

SANİBEY DAM and HYDROELECTRIC POWER PLANT



SANİBEY BARAJI ELEKTRİK ÜRETİM VE TİCARET A.Ş.

Document Prepared by Gaia Carbon Finance



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SANİBEY BARAJI ELEKTRİK ÜRETİM VE TİCARET A.Ş. is a sub company of SANKO ENERJİ

¹ The project has not been registered to VCS Database yet. Therefore, "Project ID" is not available at this stage.

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1 PROJECT DETAILS

1.1 Summary Description of Project

Sanibey Baraji Elektrik Uretim ve Ticaret A.S., a subsidiary of Sanko Enerji A.S. installed a hydro power plant in Adana, Turkey. The objective of the Sanibey Dam and Hydroelectric Power Plant (Sanibey Dam & HEPP) is to generate electricity and supply it into the public grid. Due to its significant contribution to climate change mitigation and sustainable development in the region, this project is expected to fulfil the requirements of VCS rigorously.

The project activity was originally developed under the name of “Yedigoze Dam & HEPP” by Yedigoze Elektrik Uretim ve Ticaret A.S. In parallel with the demand of executive board members, both the company name and consequently the name of the project have recently been changed to “Sanibey Baraji Elektrik Uretim ve Ticaret A.S.” and “Sanibey Dam & HEPP” respectively. The board decision was taken on 08/06/2011 with the decision number 13. Sanibey Dam & HEPP is comprised of the construction of a dam and a green field 310.66 MWe hydroelectric power plant located in the Seyhan river basin, in Turkey’s Eastern Mediterranean Region. In order to generate energy, a dam, having a body of concrete faced rock fill and a HEPP have been constructed. Generally describing; a spillway is located on the left bank of the river bed; also energy structures consisting of two penstocks and a power plant building including two units having outputs of 155.33MWe each are located on the downstream of the dam body. Besides, diversion structures containing two tunnels one of which is used as a sluiceway outlet and the second one is containing valve house are located on the left bank. Once the project is accomplished, a separate project will also be carried out by the State Hydraulic Works (DSI) which envisages the provision of irrigation of 75,000ha of land in Imamoglu region.

It is estimated that the electricity production of the proposed project is going to be 966.53 GWh/year for the first fifteen years. When the full development scenario takes place after fifteen years, which means the time when the dam water will also be used for irrigation of 75.000 ha area of land, the annual electricity production will drop to approximately 768.66 GWh to supply the national grid using a renewable resource and tapping the significant hydropower potential in the region.

The project activity reduces greenhouse gases (GHGs) emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources. The average annual emission reductions of the proposed Project for the crediting period are estimated as 524,729 tonnes of CO₂e according to the estimated annual electricity generation figure in the feasibility study report.

Project Technology:

The following table shows a full detail of the project’s technical specifications:

Dam and Cofferdams		
Type		Concerete Faced Rock Fill
Height above Thalweg	M	105
Height above Foundation	M	130

Crest Width	M	8
Crest Length	M	400
Crest Elevation	M	240
Diversion and Bottom Outlet		
Type of Cross Section		Circular
Diameter	M	8
Length	M	891; 850
Number of Units		2
Spillway		
Type		Radial
		Chute and Flip Bucket
Sill Elevation		221.5
Maximum Capacity of Spillway	m3/s	9000
Penstock		
Type		Above ground
Number of Units		2
Diameter	M	6.3
Length	M	393;382
Power Plant Building		
Type		On the ground
Height	M	58.5
Length	M	65.3
Width	M	48.65
Turbines		
Type		Vertical axis FRANCIS
Number of Units		2
Unit Rated Power	kW	158,500
Total Installed Capacity	kW	310,660
Transformer		
Type		Outdoor Type, oily, three phased
Number of Units		3
Power of a Unit	MVA	175
Voltage	kV	14.4/380

The turbine and generator manufacturer of the project is Alstom. The manufacturer is a French company, acclaimed for its integrated power plants, power production services and air quality control systems. Alstom has been selected as the equipment provider because of its reliable quality products and technology, which is a grid friendly technology with low maintenance needs as well as low noise and low environmental impacts.

The project was commissioned in two phases. The first phase started on 2nd December 2010 while the second phase started on 26th January 2011.

This monitoring period is from 02 December 2010 to 31 May 2012. The total emission reduction of the monitoring period is 853,840 tCO₂e.

1.2 Sectoral Scope and Project Type

According to Annex A of the Kyoto Protocol, the Project fits in:

Sectoral Scope Number : 1

Sectoral Scope : Energy Industries -Renewable Energy

Sanibey Dam & HEPP is not a grouped project.

1.3 Project Proponent

Name : SANIBEY BARAJI ELEKTRİK ÜRETİM SANAYİ VE TİCARET A.Ş.

Address : SANKO Enerji –İsko Subesi Organize Sanayi Bölgesi 3.Cadde İnegöl/Bursa
TURKEY

Web : www.sankoenerji.com.tr

Contact person : Mr. Taner ŞENGÖNÜL

Tel : + 90 224 280 77 00

Fax : +90 224 714 93 10

Roles/responsibilities : Representing the project owner, analyzing the documents related to the carbon finance of the project, coordinating internal departments with the carbon consultant.

1.4 Other Entities Involved in the Project

Name : Gaia Finansal Danışmanlık Hiz. Tic. Ltd. Şti. (GAIA CARBON FINANCE)

Address : Zafer Sok. Manuel Apt. No:11/4 Şişli 34371 İstanbul / TURKEY

Web : www.gaiacf.com

Contact person : Mr. Serkan DÜNDAR

Tel : + 90 212 224 04 50

Fax : + 90 212 224 04 66

Roles/responsibilities : Development of Baseline, PDD and Monitoring Report

1.5 Project Start Date

Project start date: 2nd December 2010 (Date on which the project commenced electricity production)

1.6 Project Crediting Period

The crediting period of the project begins with the commissioning of the plant. The exact commencement date for the plant is the day of first documented supply to the grid. It is estimated that the Project will reduce 524,729 tCO₂e annually, generating an expected total of 5,209,598 tCO₂e for the duration of the initial 10-year crediting period. VCS project crediting period will be renewed once which will make the total crediting period as 20 years. The project started to generate electricity on December 2nd, 2010. The end date of the first crediting period is 1st of December 2020.

1.7 Project Location

The Project site is located in the Seyhan river basin in Turkey, in Eastern Mediterranean Region, in the boundaries of Imamoglu and Aladag district, Adana province; the project is located between 37°24'- 37°38' north latitudes and 35° 25'- 35° 35' east longitudes. The following figures show the project's location.

1.8 Title and Reference of Methodology

Approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources, Version 12.1.0"³ was applied. In addition, as referred in the methodology, "Tool to calculate the emission factor for an electricity system, Version 02"⁴ was applied. Also, to prove additionality, "Tool for the demonstration and assessment of additionality, Version 05.2"⁵ was applied.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The construction of the project started on 01.07.2007. The first unit started operation on 2 December 2010. The second unit was commissioned on 26 January 2011. Please see the table below for the important dates for the implementation of the project activity:

Event	Date
Stakeholder consultation	December 12 th , 2006
Financial analysis of the project	December 5 th , 2006
First VER consideration	December 5 th , 2006
Investment Decision	December 25 th , 2006
Feasibility report	November 2007
Contract signature for the construction-point of no return	July 1 st , 2007
Start of construction	July 1 st , 2007
EIA approval (by the Ministry of Environment and Forestry)	July 6 th , 2007
Contract signature for the equipments	March 20 th , 2008
Loan signature	September 3 rd , 2008
Contract with a PDD consultant	February 1 st , 2011
Contact with a DOE	August 2011
Commissioning date of the first unit	December 2 nd , 2010
Commissioning date of the second unit	January 26 th , 2011

Power plant operated normally during this monitoring period. There have been no emergencies happened to the monitoring system in this monitoring period. No faulty measurement or no

³ <http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L/view.html>

⁴ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.pdf>

⁵ <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v5.2.pdf>

measurement differences between the meters occurred. Therefore, no calibration happened. The electricity generation of the power plant also realized close to the estimation in the PDD.

2.2 Project Description Deviations

During the monitoring plan, the following deviations are determined and the monitoring plan in the Project Description is revised:

- The source of the parameter “Quantity of net electricity generation supplied by the project plant/unit to the grid in year y” was given as “Monthly Meter Reading Protocols” in the VCS PD. However, since TEIAS started to measure the produced electricity remotely, Monthly Meter Reading Protocols are not available. Therefore, the source of the parameter is defined as “Market Financial Settlement Center (PMUM) records which includes the exact electricity productions and tractions. PMUM records are the basis of the invoices made out to TEIAS.
- The source for the cross-check of the amount of produced electricity is also revised as “Monthly Reports of internal SCADA System”
- The description of measurement methods and procedures to be applied for the parameter “*A_{PJ}: Area of the regulation pond measured in the surface of the water, after the implementation of the project activity*” was given as “Measured from topographical surveys, maps, satellite pictures, etc” and the QA/QC Procedures procedure to be applied was defined as “The readings will be done during the period when the water flow is high to have the largest reservoir area” However, the “QA/QC Procedures to be applied” is revised as “The reservoir area mentioned above is the maximum reservoir area at maximum altitude. This water level only occurs at the Q500 flood discharge” and the calculation method is defined as “The reservoir area is calculated by a topographical engineer based on the map showing the reservoir area at the maximum altitude.”
- In the VCS PD it is mentioned that “*The Electrical Engineers will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter’s reading and calibration and reading’s recording, adjustment and reporting every year. If new personnel are hired, they will have to follow up a training program and will be trained in the specific skills required to carry out the Monitoring Plan*” However, the electrical engineers are not trained in terms of meter readings and calibration, since the meter readings are made by TEIAS in every month remotely and the company is not responsible for the calibration of the meters.

2.3 Grouped Project

N/A

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	EF _{grid,CMY}
Data unit:	tCO ₂ /MWh
Description:	Baseline emission factor: the combined emission factor of the project grid system.” Tool to calculate the emission factor for an electricity system”
Source of data:	Validated VCS Project Description (Version 08) of

	the Project.
Value applied:	0.5429
Purpose of the data:	Used for baseline emission calculation.
Any comment:	EF _{grid,CMY} value (0.5429 tCO ₂ /MWh) is valid for the duration of the crediting period.

3.2 Data and Parameters Monitored

Data Unit / Parameter:	EG _{facility,y}									
Data unit:	MWh									
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y									
Source of data:	PMUM (Market Financial Settlement Center) records (Monthly Reports of internal SCADA System are cross-checked)									
Description of measurement methods and procedures to be applied:	Two sets of meters (A main and a backup meter for both units) measuring continuously then calculate the net electricity generation supplied by the project to grid.									
Frequency of monitoring/recording:	Measuring continuously/ recording monthly									
Value monitored:	Net electricity generation figures are: <u>2010</u> : 58,515.95 MWh <u>2011</u> : 942,683.58 MWh <u>2012</u> : 571,542.11 MWh									
Monitoring equipment:	<p>The model of the meters is Actaris SL761A and the serial numbers of the meters are:</p> <table border="1"> <thead> <tr> <th></th> <th>Main meter</th> <th>Check meter</th> </tr> </thead> <tbody> <tr> <td>Unit 1</td> <td>53042206</td> <td>53042208</td> </tr> <tr> <td>Unit 2</td> <td>53042209</td> <td>53042207</td> </tr> </tbody> </table> <p>The meters are firsthand and the supplier company commits that these meters fully conforms or exceeds all relevant IEC standards including those dealing with electronic metering equipment IEC61036 for class 1 equipment and IEC60687 for class 0.2S equipment. There is no possibility for human error in the measurement of the electricity. All the measurements and calculations are done via tested meters.</p>		Main meter	Check meter	Unit 1	53042206	53042208	Unit 2	53042209	53042207
	Main meter	Check meter								
Unit 1	53042206	53042208								
Unit 2	53042209	53042207								
QA/QC procedures to be applied:	<p>Cross check measurements results with records for sold electricity.</p> <p>Calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.</p>									

Calculation method:	$EG_{Facility,y} = EG_{export,y} - EG_{import,y}$
Any comment:	-

Data Unit / Parameter:	Cap _{PJ}
Data unit:	MWe
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Description of measurement methods and procedures to be applied:	The installed capacity will be determined based on recognized standards.
Frequency of monitoring/recording:	Yearly
Value monitored:	310.66 (2 x 155.33 MWe)
Monitoring equipment:	The data is monitored from the information on the equipment on site and from the Provisional Acceptance Letter which was approved and signed by the representative of the supplier company, Alstom Power Ltd. Şti. In addition, the installed capacity was checked with the electricity generation license which was granted by Energy Market Regulatory Authority. The company has not made any change on the project design up to know and therefore, there is no increase or decrease in the installed capacity of the power plant.
QA/QC procedures to be applied:	-
Calculation method:	N/A
Any comment:	-

Data Unit / Parameter:	A _{PJ}
Data unit:	m ²
Description:	Area of the regulation pond measured in the surface of the water, after the implementation of the project activity.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc
Frequency of monitoring/recording:	Yearly
Value monitored:	14,299,205.54 m ²

Monitoring equipment:	-
QA/QC procedures to be applied:	The reservoir area mentioned above is the maximum reservoir area at maximum altitude. This water level only occurs at the Q500 flood discharge.
Calculation method:	The reservoir area is calculated by a topographical engineer based on the map showing the reservoir area at the maximum altitude.”
Any comment:	Please see Annex 2 for the Reservoir Area Map.

3.3 Description of the Monitoring Plan

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed Project within the crediting period is complete, consistent, clear and accurate.

The project is operated by Sanibey Barajı Elektrik Üretim ve Ticaret A.Ş. (Sanko Enerji) which ensures the overall site management in accordance with Turkish Laws and technology providers' guidelines.

The monitoring has been performed in-house by the project proponent:

1. Plant Engineer is responsible for the control of the electricity supplied to the grid and imported from the grid with TEIAS. The electricity measurements are made by TEIAS remotely. In addition to the measurements made by TEIAS, the internal SCADA system (MIKRONIKA program of SYNDES ENERGIA) measures the produced electricity. The plant engineer checks these electricity measurement records and reports to the Operations Manager of the plant.
2. Accounting Manager is in charge of providing the electricity sales receipts to the Operations Manager of the plant.
3. Operations Manager is the VER coordinator. He is in charge of:
 - a. Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
 - b. Communicating and coordinating the monitoring tasks of all business units.
 - c. Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of the data obtained from the plant engineer and the accounting manager. He also records this operation properly to be able to provide it to the DOE during the verification process.
 - d. Calculating and reporting the emission reductions, and

In order to verify the generated units of emission reductions, the VER coordinator, Operation Manager reports the all necessary data to the head quarter of the company, in which the following important aspects include:

- Year
- Net electricity supplied by the project activity to the grid (in MWh)
- Annual gross electricity generation(in MWh)
- Annual electricity consumption (in MWh)

- Calculation of the emissions reductions: ERs per year (in tCO₂e/yr) produced from the activity of the project

Each year, the monitoring report is submitted to DOE for the verification. The report covers the monitoring of grid-connected power generation, check report; report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

Data is recorded for each crediting period and maintained at least 2 years after its end. The company will establish a dedicated maintenance system to ensure the data availability for the required period.

Measuring

TEIAS obtains the readings from the meters remotely and reports them in a spread sheet (for measurement control and will store the data discharged from the meters electronically) to the Plant engineer.

The project's electricity production is fed into the grid through a transformer station.

In line with the EMRA requirements, the company purchased and installed two electricity meters for each unit of Sanibey Power Plant.

	Unit 1	Unit 2
Brand	ACTARIS	
Model	SL 761A	
Standard/Class	0.2s	
Serial Number	Main meter : 53042206 Check meter : 53042208	Main meter : 53042209 Check meter : 53042207

The recalibration of these equipments will be done in line with the equipment requirements but recalibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years.⁶

As mentioned above, for each unit, there are two sets of meters in the transformer station. (The meters are electronic meters with an accuracy class of 0.2.) One of is the main meter for measuring and the other is the check meter for control. Both of these meters are metering the energy in two directions (consumption and production). If there is a measuring difference between these meters and one of the parties (TEIAS or the company) requests for calibration of the meters, in this case, the meters will be calibrated without waiting for the periodic calibration date. (TEIAS System Usage Agreement, Art 3, B./2./b))⁷ This calibration process is done by another third party under the control of TEIAS. The company is not responsible for calibration of the meters in Turkey according to the local standards.

⁶ <http://www.mevzuat.adalet.gov.tr/html/21179.html>

⁷ www.teias.gov.tr/sistemkullanim1.doc

All production figures which are subject to sales to the grid are agreed with PMUM (Market Financial Reconciliation Centre). These figures can be accessed from PMUM's web site by the seller. Therefore, net electricity production figures⁸ announced by PMUM will be used in emission calculation figures. These figures will also be cross checked with the production and internal electricity usage figures obtained from monthly reports of internal SCADA System..

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Accordingly the baseline emissions BE_y are calculated as following:

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

Where:

BE_y	Baseline emissions in year y (tCO ₂)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Y	Refers to a given year

Since the project is an installation of a new grid-connected renewable power plant, the baseline scenario is formulated in ACM0002, Version 12.1.0: "Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the Combined Margin (CM) calculations described below".

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor. The ACM0002 / Version 12.1.0 guideline recommends equal weight values for hydropower projects as seen in the formula below:

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

Where:

$EF_{grid, BM, y}$	=	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{grid, OM, y}$	=	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The default values recommended by "Methodological tool (Version 02) Tool to calculate the emission factor for an electricity system" for w_{OM} and w_{BM} for activities other than wind and solar power generation projects are 0.5 and 0.5, respectively.

$$EF_{grid, CM, y} = 0.6613 \times 0.5 + 0.4246 \times 0.5$$

Therefore resulting $EF_{grid, CM, y}$ is 0.5429 tCO₂/MWh

⁸ Net electricity production figure = Electricity generation (operation base) – Electricity traction from grid

The total electricity generations, the electricity traction from the grid and the net electricity supplied to the grid are calculated based monthly PMUM (Market Financial Settlement Center) Records for 2010, 2011 and 2012. The results are as follows:⁹

Date	Electricity Supply (MWh)	Electricity Traction (MWh)	Net Electricity Supplied to the Grid (MWh)*
2010	58,611.68	95.73	58,515.95
2011	944,070.80	1,387.22	942,683.58
2012	571,907.16	365.05	571,542.11
TOTAL	1,576,522.10	1,853.12	1,572,741.64

* Net Electricity Supplied to the grid = Electricity supply - Electricity traction from grid

Table 1: Electricity Generations of Sanibey Dam&HEPP from 2nd of December 2010 to 31st of May 2012

The total annual electricity generation of the project is estimated as 966,530 MWh/year. There is not an efficiency problem in the power house and the electricity generations realized close to estimated value.

As a result, based on the above electricity generation figures and the combined margin emission factor (EF_{grid,CM,y}) of 0.5429 tCO₂/MWh, baseline emissions figures are calculated as follows:

$$\begin{aligned}
 BE_{2010} &= EG_{PJ,2010} \times EF_{grid,CM,2010} \\
 &= 58,515 \text{ MWh} \times 0.5429 \text{ tCO}_2/\text{MWh} \\
 &= \mathbf{31,768 \text{ tCO}_2}
 \end{aligned}$$

$$\begin{aligned}
 BE_{2011} &= EG_{PJ,2011} \times EF_{grid,CM,2011} \\
 &= 942,683 \text{ MWh} \times 0.5429 \text{ tCO}_2/\text{MWh} \\
 &= \mathbf{511,782 \text{ tCO}_2}
 \end{aligned}$$

$$\begin{aligned}
 BE_{2012} &= EG_{PJ,2012} \times EF_{grid,CM,2012} \\
 &= 571,542 \text{ MWh} \times 0.5429 \text{ tCO}_2/\text{MWh} \\
 &= \mathbf{310,290 \text{ tCO}_2}
 \end{aligned}$$

4.2 Project Emissions

According to ACM0002 / Version 12.1.0 if the power density (PD) of the hydro power plant is above 10 W/m², PE_y is 0.

The power density of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD = Power density of the project activity, in W/m²

⁹ Please see Annex 1 for monthly generation figures from PMUM records

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero

$$\text{Cap}_{PJ} = 310,660,000 \text{ W}$$

$$\text{Cap}_{BL} = 0 \text{ (Justification: The project is a new hydro power plant)}$$

$$A_{PJ} = 14,299,206 \text{ m}^2$$

$$A_{BL} = 0 \text{ (Justification: The project is a new hydro power plant)}$$

Therefore;

$$PD = (310,660,000 - 0) / (14,299,206 - 0) = 21.72 \text{ W/m}^2$$

Since the Power Density of the Project is greater than 10 W/m² even in the 235m altitude, PE₂₀₁₀, PE₂₀₁₁ and PE₂₀₁₂ are assumed to be 0 as suggested in ACM0002 / Version 12.1.0.

$$PE_{2010} = 0 \text{ tCO}_2/\text{year}$$

$$PE_{2011} = 0 \text{ tCO}_2/\text{year}$$

$$PE_{2012} = 0 \text{ tCO}_2/\text{year}$$

4.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing and transport). These emissions sources are neglected.

Therefore:

$$LE_{2010} = 0 \text{ tCO}_2$$

$$LE_{2011} = 0 \text{ tCO}_2$$

$$LE_{2012} = 0 \text{ tCO}_2$$

4.4 Summary of GHG Emission Reductions and Removals

Also, according to ACM0002/Version 12 the emission reductions in year y should be calculated as the following formula

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

¹⁰ Reservoir Area Map of the project is provided in **Annex 2)**

BE_y = Baseline emissions in year y (t CO₂e /yr)
 PE_y = Project emissions in year y (t CO₂/yr)
 LE_y = Leakage emissions in year y (t CO₂/yr)

Since PE_y and LE_y are assumed to be 0, emission reductions are equal to baseline emissions.

$ER_{2010} = BE_{2010}$, therefore $ER_{2010} = 31,768$ tCO₂

$ER_{2011} = BE_{2011}$, therefore $ER_{2011} = 511,782$ tCO₂

$ER_{2012} = BE_{2012}$, therefore $ER_{2012} = 310,290$ tCO₂

As a result, total emission reduction during the monitoring period is 853,840 tCO₂.

Please see **Annex 1** for the detailed emission reductions of the project for 2010, 2011 and 2012.

5 ADDITIONAL INFORMATION

N/A

ANNEX – I

Details of Electricity Generation and Emission Reduction Figures

Sanibey Dam & HEPP - 2010				
Date	Electricity Supply (MWh)	Electricity Traction (MWh)	Net Electricity Supplied to the Grid (MWh)*	Emission Reductions (Tons)
Dec-10	58,611.68	95.73	58,516	31,768
Total	58,611.68	95.73	58,515.95	31,768

Sanibey Dam & HEPP - 2011				
Date	Electricity Supply (MWh)	Electricity Traction (MWh)	Net Electricity Supplied to the Grid (MWh)*	Emission Reductions (Tons)
Jan-11	62,247.25	175.24	62,072.01	33,699
Feb-11	61,673.17	116.22	61,556.95	33,419
Mar-11	177,375.01	35.71	177,339.30	96,278
Apr-11	135,883.28	73.41	135,809.87	73,731
May-11	140,120.32	84.49	140,035.83	76,025
Jun-11	80,610.75	123.96	80,486.79	43,696
Jul-11	53,205.87	152.88	53,052.99	28,802
Aug-11	54,425.77	152.31	54,273.46	29,465
Sep-11	36,143.28	107.81	36,035.47	19,564
Oct-11	47,355.11	115.94	47,239.17	25,646
Nov-11	45,979.85	128.17	45,852	24,893
Dec-11	49,051.14	121.08	48,930	26,564
Total	944,070.80	1,387.22	942,683.58	511,782

Sanibey Dam & HEPP - 2012				
Date	Electricity Supply (MWh)	Electricity Traction (MWh)	Net Electricity Supplied to the Grid (MWh)*	Emission Reductions (Tons)
Jan-12	67,256.32	117.27	67,139.05	36,450
Feb-12	89,205.27	81.97	89,123.30	48,385
Mar-12	132,428.40	50.50	132,377.90	71,868
Apr-12	189,906.04	18.52	189,887.52	103,090
May-12	93,111.13	96.79	93,014.34	50,497
Total	571,907.16	365.05	571,542.11	310,290

ANNEX – II

