Monitoring Report

82 MW Lau Renun Hydro Power Plant,

North Sumatra

(VCS Database Project ID 488)

Monitoring period – 01/04/2009 to 31/03/2010 (both days included)

Monitoring report No.4
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Net Emission Reduction : 197,295 tCO_2e

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TABLE OF CONTENT

1. Project Background 3
2. Project Implementation and sustainable development 3
   2.1 Implementation status 3
   2.2 Operation of the project 3
   2.3 Sustainable development 3
   2.4 Actual emission reductions 4
3. Compliance with the monitoring methodology 4
   3.1 Monitoring period 5
   3.2 Monitoring equipment and instalation 5
   3.3 Monitoring parameters 5
   3.4 Monitoring management and operational system 9
   3.5 Accuracy of monitoring equipments 10
      3.5.1 Calibration of monitoring equipments 10
      3.5.2 Monitoring equipment malfunctions 11
4. Emission Reduction calculations 11
   4.1 Baseline Emissions 11
      4.1.1 Formula used for baseline emissions calculation 11
      4.1.2 Baseline emissions calculation 12
   4.2 Project Emissions 12
      4.2.1 Formula used for project emissions calculation 12
      4.2.2 Project emissions calculation 14
   4.3 Emission Reductions 14
      4.3.1 Formula used for emission reductions calculation 14
      4.3.2 Emission emissions calculation 15
5. Environmental Performance 15
6. Conclusion 15

Appendix 1 Complete Emission Reduction Xcel Sheet calculation 17
Appendix 2 Standard Operating Procedures 19

1. Project Background

The project activity is a new run-off river type hydropower plant with a daily regulating pond at the five-hour peak power generation, diverting from the Renun river main stream and eleven (11) tributaries into Lake Toba. The regulating pond has a storage capacity of 500,000 m3 and a power density of 820 W/m^2. The total actual installed capacity of the project is 82 MW, consisting of two 41 MW turbines. The project is owned and developed by PT. PLN (Persero), a state-owned electricity company. The project supplies electricity to the connected Sumatra grid.
The Lau Renun Hydroelectric project was registered as VCS project. Further background on this project can be found in the Voluntary Carbon Standard Project Description (VCS PD).
Parties involved are Indonesia (Host Country) and Switzerland (Other Parties).

The Lau Renun Hydroelectric Power Plant is located the latitude and longitude of 02° 39' 00" N, 98º 24' 34" E, northwestern part of Lake Toba in North Sumatera Province, about 100 km South of Medan City.

2. Project Implementation and sustainable development

2.1 Implementation status

The Project has been completed and commisioned since 14 August 2006. The power plant has been generating a total of 265,538 MWh_e, during this 4th monitoring period from 01 April 2009 to 31 March 2010.
The project classified as 'large scale grid connected renewable electricity generation' because it has installed capacity 82 MW and connected to the grid. The calculated emission reductions achieved by the project activity within this period is 197,295 tCO_2e.
The emission reduction credits are calculated and reported in more details in Section 4 of this monitoring report. These credits are to be verified and claimed as Voluntary Carbon Units (VCUs).

2.2 Operation of the project

Overall the power plant has been successfully managed and operated by a team of competent personnel. Its performance has been satisfactorily and in line with the design. The design has not changed compared to the PD.

2.3 Sustainable development

The project has strongly contributed on the sustainable development at social, economic, environmental and technological aspects as explained below:

Social well-being:
- The project contributes to the development of the region by increasing community development and corporate social responsibility of PT. PLN (Persero) such as infrastructure development (road, bridges); funds for building a new school, church and mosque in the region; upgrading health care facilities (a small clinic) as well as free medicines in the vicinity of the project for the benefit of the community.
- During both construction and operation, various kinds of mechanical work are required, providing employment on a regular and permanent basis.

Economic well-being:
- The project activity generates direct and indirect employment for skilled and unskilled manpower during construction phase as well as during operational stage and thus helped in controlling migration from the region and alleviation of poverty in the local area.

- The project activity is a good investment in a developing region, which otherwise would not have happened in the absence of project activity.
- The generated electricity if fed into regional grids through the local grid, thereby improving the availability of electricity to local consumers (villagers and sub-urban inhabitants) by increasing the electricity supply.
- The project activity leads to diversification of the national energy supply that is dominated by conventional fuel based generation units.
- The project activity contributes to economic sustainability around the plant sites and encourages economic power decentralization.

Environmental well-being:
- The project utilizes hydropower to generate electricity, which otherwise would have been generated through alternative fuel- (most likely fossil fuel-) based power plants. It this contributing to a reduction in specific emissions (emissions of pollutant / unit of energy generated) including GHG emissions.
- As hydroelectric power projects produce no end-products in the form of solid waste (ash, etc.), they do not have to cope with the problem of solid waste disposal encountered by most other sources of power.
- Being a renewable energy source, hydro energy is used to generate electricity that contributes to resource conservation.
- Thus, the project causes no negative impact on the surrounding environment since it is a run-off river type hydropower plant with daily regulating pond; and in the end contributes to environmental well being. The low impact on the surrounding environment shows the very high power density of regulating pond of shown to be 820 W/m^2.

Technological well-being:
- The project supports high quality equipments transfer from other regions and even other countries, and contributes to capacity building of the labor force through training and practical work.
- The project promotes local products developed in the region, when replacement of spare parts is necessary, and supports renewable technology development especially for hydroelectric power technology.

2.4 Actual emission reductions

The 4th monitoring period is from 01 April 2009 to 31 March 2010. During the period, the actual emission reduction is 197,295 ton CO_2. Detailed calculations of the emissions can be found in section 4 of this monitoring report.

3. Compliance with the monitoring methodology

The project personnel and management has conducted the monitoring activities by following the monitoring plan presented in the PD and in accordance with the following approved methodology and tool:

Applied methodology

ACM0002 – Consolidated baseline methodology for grid connected electricity generation from renewable sources (Version 10, EB 47)

Applied tool

"Tool for demonstration and assessment of additionality" (version 05.2)
"Tool to calculate the emission factor for an electricity system" (version 1.1)
"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02)

3.1 Monitoring period

The 4th monitoring period covers 01 April 2009 to 31 March 2010 (both days included)

3.2 Monitoring equipment and Installation

Given the emission factor is calculated *ex-ante* and according to the Monitoring Methodology ACM0002 version 10, the only data to be monitored is electricity supplied to the grid by the project.

Metering of Electricity Supplied to the Grid

The main electricity meter of each power generation unit for establishing the electricity delivered to the grid is installed at the transaction point in Renun power plant. This electricity meter will be the main meter (revenue meter) that measures the quantity of electricity supplied to the grid that will be paid by the PLN. As this meter provides the main VCS measurement, it will play a key role in the verification process.

The project developer owns the meter and is responsible for its maintenance and calibration, as stated in the SOP's agreed upon with the PLN. PLN and its representative are entitled to be present during any test, inspection, maintenance, and replacement of any part of the metering system, which will be performed by the meter manufacturer or designated national body, on request of the project developer.

To ensure maximum data availability and to introduce data quality controls, two check meters are installed in addition to the revenue meter for each power generation unit. Those meters are located at the Renun power station, measuring electricity production from the project and own consumption. The accuracy class of the check meter is 1.

Electricity meters have met the relevant local standards at the time of installation. Before the installation of the meters, they were calibrated by the manufacturer on July 28, 2005 (at Balai Pengelolaan Laboratorium Kemetrologian[1]). The meters installed by the project developer according to the manufacturer's standard (ACTARIS). Records of the meter (type, make, model and calibration documentation) is shown in the Table 1 below.

3.3 Monitoring parameters

The parameters monitored applied for the determination of the emission reductions is described in detail in section 3.3 of the VCS Project Document v.3.1 dated 17th January 2011.

The simplified diagram of all measurement devices installed and their relative position is presented in Figure 1 below. Primary instruments are shown with numbers. The primary instruments include:

- Total net electricity transferred, as measured by two electricity meters with code name MU1, MU2 located at the transaction point (150 kV transmission line) as main data.
- Total diesel oil consumption for two emergency diesel generators located at Power House and Main Intake.

[1] Indonesian Certified Calibration Office

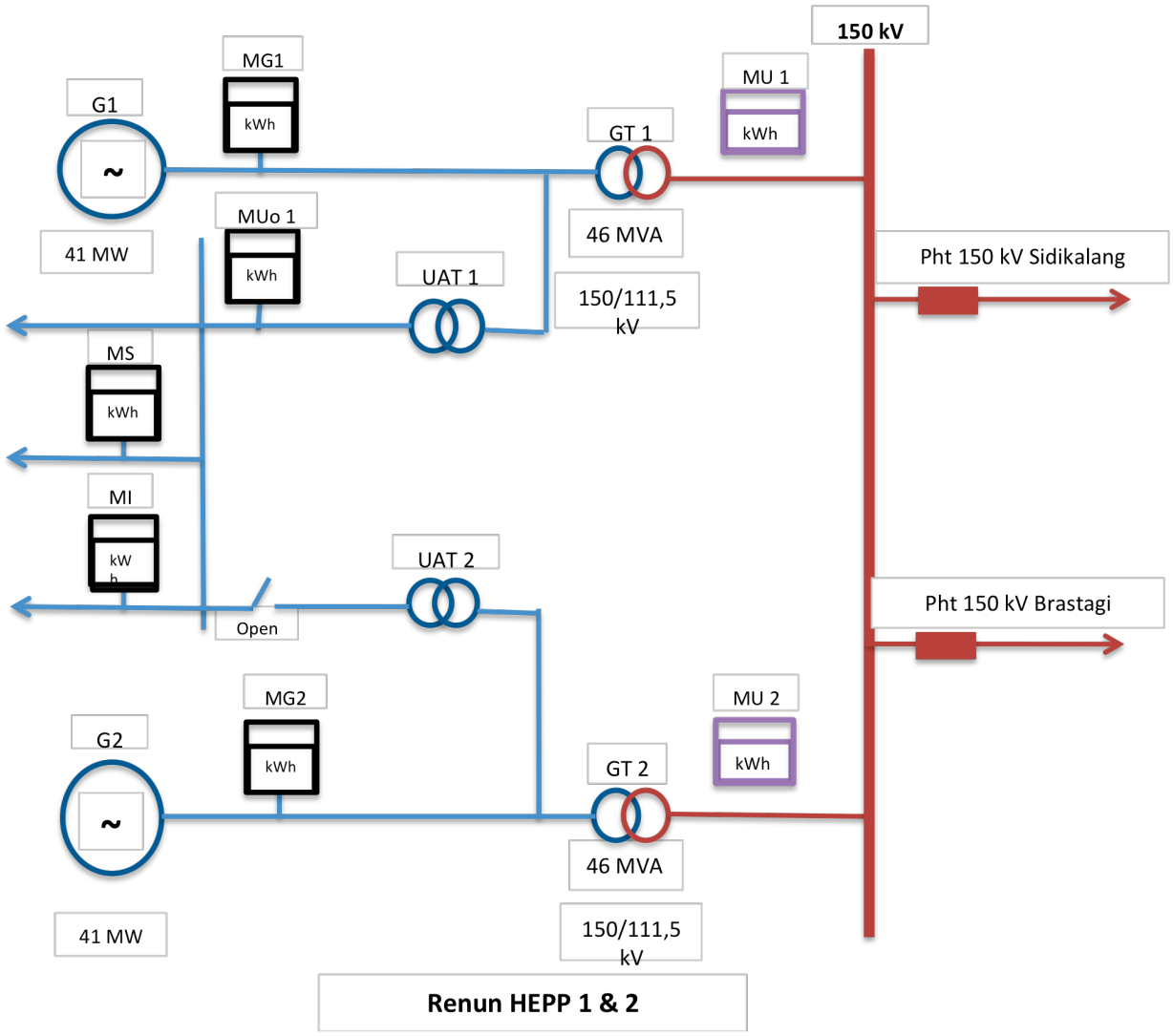


Figure 1 Project's Simplified Schematic Diagram, including relative position of its metering devices

Table 1 below summarizes parameters that are monitored against requirement in the VCS-PD. Readings from all instruments listed in this table are logged on the basis as mandated by the PD.

Table 1. Key monitored parameters, its relevant instrument, and estimated values in the PD.

PD Ref	Output of measurements	Unit	Source of Data as required in section 3.3 of PD	Instruments Installed Instrument's Accuracy
EG_y (VCS PD page 28)	Net electricity supllied to the grid by the project activity during the year y	kWh	**kWh meter at project activity site (switchyard)** The electricity generation's data used for monitoring is the monthly electricity generation/protocol report "Berita Acara tentang Penyerahan dan Penerimaan kWh Penyaluran" delivered to grid. This monthly report was signed by both	**Main Meter:** Digital Watt-hour meter ACTARIS SL7000, Class 0.2 **Serial Number :** Meter from Generation Unit 1 (MU-1): 36027216 Meter from Generation Unit 2 (MU-2): 36027222

			parties of generation department and transmission department (as Joint Meter Reading). These readings are taken from main meter located in main control house, which acts as the transaction point. These readings are also stored in a computer based on SCADA system. Hence there are no possibilities of manual errors to be occurred during the transposition between data sets.	**Cross-check Meter (sub-station)_:** Type OWO9HPVR, analog, OSAKI Electric, Class 1.0 (same for all kWh meters) **Serial Number:** Meter at Sidikalang : 0629076 Meter at Berastagi : 0629078
				Check Meter (at each Power Generation Unit) : Type ELB7W6a, analog, SCHLUMBERGER, Class 1.0 (same for all kWh meters) **Serial Number:** Meter at Generator 1 : 4674483 Meter at Generator 2 : 4674482 Meter at PS 1 (Own Consumption) : 4674485 Meter at PS 2 (Own Consumption, Digital, ACTARIS, Class 0.2) : 36027194
				Calibration Interval: Meters at the generation unit and the transmission sub-station will be calibrated once every five-year according to the national regulation [2].
$FC_{i,y}$	Amount of diesel fuel used in the hydropower plant operation during the year y	litre	Calculated- Diesel fuel operational logbook	Fuel consumption will be recorded monthly, specifically for each fuel (currently only diesel consumption is available). Fuel consumption is calculated from the monitored running hours on monthly operation report of the diesel generators, converted to litres using the diesel oil consumption per hour, from engine manufacturer datasheet on 100% load. Then, litres shall be converted to tonnes using fuel specific density or scientifically proven fuel densities.
				QA/QC procedures to be applied: N/A
				Any comment: Fuel consumption will only occur in emergencies when power plant is not operational and the grid is also not available, a confluence of

[2] The Ministry of Mineral and Energy Resource's regulation Number 37 year 2008

				events which is expected to happen very rarely; at other times the plant will run on grid electricity. Emergency diesel genset is only for critical instrument/control system during turbine trip and shutdown. For this monitoring period (from 01 April 2009 to 31 March 2010), fuel consumption calculation is based on the diesel purchase receipts. However, from the next monitoring period onwards, fuel consumption is calculated from the monitored running hours on monthly operation report of the diesel generators, as above.

Table 2. Fix ex-ante parameters, its relevant instrument, and estimated values in the PD.

PD Ref	Output of measurements	Unit	Source of Data as required in section 3.3 of PD
$EF_{grid,CM,y}$	Grid emission factor of Sumatra	tCO_2/MWh	DNA of Indonesia http://dna-cdm.menlh.go.id/id/database Filename "DNA CDM_Grid_Sumatera_JAMALI_2008". EF value for Grid Sumatera: 0.743
$NCV_{i,y}$	Net caloric value of diesel fuel	GJ/kg (1 GJ/kg = 1 TJ/ton)	2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook volume 2 chapter 1 Table 1.2: IPCC default value: 0.043
P_i	Density of diesel fuel	kg/m^3	Pertamina diesel fuel specification[3] Value used: 0.815 kg/litre or 815 kg/m^3
$EF_{CO2,i,y}$	Weight average CO_2 emission factor of diesel fuel in year'y'	tCO_2/TJ	IPCC default values is used (Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook volume 2 chapter 1 Table 1.4) IPCC default values: 74.1

Metering the net electricity supplied to the grid by the project activity during the year y

Renun HEPP is following the "Prosedur Pembuatan BA Pengiriman Energi Listrik PLTA Renun" or the 'Procedure to develop Renun HEPP Monthly Electricity Protocol Report' as the detail procedure for Electricity Transfer to the Sumatera Grid. This procedure is a further development refer to the general operational procedure for PLN generation unit located in the North and South Sumatera title, "Prosedur tetap transfer tenaga listrik antara PT PLN (Persero) Pembangkitan Sumbagut, PT PLN (Persero) Pembangkitan Sumbagsel dengan PT PLN (Persero) P3B Sumatera"

By this SOP the data could be retrieve from procedural as follows:
1. Automatic Meter Reading (AMR)
2. Local Download (LD)
3. Remote Reading (RR)
4. Stand meter reading (Renun HEPP follows this procedure)

Stand meter reading

- Joint meter reading by operator from Generation Unit (Unit Pembangkitan / UP) and Transmission Service Unit (Unit Pelayanan Trasmisi / UPT P3B) conducted on the first date of each month at 10 A.M

[3] Pertamina Solar Characteristic

- Operating and maintenance supervisor (O & M supervisor) responsible for recording the amount of EG exported by Generation unit as the result from kWh meter downloading.
- Operating and maintenance supervisor responsible for constructing the electricity generating protocol report which includes calculation of net electricity delivered to PLN transmission unit. This report has to be reported and signed by Unit Manager, which will then be further reported to the Sector Manager. VCS manager will have the copy of such report and be notified as well.
- O & M supervisor with other authorized staff from Generation unit will extract the data by downloading via computer from the kWh electronic meter and then record it in the form of Monthly Electricity Protocol (MEP) which shall be signed by both Generating unit (PLN Renun Generation Unit) and PT. PLN (transmission unit). The joint meter reading taken at the transaction point is witnessed by the presence of P3B officials as transmission department and the PP representative as generation department.
- The MEP will be then rechecked by authorized person from transmission unit for Pandan sector.

After all such information is rechecked and agreed by all related parties, the MEP will be signed by all authorized parties from Generation unit and Transmission unit. The report will thus be sent to PLN Medan as headquarter for all power plant units in North Sumatra.

Main meter failure – use of check meter data

If the main electricity meter is found to be faulty during its reading, data from the production and own consumption meter will be used in its place. In this circumstance, the electricity exported to the grid should be calculated as follows:

a) The data from the production and own consumption meter will be used for the period of the main meter failure. with a minor adjustment to allow for transmission losses.
b) The electricity used and measured for own consumption should be deducted from the produced electricity measured. The difference will be equal to the net electricity produced.

Check meter failure

A failing cross-check meter will be repaired or replaced by an accredited equipment testing organization appointed by PLN. Maintenance records and any calibration documents will be retained by the project and ensured by the operation and maintenance supervisor that the calibration documents comply with calibration requirements. In case of a check meter failure simultaneously to a main meter failure no electricity produced can be measured and therefore no credits can be claimed.

Possible fault with either meter

During the process of checking the electricity data from the meters, a difference may be established that is considerably larger than the historic difference (allowing for transmission losses). In this unlikely event, it could be either electricity meter at fault. The data recording procedures for this circumstance will be specified in a separate procedure.

3.4 Monitoring management and operational system

PLN Sector Pandan (covering several power plant units, including Renun) performed general internal and external audits on management, ISO 9001, ISO 14001 and OHSAS. Several findings and non-conformities were addressed; all of those issues are related to management, safety, health, financial report and waste handling.

The annual internal audit was performed on several section/subjects as required by PLN Pandan Sector Management, focusing on several new issues apart from the powerplant operational and technical issues.

The external audit was performed to re-new the ISO certificates. The ISO 9001:2008 certificate valid from 23 February 2010 until 03 January 2013. The ISO 140001:2004 certificate valid from 19 February 2008 until 04

January 2011. The OHSAS certificate valid from 06 February 2008 until 06 February 2011. All certificates have been re-audit or still valid during the present monitoring period (01 April 2009 – 31 March 2010).

The external and internal audit results showed no VCS related issue from auditor findings.

The monitoring team has been established and integrated within the existing organization structure of Renun hydropower plant prior to the start of the verification. Clear roles and responsibilities is assigned to all staff involved in the VCS project and the prospect of nominating a VCS Manager have been considered. The VCS Manager has the overall responsibility for the monitoring system on this project.

VCS team has been required to do several key monitoring system features including:

a. VCS staff training
b. VCS data and record keeping arrangements
c. Data collection
d. VCS data quality control and quality assurance
e. Equipment maintenance
f. Equipment calibration
g. Equipment failure

South Pole has organized one time Monitoring training as introduction for all VCS team at the project site location. During the monitoring period, VCS team is responsible to collect, record and data keeping and quality control for all VCS data needed. Details about the monitoring management including roles and responsibilities of related personnel, QA/QC of parameters monitored and procedures for accounting for missing key parameters and other details can be found in the SOP Monitoring Plan.

The Lau Renun Unit Office provides SOPs for equipment maintenance, calibration and failure as describe below:

1. Standard Operational Procedure (SOP) Renun HEPP (procedure for plant operational)
2. SOP to calibrate the Test and Measurement equipments.
3. SOP to develop an Electricity Transfer Monthly Protocol Report
4. SOP for Electricity Transfer
5. SOP for Emergency Response

Renun HEPP VCS team will continue to follow those SOP during the monitoring period.

VCS data collection and record keeping arrangements

As explained on the 1st paragraph of section 3.2, the only data to be monitored is electricity supplied to the grid by the project. Every month the Operation Supervisor from Renun Generation Unit (member of VCS Team) and Transmission Sub-station read the meter together and record the data on their journal. Based on this reading, they develop a monthly electricity generation report signed by both parties of generation department and transmission department. These readings are also stored in a computer based on SCADA system located at the Pandan Sector office. Hence there are no possibilities of manual errors to be occurred during the transposition between data sets.

3.5 Accuracy of monitoring equipments

The accuracy of the monitoring results are in conformity with calibration requirements, recording frequency and quality assurance and quality control procedure stated in the monitoring plan.

3.5.1 Calibration of monitoring equipments

The following is the calibration status of the monitoring equipment during this period:

Meter Tag Number	Parameter measured	Serial Number	Duration of calibration mentioned in the	Latest calibration date	By	Next calibration date

			PD			
MU 1	Net electricity generation supplied to the Grid from Generation Unit 1	36027216 ACTARIS Class 0.2	Once every five-years	28 July, 2005	External calibration (Balai Pengelolaan Laboratorium Kemetrologian)	Latest July 2010
MU 2	Net electricity generation supplied to the Grid from Generation Unit 2	36027222 ACTARIS Class 0.2	Once every five-years	28 July, 2005	External calibration (Balai Pengelolaan Laboratorium Kemetrologian)	Latest July 2010

3.5.2 Monitoring equipment malfunctions

There was no metering devices breakdown or malfunction during the following monitoring period. All the meters listed above have performed well. However, any plant shut down or any other malfunctions are recorded in the logbook. In case of failure of the main meter, will use the production meter and the plant own consumption meter (which were also located at generation site of each power generation unit) as cross-check meters, measuring the quantity of electricity exported from the project. The difference between electricity produced and consumed on-site shall be valid for claiming carbon credits. In the special case of total failure of all meters no credits will be claimed during such period.

4. Emission Reduction calculations

The formulas used for calculation are in accordance with the approved methodology ACM0002 – Consolidated baseline methodology for grid connected electricity generation from renewable sources (Version 10, EB 47).

4.1 Baseline Emissions

4.1.1 Formula used for baseline emissions calculation

The formula used for determination of the baseline emissions are described in section 4.3 of the Project Document v.3.1 dated 17th January 2011.

Baseline emissions are calculated as follows:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ (1)

Parameter	Description	Unit	Value	Source
BE_y	Baseline emission during the period y	tCO_2/year	197,295	Equation (1)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y	MWh/yr	265,538	Electricity Transfer Protocol Report
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y	tCO_2/MWh	0.743	Indonesian DNA published grid emission factor for Sumatra.

4.1.2 Baseline emissions calculation

Date	Month	Year	EG Facility	BEy

From	To			(MWh) *Actual monitored value*	
1	30	Apr	2009	28,930	21,495
1	31	May	2009	23,103	17,166
1	30	Jun	2009	18,835	13,994
1	31	Jul	2009	16,594	12,329
1	31	Aug	2009	17,384	12,916
1	30	Sep	2009	19,054	14,157
1	31	Oct	2009	24,698	18,351
1	30	Nov	2009	23,867	17,733
1	31	Dec	2009	28,028	20,825
1	31	Jan	2010	21,172	15,731
1	28	Feb	2010	19,836	14,738
1	31	Mar	2010	24,037	17,859
			TOTAL	**265,538**	**197,295**

4.2 Project Emissions

4.2.1 Formula used for project emissions calculation

The formula used for determination of the baseline emissions are described in section 4.3 of Project Document v.3.1 dated 17 January 2011.

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (2)$$

Parameter	Description	Unit	Value	Source
PE_y	Project emission in year y	tCO_2e/yr	Calculated	Equation (2)
$PE_{FF,y}$	Project emissions from fossil fuel consumption in year y	tCO_2/yr	Calculated	"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
$PE_{GP,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y	tCO_2/yr	0	Project activity is not a geothermal powerplant.
$PE_{HP,y}$	Project emissions from water reservoirs	tCO_2/yr	0	Lau Renun HEPP is a run-off river hydro powerplant.

Project emissions from the consumption of fossil fuels

$$PE_{FF,y} = PE_{FC,j,CO2},$$

$$PE_{FC,j,CO2} = \Sigma FC_{i,j,y} \times COEF_{i,y} \quad (3)$$

$$\Sigma FC_{i,j,y} = T_{DG} \times EFC \times Pi \quad (4)$$

Parameter	Description	Unit	Value	Source

$PE_{FC,j,CO2}$	CO_2 emissions from fossil fuel combustion in process j during year y	tCO_2/y	3.12	Equation (3) % PEy to Bey = 0.0000158 Note: because Project Emission (PE) is less than 1%, here PE is neglected (value considered to be zero)
$FC_{i,j,y}$	Quantity of fuel type I combusted in process j during the year y	ton/y	0.08	Equation (4)
$COEF_{i,y}$	CO_2 emission coefficient of fossil fuel type i in year y	tCO_2/ton	3.1863	Equation (5)
i	Fuel types combusted in process j during year y	-	i= Diesel oil	Lau Renun HEPP
T_{DG}	Emergency Diesel Generator Set running hour	hour	Measured	Renun HEPP
EFC	Engine Fuel Consumption of diesel generator set	Litre/hour	154	Fuel consumption Prime Power (100% load)
Pi	Fuel Density	Ton/litre	0.000815	Pertamina Diesel Fuel Specification (unit converted into ton/litre)

$COEF_{i,y}$ is calculated using option B. Option B calculates $COEF_{i,y}$ based on net calorific value and CO_2 emission factor of fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i} \quad (5)$$

Parameter	Description	Unit	Value	Source
$COEF_{i,y}$	CO_2 emission coefficient of fossil fuel type i in year y	tCO_2/ton	3.1863	Equation (5)
$NCV_{i,y}$	Weighted average net calorific value of fuel type i in year	GJ/kg	Diesel Fuel: 0.043	IPCC 2006 default for diesel oil
$EF_{CO2,i}$	Weighted average CO_2 emission factor of fuel type i in year y	tCO_2/GJ	Diesel Fuel: 0.074	IPCC 2006 default for diesel oil
i	Fuel types combusted in process j during year y	-	i=Diesel oil	Lau Renun HEPP

Leakage

According to the methodology, leakage from related emission sources do not need to be considered, thus leakage is zero.

$L_y = 0$

4.2.2 Project emissions calculation

Date		Month	Year	Fuel Consumption (litre)
From	To			
1	30	Apr	2009	100
1	31	May	2009	100
1	30	Jun	2009	100
1	31	Jul	2009	100
1	31	Aug	2009	100
1	30	Sep	2009	100
1	31	Oct	2009	100
1	30	Nov	2009	100
1	31	Dec	2009	100
1	31	Jan	2010	100
1	28	Feb	2010	100
1	31	Mar	2010	100
			TOTAL	**1,200**

Conversion Factor:

Density diesel fuel = 0.815 kg/litre = 0.000815 ton/litre.

Date		Month	Year	Fuel Consumption (ton)	pEy
From	To				
1	30	Apr	2009	0.08	0.26
1	31	May	2009	0.08	0.26
1	30	Jun	2009	0.08	0.26
1	31	Jul	2009	0.08	0.26
1	31	Aug	2009	0.08	0.26
1	30	Sep	2009	0.08	0.26
1	31	Oct	2009	0.08	0.26
1	30	Nov	2009	0.08	0.26
1	31	Dec	2009	0.08	0.26
1	31	Jan	2010	0.08	0.26
1	28	Feb	2010	0.08	0.26
1	31	Mar	2010	0.08	0.26
TOTAL				**0.98**	**3.12**
% PE_y to BE_y					**0.0000158**

Since total $PE_{FC,j,CO2}$ accounts for **less than 1%** of the baseline emissions, and in accordance with ACM0002 version 10, the project emission can be neglected. Therefore $\mathbf{PE_y = 0}$.

4.3 Emission Reductions

4.3.1 Formula used for emission reductions calculation

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$ (3)

Parameter	Description	Unit	Value	Source
ER_y	Project emission in the period y	tCO_2e	Calculated	Equation (3)
BE_y	Baseline emissions in the period *y*	tCO_2e	Calculated	Equation (1)
PE_y	Project emissions in the period *y*	tCO_2e	Calculated	Equation (2)

4.3.2 Emission emissions calculation

BE_y	197,295	ton CO_2
PE_y	0	ton CO_2
ER_y	197,295	ton CO_2

5. Environmental Performance

Since the Project commencement, one set of environmental assessment report for the local environmental agency had been developed in April 2006, which covers the monitoring period of April to June 2006. The subsequent environmental performance test was carried out for the monitoring report submission. Table below show the conclusion of the environmental assessment report as summarized in Chapter III of the report[4].

Parameter monitored	Conclusion
Land utilization	There was an increase / reduction in use of space, land and soil, both the building and the local community's plantation. But in general, no major issues occur for this parameter.
Water Quality: - pH	The average pH of Renun river and its 11 creeks are lower than the previous monitoring period. No major impact to the water quality in overall.
Air Quality: - Dust - Noise	The operations of machinery and vehicle have low impact to the local community who live around the project site area, because: - The nearest village located quite far from the project site. - The operations of machinery and vehicle are not only focus in one place but spread on several locations Mitigations: To avoid flying ashes during dry season, project owner constantly watering the road that mainly use as transportation medium of the project vehicle.

6. Conclusion

From 01 April 2009 to 31 March 2010, the project activity has performed satisfactorily and achieved a total emission reduction of 197,295 tCO_2, which has been calculated according to the approved methodology set out in the VCS PD version 3.1. The monitoring of required parameters is in accordance with the approved monitoring methodology as described in the VCS PD.

The company management also believes that its VCS Team has taken all reasonable efforts to maintain credibility of data through proper administration and supervision. To evaluate the monitoring report for each monitoring period, the VCS Team (PT PLN (Persero) Generation Sector Pandan) held a management review

[4] Please refer to submitted document "RKL RPL 2006 Sem I.doc"

once for every monitoring period, at end of the monitoring period. For current monitoring period, the management discussed some points such as calibration, evaluation operation, coordination with P3B, etc (complete management review result was attached).

Appendix 1 Complete Emission Reduction Xcel Sheet calculation

Project Name: Renun Hydro Power Plant

Emission Reductions

Vintage Year		BEy	PEy	ER
1 April 2009	- 31 March 2010	197,295	-	197,295
	Total	197,295	-	197,295

Note : this PE value is smaller than 1% of BE (197,295), therefore PE is neglected

Baseline emission calculation

Baseline Emission

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (6)$$

Grid EF	0.743 tCO2/MWh

Year	Vintage Month	EG facility (MWh)	BEy
2009	1 - 30 April	28,930	21,495
2009	1 - 31 May	23,103	17,166
2009	1 - 30 June	18,835	13,994
2009	1 - 31 July	16,594	12,329
2009	1 - 31 August	17,384	12,916
2009	1 - 30 September	19,054	14,157
2009	1 - 31 October	24,698	18,351
2009	1 - 30 November	23,867	17,733
2009	1 - 31 December	28,028	20,825
2010	1 - 31 January	21,172	15,731
2010	1 - 28 February	19,836	14,738
2010	1 - 31 March	24,037	17,859
Total		265,538	197,295

Project Emission calculation

Project Emission from consumption of fossil fuels, $PE_{CO2,fossil\ fuel,y}$

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (4)$$

COEFi,y	tCO2/t Diesel	3.1863
Fuel density	kg/m3	815

Year	Date		Month	Fuel consumption (t)	PE_y (t CO_2/yr)
	From	To			
2009	1	30	April	0.08	0.26
2009	1	31	May	0.08	0.26
2009	1	30	June	0.08	0.26
2009	1	31	July	0.08	0.26
2009	1	31	August	0.08	0.26
2009	1	30	September	0.08	0.26
2009	1	31	October	0.08	0.26
2009	1	30	November	0.08	0.26
2009	1	31	December	0.08	0.26
2010	1	31	January	0.08	0.26
2010	1	28	February	0.08	0.26
2010	1	31	March	0.08	0.26
Total				0.98	3.12
% PEy to Bey					0.0000158

Note :

Because Project Emission (PE) is less than 1%, so PE is neglected

Appendix 2 Standard Operating Procedures

List of submitted Standard Operating Procedures

SOP Number	Title	Content
SOP - PLTA - 01	Standard Operational Procedure PLTA Renun	Preparation of Unit, Turbine and Generator. How to start and stop the machinery, water filling the regulating pond, etc.
-	Standard Operating Procedure (SOP) Kalibrasi Alat Ukur dan Alat Uji	The description of procedure, calibration flow chart, calibration form template and responsible persons involved and their responsibilities.
-	Standard Operation Procedure (SOP) Tim Siaga Tanggap Darurat (Emergency Response)	Describe about 'Emergency Response Team' organization structure, Job title of each member and the job description, and also steps to do the emergency responses.
SOP on Electricity Energy Transfer	a.Prosedur Tetap Transfer Tenaga Listrik antara PT.PLN Pembangkitan Sumbagut, PT. PLN Pembangkitan Sumbagsel dengan PT. PLN (P3B) Sumatera. b.Prosedur pembuatan BA (Berita Acara) Pengiriman Energi Listrik PLTA Renun	SOP for electricity transfer to the Sumatera Grid (General procedure) Procedure to develop Renun HEPP Monthly Electricity Protocol Report (Detail procedure)