CEVİZLİK
RUN-OF-RIVER HYDROELECTRIC POWER PLANT

AKIM ENERJİ ÜRETİMİ SANAYİ VE TİCARET A.Ş.

Project Title	Cevizlik Run of River Hydroelectric Powerplant
Version	03
Report ID	SNK/2012/01
Date of Issue	18 October 2012
Project ID	753
Monitoring Period	01 July 2011 – 30 Jun 2012
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1 PROJECT DETAILS

1.1 Summary Description of Project

The project is located in the Eastern Blacksea Region of Turkey, within the province of Rize province. The project is on the İyidere river. Akım Enerji Üretim Sanayi ve Ticaret A.Ş. (hereafter, Akım Enerji) is in the phase of installing run of river hydropower plant near İyidere river in Rize province, Turkey. The project aims the installation of a 92,96 MWm / 91,40MWe run of river hydropower electricity plant (HEPP) in Rize province, Turkey. The objective of the project is to generate electricity and supply it into the public grid. The project activity is the biggest size run-off-river project ever realised in Turkey considering its installed capacity and first of its kind as it is constructed underground without any upstream reservoir lake.

The main purpose of the project is to generate approximately 335 GWh/year of electricity 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 project is located in the Eastern Blacksea Region of Turkey, within the province of Rize province. The project is on the İyidere river. The altitude at the location is 235 m. As the project activity is a Greenfield project, the conditions prior to the project initiation is the continuation of the current situation, i.e. the equivalent amount of energy would have been produced by other grid-connected units, which are mainly thermal power plants, undertaking business as usual maintenance.

The theoretical annual average energy production of the facility is based on the waterflow data which was collected by “General Directorate of State Hydraulic Works” of Turkey which is the primary executive state agency of Turkey for national overall water resources planning, managing, execution and operation. The annual average electricity production figure is based on the theoretical annual production figures with historical annual water flows.

The project was started the construction on 2 January 2008, the turbine started the commissioning 29 May 2010. First monitoring period was from 29 May 2010 to 30 June 2011. This monitoring period is from 1 July 2011 to 30 June 2012.The total emission reduction of this monitoring period is 164,049.86tCO2e.

Project technology:

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

Property	Unit	Amount
Catchment Area	km^2	790
Annual Average Precipitation	mm	1100
Average Discharge	m^3/s	26,46
Design Discharge	m^3/s	50
Type	-	Ogee shaped concrete Gravity
Crest Length	m	60
Crest Elevation	m	456
Thalweg Elevation	m	450

Foundation Elevation	m	444
Height above Thalweg	m	6
Height above Foundation	m	12
Flood Water Level	m	457.95
Q100	m^3/s	557
Q500	m^3/s	719.52
Flushing Gate		
Crest Elevation	m	450
Foundation Elevation	m	444
Crest Length	m	17
Number of Gates		3
Gate Size	m x m x m	3 x 2.50 x 4.00
Intake Structure Total Width	m	14
Settling Basin		
Length	m	64
Width	m	4 X 7
Settled Particular Size	mm	0.60
Regulation Pond Surface Area	m^2	14091
Regulating Pond Capacity Active Volume	m^3 m^3	200000 173000
Headrace Tunnel		
Type		Horseshoe, concrete lined
Inner Diameter	m	4.00
Thickness of Concrete	m	0,40
Tunnel Capacity	m^3/s	50,00
Headrace Tunnel Length	m	7981,485
Access Tunnel 1 Length	m	410
Access Tunnel 2 Length	m	545
Access Tunnel 3 Length	m	960
Access Tunnel 4 Length	m	250
Access Tunnel 5 Length	m	113,50
Surge Tank		
Type		Varying Cross Section
Top Elevation	m	476
Bottom Elevation	m	412,40
Max. Water Level	m	470.10
Minimum Water Level	m	420.39
Inner Diameter	m	12.00 (412,40~430.00 between elevation) 16.00 (430.00~476.00 between elevation)
Penstock		
Inner Diameter	m	3.40
Excavation Diameter	m	4.60
Average Steel Thickness	m	20
Length	m	348,63
Powerhouse		
Type		Underground
Height	m	30,70
Length	m	43,80
Width	m	16
Project Discharge	m^3/s	50,00
Tailrace Elevation	m	226,90
Turbine Axis Level	m	221,00

Turbine Type		Vertical Axis Francis
Gross Head	m	230,00
Net Head	m	200,60
Installed Capacity	MW	92,96
Unit Capacity	MW	51,21
Number of Units		2
Underground Powerhouse Access		
Type		Modified Horseshoe
Tunnel Size	m	5 x 6
Concrete Thickness	m	0,50
Tunnel Length	m	98,225
Energy Transmission Line		
Type	kV	154
Characteristics		2 x 954MCM
Power Transmission Line Length	km	21

The turbine and generator manufacturer 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.

1.2 Sectoral Scope and Project Type

The project comes under sectoral scope 1, energy Industries renewable resources.

Project Category: Renewable electricity in grid connected applications.

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

Sectoral Scope Number **:** 1

Sectoral Scope **:** Energy Industries -Renewable Energy

This project is not a grouped project.

1.3 Project Proponent

AKIM ENERJI ÜRETIMI SANAYI VE TICARET A.Ş.

SANKO Holding –ISKO SUBESİ ORG. SAN. BOL. 3.CADDE INEGOL/BURSA/TURKEY

Tel: + 90 224 280 77 00

Akım Enerji is the owner and the only responsible for the project.

1.4 Other Entities Involved in the Project

No other entities.

1.5 Project Start Date

The project started commissioning on 29 May 2010, and construction started on 2 January 2008.

1.6 Project Crediting Period

The crediting period of the project begins with the commissioning of the plant. The project started to generate electricity on May 29th, 2010. The project crediting period is from 29 May 2010 to 28 May 2020. VCS project crediting period will be renewed one which will make the total crediting period as 20 years.

1.7 Project Location

The project is located in the Eastern Blacksea Region of Turkey, within the province of Rize province. The project is on the İyidere river. The project's geographical location is 40º 50´ 37´´ - 40º 50´ 38´´ North, and 40º 28´ 29´´ - 40º 28´ 31´´ East.

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 10."[1] was applied. In addition, as referred in the methodology, "Tool to calculate the emission factor for an electricity system, Version 01.1." [2] was applied. The project's additionality has been demonstrated using the version of "Tool for demonstration and assessment additionality" Version 05.2.[3]

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project was started construction on 02.01.2008. The first unit started to commissioning on 28 May 2010. The electric generated to TEIAS according to signed agreement with Akım Enerji.

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

[1] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L/view.html

[2] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v1.pdf

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

Events and action	Date
First VER consideration	July 23rd 2004
Feasibility report	May 2005
Stakeholder consultation	March 16th 2006
EIA approval (by the Ministry of Environment and Forestry)	July 24 2006
Contract signature for the electrical works	December 4th 2006
Contract signature for the equipments	December 5th 2006
First discussions with financial institutions	February 2006
First contacts with PDD consultants	October 2007
Loan signature	January 2008
Contract signature for the construction works	January 2nd 2008
Contact with a PDD consultant	April 25th 2008
Contact with a DOE	June 12th 2008
Start of PDD elaboration	July 2008
Start of VER validation	November 2009
Expected commissioning of the power plant	May 2010
Project start date	May 2010

2.2 Project Description Deviations

During the monitoring plan, the following deviations are determined and the monitoring plan 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 "OSF Forms" which are prepared by TEIAS after the remote measurements of the meters and sent to the plant engineer by e-mail at the end of each month.
- 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_{2e}/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 6) of the Project.
Value applied:	0.559
Purpose of the data:	Used for baseline emission calculation.
Any comment:	$EF_{grid,CMy}$ value (0.559 tCO_2/MWh) is valid for the duration of the crediting period.

3.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{PJ,y}$
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 (Meter reading records of main meters are cross-checked)
Description of measurement methods and procedures to be applied:	Two sets of meters measuring continuously then calculate the net electricity generation supplied by the project to grid.
Frequency of monitoring/recording:	Measuring continuously/ recording monthly

Value monitored:	Electricity generation figure is 94.045,90 MWh for 2011 and 199,425.150 MWh for 2012(from July 1st 2011 to June 30st 2012)
Monitoring equipment:	The model of the meters is Actaris SL761A and the serial numbers of the main meters (53035222 & 53035223) and control (check) meters (53035224 & 53035225) are respectively. 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.
QA/QC procedures to be applied:	As per "tool calculate the emission factor for an electricity system". Cross check measurements results with records for sold electricity.
Calculation method:	$EG_{fac,y} = EG_{export,y} - EG_{import,y}$
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:	92.96 MW_m/ 91,40 MW_e (2 x 45,70MW_e)
Monitoring equipment:	The data is monitored from 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:	14,091 m^2
Monitoring equipment:	-
QA/QC procedures to be applied:	The reservoir area mentioned above (14,091 m^2) is the maximum reservoir area at 470,10 m altitude. This water level only occurs at the Q500 flood discharge.
Calculation method:	-
Any comment:	Please see Appendix-I for the reservoir area calculation details.

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 Akım 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 and the plant engineer is informed by TEIAS by e-mail regarding the electricity measurements by an e-mail each month. (An excel sheet called "OSF Form – Dengeleme Birimi Sayaç Değerleri Formu" which includes the hourly electricity generations and imports is sent to the plant engineer from TEIAS.) The plant engineer checks these electricity measurement records and reports to the Operation 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 plant engineer and the accounting manager. He also recorded this operation properly to be able to provide it to the DOE during the verification process.
d. Calculating and report 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 tCO_2e/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 the spreadsheet (please refer to *Figure*) for measurement control and store the data discharged from the meters electronically to the Plant Engineer.
The project's electricity production will be fed into the grid through a transformer station which will be used by Cevizlik Power Plant.

The recalibration of these equipments will be done in line with the equipment requirements but re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years.[4]

The meter (ACE SL7000 series developed for Turkey) which was used in the switchyard building is produced by Actaris and is in line with the EMRA requirements for electricity meters. (Please find the information on the technical specifications of the meter and its conformity with the EMRA requirements on the website of Aktif Enerji which is the exclusive distributor for Actaris products in Turkey.)

Also, the Actaris meter fully conforms to or exceeds all relevant IEC standards for electronic metering equipments. (IEC61036 for class 1 equipment and IEC60687 for class 0.2S equipment)# The Actaris meter ensures long term stability of the accuracy, and achieves a maintenance free design which

[4] *http://www.mevzuat.adalet.gov.tr/html/21179.html*

makes unnecessary the re-calibration of the meter. However re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years.

Besides, in order to measure the electricity production figure of the plant accurately, there are two sets of meters in the switchyard building. One 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 two 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))[5]. 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.

All production figures which are subject to sales to the grid are agreed with PMUM (Market Financial Reconciliation Centre). These figures can be accesses from PMUM's web site by the seller.
Therefore, net electricity production figures[6] 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 provided from the OSF forms which are provided to the company by TEIAS after the remote measurement of the meters.

The Electrical Engineers received sufficient and continuous training (such as for operations and using system, scada etc. from TEIAS and equipment suppliers) in terms of monitoring and verification on aspects such as meter's reading and calibration and reading's recording, adjustment and reporting. 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.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Accordingly the baseline emissions BE_y are calculated as following:

$BE_y = (EG_y - EG_{baseline}) \times EF_{grid, CM, y}$

Where:

BE_y Baseline emissions (tCO_2e)
EG_y Annual electricity supplied by the project to the grid (MWh)
$EG_{baseline}$ Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$ Baseline emission factor (tCO_2e/MWh) 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 10: *"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".*

[5] *www.teias.gov.tr/sistemkullanim1.doc*

[6] Net electricity production figure = Electricity generation (operation base) – Electricity traction from grid

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor. The ACM0002 / Version 10 guideline recommends equal weight values for hydropower projects as seen in the formula below:

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

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 01.1) 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.

$EF_{grid,\ CM,\ y}$= 0.661 x 0, 5 + 0,457 x 0, 5

Therefore resulting $EF_{grid,CM,y}$ is 0.559 tCO_2/MWh

The total electricity generations, the electricity traction from the grid and the net electricity supplied to the grid are as follows:

CEVİZLİK HEPP 2011-2012			
Emission Factor: 0.559	**Net Electricity Generation (kWh)***	**Electricity traction from grid (kWh)**	**Net elect. Supplied to the grid (kWh)****
Date			
Jul 2011	25,918,040.00	58,040.00	25,860,000.00
Aug 2011	12,956,810.00	69,190.00	12,887,620.00
Sep 2011	10,517,500.00	58,500.00	10,459,000.00
Oct 2011	22,091,680.00	47,670.00	22,044,010.00
Nov 2011	13,208,020.00	72,080.00	13,135,940.00
Dec 2011	9,731,840.00	73,320.00	9,658,520.00
Jan 2012	7,262,570.00	83,260.00	7,179,310.00
Feb 2012	6,266,350.00	72,370.00	6,193,980.00
Mar 2012	8,699,010.00	70,400.00	8,628,610.00
Apr 2012	52,252,500.00	11,360.00	52,241,140.00
May 2012	70,512,970.00	130.00	70,512,840.00
Jun 2012	54,670,130.00	860.00	54,669,270.00
Total 2011+2012	**294,087,420.00**	**617,180.00**	**293,470,240.00**

Year 2011-2012								
Emission Factor: 0.559	Net Electricity Generation (kWh)*(53035222)	Electricity traction from grid (kWh) (53035222)	Net Electricity Generation (kWh)*(53035223)	Electricity traction from grid (kWh) (53035223)	Net Electricity Generation (kWh)*	Electricity traction from grid (kWh)	Net elect. Supplied to the grid (kWh)**	Emission Reductions (Tons)
Jul 2011	11,489,310	42,830	14,428,730	15,210	25,918,040.00	58,040.00	25,860,000.00	14,455.74
Aug 2011	5,867,130	51,150	7,089,680	18,040	12,956,810.00	69,190.00	12,887,620.00	7,204.18
Sep 2011	0	37,400	10,517,500	21,100	10,517,500.00	58,500.00	10,459,000.00	5,846.58
Oct 2011	7,466,750	30,570	14,624,930	17,100	22,091,680.00	47,670.00	22,044,010.00	12,322.60
Nov 2011	11,908,910	11,530	1,299,110	60,550	13,208,020.00	72,080.00	13,135,940.00	7,342.99
Dec 2011	6,907,010	14,500	2,824,830	58,820	9,731,840.00	73,320.00	9,658,520.00	5,399.11
Jan 2012	5,689,750	22,650	1,572,820	60,610	7,262,570	83,260	7,179,310	4,013
Feb 2012	2,150,210	23,610	4,116,140	48,760	6,266,350	72,370	6,193,980	3,462
Mar 2012	4,295,070	24,360	4,403,940	46,040	8,699,010	70,400	8,628,610	4,823
Apr 2012	26,408,400	3,060	25,844,100	8,300	52,252,500	11,360	52,241,140	29,203
May 2012	34,977,250	60	35,535,720	70	70,512,970	130	70,512,840	39,417
Jun 2012	27,498,170	340	27,171,960	520	54,670,130	860	54,669,270	30,560
Total 2011+2012	**144,657,960**	**262,060**	**149,429,460**	**355,120**	**294,087,420**	**617,180**	**293,470,240**	**164,049.86**

** Net electricity corresponds the measured electricity generation by the meters. This value does not include the internal consumption of the plant*

*** Net elct. Supplied to the grid = Net Electricity Generation - Electricity traction from grid*

***Table 1:** Electricity generation readings of the Cevizlik HEPP from 01th July 2011 to 30th June 2012*

Based on the above electricity generation figures, baseline emissions for years 2011 and 2012 are calculated as follows:

$\mathbf{BE_{2011}}$ = EG_{2011} x $EF_{grid,CM,2011}$
= 94,045.090 MWh x 0.559
=**52,571.21 tCO_2**

$\mathbf{BE_{2012}}$ = EG_{2012} x $EF_{grid,CM,2012}$
= 199,425.150 MWh x 0.559
= **111,478.66tCO_2**

4.2 Project Emissions

The Project emissions are calculated with the formula mentioned in ACM0002/Version 10 as:

Where:
PEy = Emission from reservoir expressed as tCO_2e/year
$EF_{Re}s$ = Is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO2e /MWh
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

However, again according to ACM0002 / Version 10 if the power density (PD) of the hydro power plant is above 10 W / m^2 , PEy is 0.

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

Where:
PD = Power density of the project activity, in W/m^2
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 (m^2)
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 (m^2). For new reservoirs, this value is zero
Cap_{PJ} = 92.960.000 W

Cap_{BL} = 0 (Justification: The project is a new hydro power plant)
A_{PJ} = 14091 m^2
A_{BL} = 0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (92.960.000 – 0)/(14.091 – 0) = 6.597W/m^2
Therefore;

Since the Power Density of the Project is greater than 10 W/m^2 PE_y is assumed to be 0 as suggested in ACM 0002 / Version 10.

Also, as suggested in ACM0002 / Version 10, the leakage emissions are not considered. Therefore:

PE_{y2011} = 0 tCO_2/year

PE_{y2012} = 0 tCO_2/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_{y2011} = 0 tCO_2

LE_{y2012} = 0 tCO_2

4.4 Summary of GHG Emission Reductions and Removals

Also, according to ACM0002/Version 10 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 CO_2e/yr)
BE_y = Baseline emissions in year *y* (t CO_2e /yr)
PE_y = Project emissions in year *y* (t CO_2/yr)
LE_y = Leakage emissions in year *y* (t CO_2/yr)

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

Please see the tables below for the emission reduction of the project for 2011 and 2012:

Year 2011								
Emission Factor: 0.559	**Net Electricity Generation (kWh)*(53035222)**	**Electricity traction from grid (kWh) (53035222)**	**Net Electricity Generation (kWh)*(53035223)**	**Electricity traction from grid (kWh) (53035223)**	**Net Electricity Generation (kWh)***	**Electricity traction from grid (kWh)**	**Net elect. Supplied to the grid (kWh)****	**Emission Reductions (Tons)**
Jul 2011	11,489,310	42,830	14,428,730	15,210	25,918,040.00	58,040.00	25,860,000.00	14,455.74
Aug 2011	5,867,130	51,150	7,089,680	18,040	12,956,810.00	69,190.00	12,887,620.00	7,204.18
Sep 2011	0	37,400	10,517,500	21,100	10,517,500.00	58,500.00	10,459,000.00	5,846.58
Oct 2011	7,466,750	30,570	14,624,930	17,100	22,091,680.00	47,670.00	22,044,010.00	12,322.60
Nov 2011	11,908,910	11,530	1,299,110	60,550	13,208,020.00	72,080.00	13,135,940.00	7,342.99
Dec 2011	6,907,010	14,500	2,824,830	58,820	9,731,840.00	73,320.00	9,658,520.00	5,399.11
Total 2011	**43,639,110**	**187,980**	**50,784,780**	**190,820**	**94,423,890.00**	**378,800.00**	**94,045,090.00**	**52,571.21**

Year 2012								
Emission Factor: 0.559	**Net Electricity Generation (kWh)*(53035222)**	**Electricity traction from grid (kWh)(53035222)**	**Net Electricity Generation (kWh)*(53035223)**	**Electricity traction from grid (kWh)(53035223)**	**Net Electricity Generation (kWh)***	**Electricity traction from grid (kWh)**	**Net elect. Supplied to the grid (kWh)****	**Emission Reductions (Tons)**
Jan 2012	5,689,750	22,650	1,572,820	60,610	7,262,570	83,260	7,179,310	4,013
Feb 2012	2,150,210	23,610	4,116,140	48,760	6,266,350	72,370	6,193,980	3,462
Mar 2012	4,295,070	24,360	4,403,940	46,040	8,699,010	70,400	8,628,610	4,823
Apr 2012	26,408,400	3,060	25,844,100	8,300	52,252,500	11,360	52,241,140	29,203
May 2012	34,977,250	60	35,535,720	70	70,512,970	130	70,512,840	39,417
Jun 2012	27,498,170	340	27,171,960	520	54,670,130	860	54,669,270	30,560
Total 2012	**101,018,850**	**74,080**	**98,644,680**	**164,300**	**199,663,530**	**238,380**	**199,425,150**	**111,478.66**

Total 2011+2012	**144,657,960**	**262,060**	**149,429,460**	**355,120**	**294,087,420**	**617,180**	**293,470,240**	**164,049.86**

Total 2011+2012	**144,657,960**	**262,060**	**149,429,460**	**355,120**	**294,087,420.00**	**617,180.00**	**293,470,240.00**	**164,049,864.16**

** Net electricity corresponds the measured electricity generation by the meters. This value does not include the internal consumption of the plant*

*** Net elct. Supplied to the grid = Net Electricity Generation - Electricity traction from grid*

Table 2: *Emission Reductions of the Cevizlik HEPP from 01h July 2011 to 30th June 2012*

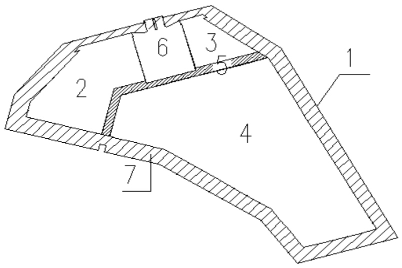
The total emission reduction of this monitoring period is 164,049.86 tCO2e.

5 ADDITIONAL INFORMATION

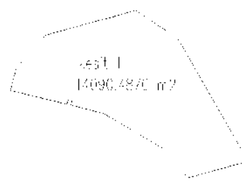
N/A

APPENDIX – I

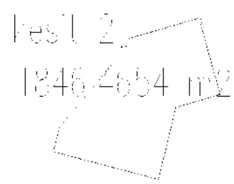
Water Level
456.00 m



Section 1 (456.00-447.50)
Water Level 8,5
Area 14090,49

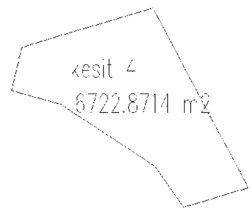


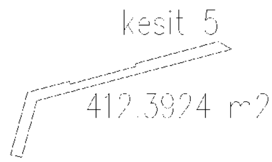
Section 2 (447.50-440.50)
Water Level 7
Area: 1846,465



Section 3 (447.50-440.50)
Water Level 7
Area: 601,4026

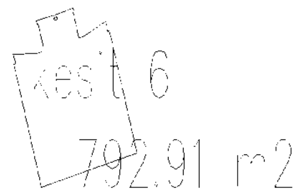
Section 4 (447.50-440.50~441.70)
Water Level 6,4
Area 6722,871



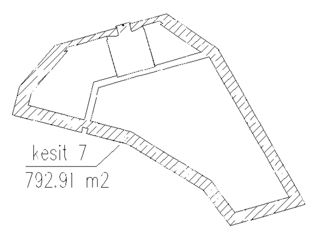


Section 5 (447.50-440.50)

Water Level 7
Area 412,3924



Section 6 (between 447.50-440.50~435.50 level cal.
Water Level 9,5
Area: 792,91



Section 7 (between 447.50-447.50~440.50 level calculation
Water Level 3,5
Area 3714,446

Total Area(m2) **Cross Section 2+3+4+5+6+7** 14090,49m^2