during year *y* for the grid serving the locations where the devices are installed, expressed as a fraction. This value shall not include non-technical losses such as commercial losses (e.g., theft/pilferage). The average annual technical grid losses shall be determined using recent, accurate and reliable data available for the host country. This value can be determined from recent data published either by a national utility or an official governmental body. Reliability of the data used (e.g., appropriateness, accuracy/uncertainty, especially exclusion of non technical grid losses) shall be established and documented by the project participant. A default value of 0.1 shall be used for average annual technical grid losses, if no recent data are available or the data cannot be regarded accurate and reliable
$Q_{ref,BL}$	Average annual quantity of refrigerant used in the baseline to replace the refrigerant that has leaked (tonnes/year). Values from Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used
$GWP_{ref,BL}$	Global Warming Potential of the baseline refrigerant (t CO_2e/t refrigerant)

[8] The constant load condition shall be demonstrated at time of validation by providing monitored or historical records of energy consumption data for a one-year period prior to the project implementation.

Project activity does not claim emission reductions from use of refrigerant in the baseline.

$BE_y = EG_{BL,y} * EF_{CO2,y}$

Where,
$EG_{BL,,y}$: Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$: Emission factor (tCO_2/MWh)

Project Emissions:

Project emissions consist of electricity and/or fossil fuel used in the project equipment, determined as follows.

$$PE_y = EP_{PJ,y} * EF_{CO2,y} \quad \textbf{(3)}$$

Where:

PE_y	Project emissions in year *y* (tCO_2e)
$E_{PJ,y}$	Energy consumption in project activity in year *y*. This shall be determined *ex post* based on monitored values
$EF_{CO2,y}$	Emission factor for electricity or thermal baseline energy. The emissions associated with grid electricity consumption should be calculated in accordance with the procedures of AMS-I.D. For fossil fuel displaced reliable local or national data for the emission factor shall be used; IPCC default values should be used only when country or project specific data are not available or difficult to obtain

Project energy consumption in case of project activities that displace grid electricity is determined as follows using the data of the project equipment or system:

$$E_{PJ,y} = \sum_i (n_i * r_i * o_i)/(1 - l_y)$$

Leakage Emissions:

If the energy efficiency technology is equipment transferred from another activity, leakage is to be considered. Since project activity involves no transfer of equipment from another activity, hence $LE_y = 0$

B.6.2. Data and parameters fixed ex ante

Data / Parameter	User information
Unit	None
Description	Customer Identification Number (unique-as per WWF records) Name of Hotel Location of Hotel
Source of data	Information provided by participating hotels
Value(s) applied	
Choice of data or Measurement methods and procedures	Information to be collected from participating hotels at time of installation of efficient equipment's
Monitoring frequency	This is the basic identification parameter that is used participants and forms the foundation of the monitoring
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	n_i
Unit	-
Description	Number of devices of the group of *"i"* devices replaced
Source of data	Records maintained by WWF
Value(s) applied	
Choice of data or Measurement methods and procedures	Information to be collected by WWF from the participating hotels
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	p_i
Unit	-
Description	Power of the devices of the group of *"i"* baseline devices
Source of data	Records maintained by WWF
Value(s) applied	
Choice of data or Measurement methods and procedures	Information to be collected by WWF from the participating hotels
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

B.6.3. Ex-ante calculation of emission reductions

Baseline Emissions

The baseline emissions have been calculated based on

1) Energy consumed in Lighting – 7,200 MWh/year
2) Energy consumed in standalone air conditioners – 9,000 MWh/year
3) Energy consumed in baseline chillers – 22,320 MWh/year

The energy consumed has been estimated based on a survey conducted and based on expected no. of hotels that will participate in this project.

$BE_y = EG_{BL,y} * EF_{CO2,y}$
= (7,200 + 9,000 + 22,320) MWh/year* 0.624 tCO_2/MWh
= 38,520*0.624
= 24,036 tCO_2e/year

Project Emissions

The project emissions have been calculated based on

1) Energy consumed in Lighting – 4,080 MWh/year
2) Energy consumed in standalone air conditioners- 7,913 MWh/year
3) Energy consumed in project activity chillers – 18,972 MWh/year

The energy consumed has been estimated based on a survey conducted, expected no. of hotels that will participate in this project and potential savings in each of the 3 categories mentioned above.

$PE_y = EP_{PJ,y} * EF_{CO2,y}$
= (4,080 + 7,913 + 18,972) MWh/year * 0.624 tCO_2e/MWh
= 30,965 *0.624 tCO_2e/MWh
= 19,322 tCO_2e/year

Emission reductions

$ER_y = BE_y – PE_y - LE_y$
$= 24,036 – 19,322 - 0$
$= 4,714\ tCO_2/year$

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

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
Year 1	24,036	19.322	0	4,714
Year 2	24,036	19.322	0	4,714
Year 3	24,036	19.322	0	4,714
Year 4	24,036	19.322	0	4,714
Year 5	24,036	19.322	0	4,714
Year 6	24,036	19.322	0	4,714
Year 7	24,036	19.322	0	4,714
Year 8	24,036	19.322	0	4,714
Year 9	24,036	19.322	0	4,714
Year 10	24,036	19.322	0	4,714
Total	240,360	193,220	0	47,140
Total number of crediting years	10			
Annual average over the crediting period	24,036	19,322	0	4,714

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

Data / Parameter	$E_{BL,y}$
Unit	MWh/year
Description	Energy consumption in the baseline in year *y*
Source of data	Calculated
Value(s) applied	Lighting – 7,200 MWh/year Standalone air conditioners – 9,000 MWh/year Baseline chillers – 22,320 MWh/year
Measurement methods and procedures	The energy consumed in the baseline is calculated based on Number of devices of the group of *"i"* devices replaced (n_i), Power of the devices of the group of *"i"* baseline devices (p_i) and average annual operating hours of the devices of the group of *"i"* baseline devices (o_i).
Monitoring frequency	Daily
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	$E_{PJ,y}$
Unit	MWh/year
Description	Energy consumption in project activity in year *y*.
Source of data	Calculated
Value(s) applied	Lighting – 4,080 MWh/year Standalone air conditioners – 7,913 MWh/year Project activity chillers – 18,972 MWh/year
Measurement methods and procedures	The energy consumed in the project activity is calculated based on Number of group i project devices operating (n_i), Electrical power demand (kW) of the group i project devices (p_i), and Operating hours of group of i project devices (o_i) of *"i"* project devices.
Monitoring frequency	Daily
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	o_i
Unit	-
Description	Average annual operating hours of the devices of the group of *"i"* baseline devices
Source of data	On site measurement of operating hours of project devices
Value(s) applied	Not Available
Measurement methods and procedures	The annual operating hours for each device group will be monitored using runtime meters.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Calculation of baseline and project emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	n_i
Unit	-
Description	Number of group i project devices operating in time interval t year y
Source of data	Records maintained by WWF
Value(s) applied	
Measurement methods and procedures	Information to be collected by WWF from the participating hotels
Monitoring frequency	**-**
QA/QC procedures	**-**
Purpose of data	Calculation of project emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	p_i
Unit	-
Description	Electrical power demand (kW) of the group i project devices
Source of data	Records maintained by WWF
Value(s) applied	
Measurement methods and procedures	Information to be collected by WWF from the participating hotels
Monitoring frequency	-
QA/QC procedures	**-**
Purpose of data	Calculation of project emissions
Additional comment	Data will be archived at least for two years after the end of the crediting period, or the last issuance of CERs, whichever occurs later.

Data / Parameter	l_y
Unit	-
Description	Average annual technical grid losses (transmission and distribution) during year y for the grid serving the locations where the devices are installed, expressed as a fraction
Source of data	Default value as suggested in AMS II.C
Value(s) applied	0.1
Measurement methods and procedures	-
Monitoring frequency	Annually
QA/QC procedures	**-**
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

Data / Parameter	$EF_{CO2,y}$
Unit	tCO_2e/MWh
Description	Grid Emission Factor
Source of data	IGES
Value(s) applied	0.624
Measurement methods and procedures	The emission factor is calculated in accordance with the provisions in AMS-I.D.
Monitoring frequency	Annually
QA/QC procedures	-
Purpose of data	Calculation of baseline and project emissions
Additional comment	-

B.7.2. Sampling plan

Sampling Design

Sampling Objectives and Reliability

The objective is to obtain a reliable estimate of the following key variables over the course of the crediting period and meeting the 90/10 confidence/precision levels.

It is envisaged that the key variable will be

- Number of devices in service and operating (ex-post)
- Number of devices (sample size) for which electricity generation is metered as a representative of the group

In case additional variables are identified during validation stage, after taking into consideration project characteristics, the sampling plan will be adopted accordingly.

(i) Target Population

The target population is the hotel users that will participate in the project. The device to be sampled will be drawn from the list of individual device/equipment users as contained in the project records (database) which is maintained by the project implementer.

(ii) Sampling Method

The required number of device to be selected for sampling of the required parameter will be determined by the PP according to the level of reliability required. The population within the sampling frame is expected to be homogenous, taking into consideration the key variable to be determined. Hence as per 'Guidelines for sampling and surveys for CDM project activities and programme of activities' version 02, EB 69 simple random sampling method will be adopted. If necessary or deemed to be appropriate by the PP, other sampling methods could also be applied with proper justification in line with 'Guidelines for sampling and surveys for CDM project activities and programme of activities' version 02, EB 69.

(iii) Sampling Size

To ensure a random selection, random number generators shall be applied. Each device in the target population will be uniquely identifiable by its Serial ID number. Each device can thus be allocated a Sample Selection Number in each monitoring period, starting at 1 and increasing up to the total number of device in the Database.

It is envisaged that the key parameter of interest will be – Number of devices in service and operating (ex-post) expressed in percentage or the sample size for which metering of electricity system shall be done

The equation to give us the required sample size is:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

n	Sample size
N	Total number of households /users
p	Expected proportion (0.50)
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

However in surveys where the project relates to a mean value of interest, the following equation shall be followed

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

$$V = \left(\frac{SD}{mean} \right)^2$$

Where

n	Sample size
N	Total number of households /users
Mean	Expected mean
SD	Expected standard deviation
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

The sample survey shall be carried out as per the methodology requirement and the project characteristics. Similar approach (equation) as described above shall be followed in the case of a baseline survey, required for a particular project.

The precision and expected variance will be established in accordance with the recommended values by UNFCCC, namely 90% precision and 10% margin of error.

(iv) Sampling Frame

Sample frame will be developed from the data recorded by project implementer. The frame will consist of the recipient information in the project region.

a) Information recorded in database

The following minimum information on households/users that receive the device will be recorded

- A list of each household/user that received the device (house address, name of occupant);
- Date of installation of the device
- Serial Number and nominal power ratings of the device installed
- Date of collection of the device

b) Information on households included in *ex-post* monitoring survey

- A list of each household in the survey (house address, name of occupant).
- Information on when the household has been added to the survey and information on when it has been removed (if applicable).
- Information on any changes made to the device (exchange, repair, removed and installed elsewhere, etc).

Data to be collected

(i) Field measurement

Number of devices placed in service and operating (ex-post)

- Within 12 months of the start of distribution, on-site visual surveys of sample hotels shall be done to identify devices are installed and operating.
- Only devices bearing certain specific characters can be counted as installed. While devices replaced as part of a regular maintenance or warranty program can be counted as operating, devices cannot be replaced as part of the survey process and counted as operating.

- The record keeping database will be used to record the results of all monitoring, thereby avoiding double counting, with all data stored to be kept for at least two years after the crediting period or the last issuance of CERs for the project activity.

(ii) Quality Assurance/Quality Control

Training will be given to staff responsible for the data collection system on the management system to be put in place as part of the overall project. This will include:

- Data to be recorded in the database
- How to identify and record the serial number on a device/equipment;

- How to fill out and where to submit copies of the installation records and any associated documentation;
- Procedure for dealing with a change in serial number or address of a device/equipment;
- Monitoring procedures, in accordance with the PDD

On completion of training, trained staff will receive a letter confirming their attendance. The name, company and contact details of all attendees will be recorded as part of the project database. This will be used to confirm that the training has been completed and that staffs are qualified to carry out the data collection as required.

In order to minimise errors, a quality control and assurance strategy plan will be established. This strategy includes a planning phase in which a clear definition of the target population, the issues and variables to be investigated, the sampling frame and sample size are determined. Also the design of a questionnaire that reflects the objectives of the survey and facilitates field operations and information processing is prepared.

In order to minimise errors, all personnel conducting field measurements, both for the collection of baseline data and annual monitoring of project, will receive training on the procedures to be used for data collection, including the format in which data should be collected, project background, basic functioning of the technology and any other relevant project background.

The potential for non-responses, refusals and related issues will be considered by the PP during sample selection. If the sampling results are insufficient to achieve the target reliability levels, the PP will address this by selecting a larger than necessary sample size before commencing monitoring. Non-response could be considered (e.g. 10%), when designing the sampling survey and determining the sample size. This will be further decided at project level.

To achieve good quality data, a standard form shall be designed ex-ant and assessed by the PP. All field personnel will be trained to decrease error. If it is necessary to engage third parties for carrying out field measurements, the PP will ensure that any such third parties are credible, experienced adequately trained for the tasks they are contracted for.In case of an outlier that is a result of a mistake (wrongly recorded, or wrongly entered onto the computer) it can be corrected and in case it is a real value it must be left as it is and included in the analysis. In case the data are highly skewed, then it should be transformed prior to the analysis using appropriate methods.

(iii) Analysis

Data will be used for the preparation of monitoring reports for project. The results of all monitoring will be entered into the database. The raw data shall be scrutinised carefully prior to estimating the mean and checking its reliability. This shall be done using graphical summaries such as histograms, boxplots, normal probability plots, etc. These plots would show up outliers in the data or any skewness in the distribution of the data.

In case of highly skewed data which cannot be transformed prior to the analysis using appropriate methods additional sample shall be taken.

Implementation Plan

All sampling efforts will be conducted by staff/third party who have undergone training as part of the project, as described above. The samplers will have understanding of the native

language(s) in which the project has been implemented, or will be accompanied by interpreters, thereby allowing complete understanding of any responses given by users, and any questions therein.

B.7.3. Other elements of monitoring plan

Purpose: The installed energy efficiency measures will be continuously monitored for the entire project duration. These monitored parameters are used for the estimation of energy savings.

Operation and Management

WWF will organize and supervise all monitoring activities according to the sampling/monitoring plan. A project coordinator will be appointed to organize all requirements according to the monitoring plan and to supervise all involved bodies. All relevant involved bodies will be trained in advance, so that a most accurate monitoring can be assured.

Baseline Study

For the baseline study all selected participating hotels will be visited and meter equipment will be installed. The baseline operating hours will be metered for at least 90 days. The results of the daily operating hours will be adjusted by seasonal adjustment factors that take seasonal differences of daylight hours into account. With these adjustments the metered baseline measurement of daily operating hours can be later applied as an annual daily average

Also the number and "power" of a representative sample of the replaced equipment shall be recorded and in a way that allows for a physical verification by a designated operational entity (DOE)

Monitoring ex post

As per the applicable methodology AMS-II.C., *for projects using Option 1, i.e. if the project equipment installed has a constant current (ampere) characteristic, monitoring shall consist of monitoring either the "power" and "operating hours" or the "energy use" of the equipment installed using an appropriate method. Appropriate methods include:*

• *Recording the "power" of the project equipment installed (e.g. lamp or refrigerator) using nameplate data or bench tests of a sample of the units installed and metering a sample of the units installed for their operating hours using run time meters; or*

• *Metering the "energy use" of an appropriate sample of the project equipment installed.*

In the project activity power of the project equipment will be recorded using nameplate data and operating hours will be recorded by installing run time meters.

Data Archiving

For each hotel participating in the project, the following information will be documented:

- Ø Name
- Ø Address
- Ø Unique consumer identification number
- Ø Type, Number and wattage of equipment installed
- Ø Date of Installation

This documentation (paper forms / database) will then be archived in a safe place and made available to the DOE during the duration of the project.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity
01/01/2015

C.1.2. Expected operational lifetime of project activity

10 years 0 months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Fixed Crediting Period

C.2.2. Start date of crediting period
01/01/2016
C.2.3. Length of crediting period
10 years 0 months

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

According to the Republic of Fiji Islands Environment Management Act 2005 (Act No.1 of 2005), any developmental proposal in the host country is required to be examined by the approving authority (Department of Environment) to determine whether the activity or undertaking in the developmental proposal is likely to cause significant environmental or resource management impact.

There is no additional source of GHG emissions to be adopted in implementation of the proposed project activity. The environmental impacts derived through the project activity are such positive ones as energy savings and lowering noises in hotels. Therefore, EIA does not need to be carried out. This will be confirmed by the Department of Environment with an official letter which will be attached with this PDD.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
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The stakeholder consultations were held as per the requirements wherein the project stakeholders such as individuals, groups and communities likely to be affected by a project, including, local residents, town councils, NGO's, competitors, possible suppliers and employees were identified and informed on the meeting. The consultation process should provide a forum where relevant information was disseminated to, and asked from, the stakeholders including social, environmental and other issues that affected stakeholders. Stakeholder update and feedback sessions were held in Nadi and Suva on 17th and 18th October, 2012. During these sessions, the results of the feasibility study were presented and next steps proposed.

E.2. Summary of comments received
The summary of the comments received and the responses from the PP are given below:

Nadi Consultations

No.	Question / Comment	Response
1	Are attractive loans available for TEEIP participants to cover purchase and installation costs?	The Reserve Bank of Fiji (RBF) are considering importation substitution possibilities and recommended approaching the commercial banks as they would be able to lend to directly.
2	Aren't carbon projects such as CDM complicated?	DoE conceded that CDM are complicated processes for their department with limited in-house expertise. However, with support such as URC ACP MEA project, it was agreed that potential projects would get adequate support.
3	Is monitoring data for the TEEIP shared or made public?	Monitoring data is aggregated for the purposes of generating carbon credits, but the individual values remain confidential. It has been asserted that given the board range of room types, numbers and sample of ten hotels this is seen as a representative sample of aggregate data. Consideration has been given to the Intellectual Property rights with regards to publishing commercially sensitive data from individual hotels so as to reassure participates and retain their participation numbers and interest in the program.
4	CFLs often fail earlier than their expected life due to power spikes. How do you expect to address this?	The program was viewed favourable and technical questions were raised as to how operators could protect their CFL setups against power spikes, i.e. brown or blackouts. The option given was to look at surge protectors and replacement of existing CFLs with better designed CFLs to cater for such situations.
5	Do the Government intend to subsidise energy efficiency measures?	The Department of Energy explained that under the current setup, concessions did exist under Section Four of their Strategic Energy Plan, under which Minimum Energy Performance Standards (MEPS) for white goods and appliances has been formulated. The FEEAP Committee is responsible for communicating such activities to the sector.
6	Are cogeneration or alternative power sources eligible under TEEIP?	This is an energy efficiency program so under the methodology selected, power sources are not eligible.

7	Will the TEEIP cover operators wishing to go off-grid?	The general operator consensus was that the national power supplier was profiting from price hikes, if an operator is able to realise the savings obtained from EE alone then the Carbon Offset Programme (COP) can be the next stage to programme progression for them. With larger operators having strategic plans to go off grid within the next five years. Again such operators will need to work together with WWF on the selection of the appropriate carbon emissions reduction methodology and the current TEEIP would not be able to cater for this as yet.
8	What branding can be used and what is the commercial structure of TEEIP?	The next phase of the program is to finalise proposed commercial structures and program rollout. The larger operators, with their finance and engineering section heads in attendance, had a management mandate to streamline their cost recovery and saving operations, with the initial outlay proposed as part one: retrofit purchase agreements and part 2: carbon returns.
9	How will WWF communicate participation in the TEEIP to hotel operators?	It was suggested that WWF should now do a Road Show and go out and sell the TEEIP to the operators.

E.3. Report on consideration of comments received

No negative comments and no critical issues were raised for implementing the project by the stakeholders. As a whole, the stakeholders were very supportive for the proposed CDM project activity.

SECTION F. Approval and authorization

Letter of Approval from each Party to be involved in the project activity will be made available at the time of submitting the PDD to the validating DOE.

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Appendix 1: Contact information of project participants

Organization	World Wide Fund for Nature South Pacific (WWF)
Street/P.O. Box	4 Ma'afu Street
Building	
City	Suva
State/Region	
Postcode	
Country	Fiji
Telephone	679 331-5533
Fax	+679 331-5410+679
E-mail	mpatel@wwf.panda.org
Website	
Contact person	
Title	Ms
Salutation	
Last name	Monica
Middle name	
First name	Patel
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	

Appendix 2: Affirmation regarding public funding

The project activity does not involve any public funding. Declaration fro same will provided at time of validation

Appendix 3: Applicability of selected methodology

Applicability of selected methodology is discussed in section B.2 of PDD. The project activity meets the applicability criteria of the methodology.

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

The project activity will be scattered across various locations in Fiji. At the time of submission of PDD grid emission factor from IGES is the only publically available data. Hence it has been considered.

Appendix 5: Further background information on monitoring plan

The monitoring plan is detailed in Section B.7

Appendix 6: Summary of post registration changes

Not Applicable as of now.

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	· The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	· The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. · As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		