MONITORING REPORT

BOYABAT HYDROELECTRIC POWER PLANT

Document Prepared By Ekobil Environmental Services and Consulting Ltd.

Contact Information: info@ekobil.com

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Prepared By	Ekobil Environmental Services and Consulting Ltd.
Contact	Ahlatlıbel Mahallesi, Güneykent Sitesi 1839. Sk. No 56, 06805 Ankara, Turkey. Tel:+90 312 489 1338 e-mail: info@ekobil.com www.ekobil.com

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Boyabat Hydro Electric Power Plant (HPP) is a dam type HPP. It has an installed capacity of 513 MWe. This total electric capacity is reached via three vertical shaft Francis turbines with a nominal output of 171 MWe each. The Project Activity is constructed over the longest (1355 km) river of Turkey, the Kızılırmak river. The project is constructed as the third project counting from the source of the Kızılırmak river.

The following are pictures from the project activity (See Figure 1 a and b), first picture (Figure 1 a) is a view of the reservoir lake and the second picture (Figure 1 b) is the view of the concrete gravity dam that barriers the waters of the Kızılırmak river.

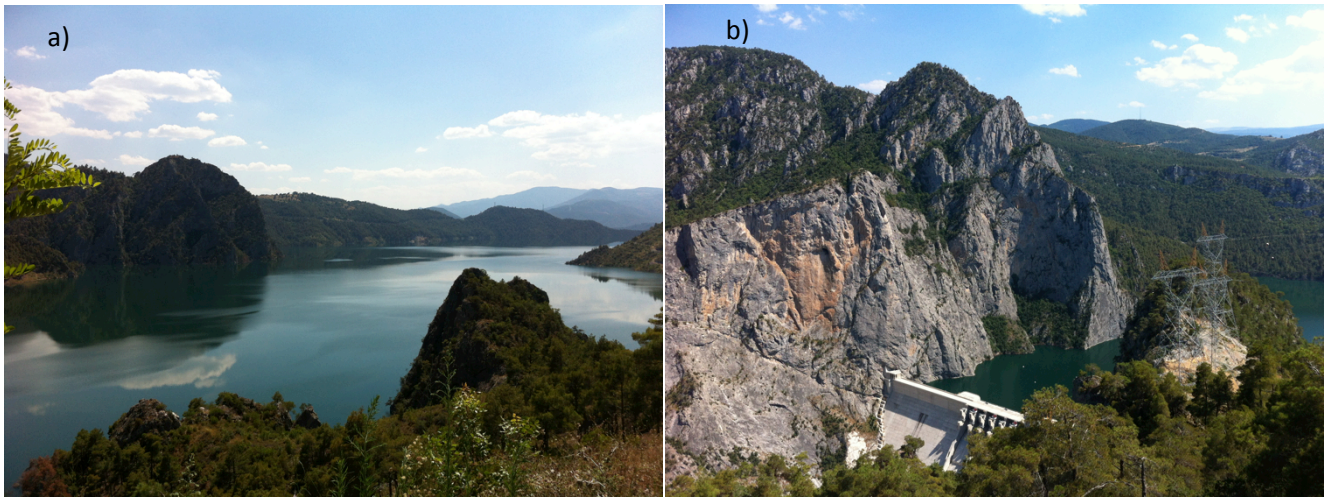


Figure 1: View from the project activity. A) General view of the reservoir lake, b) general view of the concrete gravity dam.

The main technical characteristics of the project activity and the general properties of the facilities are provided below (Source: Feasibility Study Report) (Table 1):

Table 1:General properties of the project facilities

Characteristics of the Reservoir	
Max Water Level	335 m
Min Water Level	305 m
Active Volume	1,410,000,000 m^3
Dead Volume	2,147,000,000 m^3
Total Volume	3,557,000,000 m^3
Area of the Lake	65,400,000 m^2
Length of the Lake	60 km
Characteristics of the Dam Body	
Dam Location	10 km SW of Durağan town center over the Kızılırmak river
Dam Type	Concrete Gravity Dam
Height from Base	195 m
Height from River Base	147 m
Crest Elevation	335 m
Volume of the Body	2,300,000 m^3

Crest Width	10 m
Crest Length	262m
Thalweg Elevation	147 m
Characteristics of the Spillway	
Spillway Type	Concrete Gravity Dam
Number of Units	6
Cover Height	13 m
Cover Width	10 m
Capacity	9,300 m^3/sec
Characteristics of the power station	
Type	Semi-Underground
Width	22.5 m
Length	103 m
Annual Generation	1,500*10^6 kWh
Firm Energy Generation	925*10^6 kWh
Secondary Energy Generation	575*10^6 kWh
Characteristics of the Turbine and generator	
Type of Turbine	Vertical Shaft Francis
Type of Generator	Vertical Shaft Synchronous Generator
Number	3
Installed Capacity	171 MW X 3
Effective Rated Head	122.5 m
Maximum Rated Discharge	157 m^3/sec each

How the project activity will be operating, and the boundary of the project activity (indicated in broken red line) is outlined in the following figure (Figure 2).

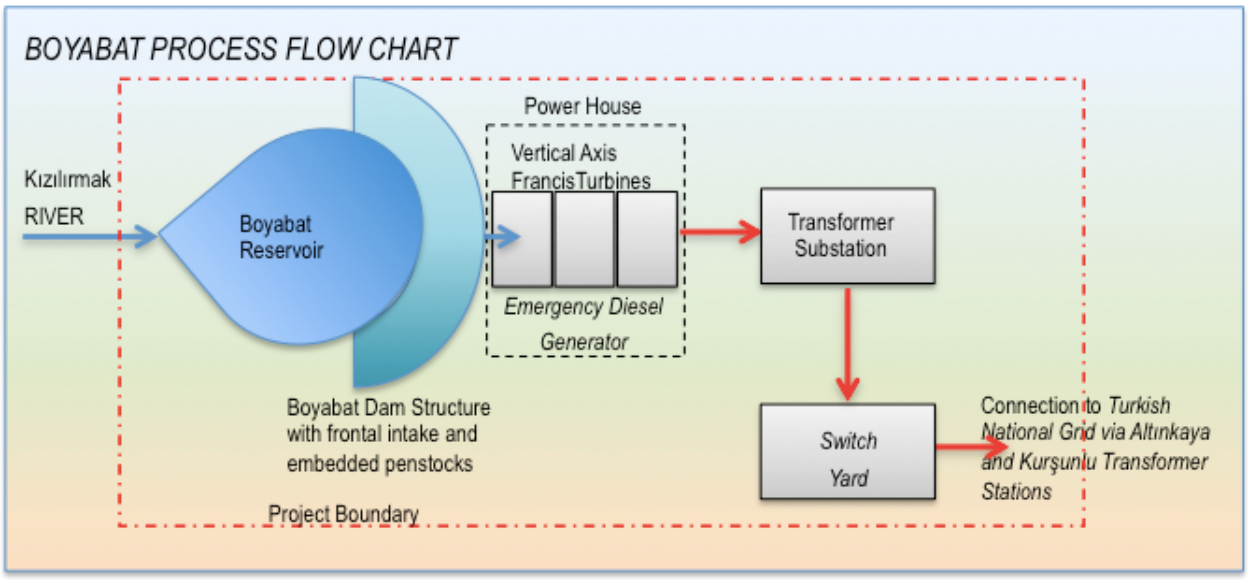


Figure 2: Flow chart showing the basic operational principles of the project activity, and the project boundary.

Some important and significant dates in the project history can be listed as shown in the following table (Table 2):

Table 2: Major project milestones

Date	Milestone	Reference
01/07/07	Feasibility Study Report	FSR 2007
25/10/07	Water Usage Agreement	Signed Agreement
13/11/07	Electricity Production License granted for the project	License numbered EÜ1374-3/992
24/03/08	The Project is officially exempted from the EIA process	EIA Exemptions Letter
01/05/08	Construction Worksite Opening Permit Accrued	NHS records
01/06/08	Expropriation process started	Summary of the expropriation process
28/11/08 [1]	Construction Contract Signed	Contract
31/08/09	Financial Closure	Signed Loan agreement
22/03/10	Hydro mechanical Equipment Procurement Contract	Contract
12/10/10	EMRA extended the construction period	EMRA Communication
22/11/12	DSI Substantial acceptance provision issued	DSI Protocol
29/11/12	The Unit 1-2 and 3 was commissioned	Substantial operation protocol

During this monitoring period the project activity is observed to export 1,179,952.57 MWh of Electricity to the host country grid, and imported 6,079.80 MWh of electricity. As a result the project is observed to create 603,370 tonnes of baseline emissions and 106,195 tones of Project emmissions, thus a net amount of 497,174 tonnes of GHG emmissions are produced by the project activity during this monitoring period.

1.2 Sectoral Scope and Project Type

The project category is Sectoral Scope 1: Energy industries (renewable-/non -renewable sources). The project type is grid connected electricity generation from renewable sources. The project is a non-grouped, stand-alone project.

1.3 Project Proponent

Organization name	BOYABAT ELEKTRİK ÜRETİM VE TİCARET A.Ş.
Contact person	Tuba Başacar Bilhan
Title	Project Finance and Budget Control Manager
Address	Cumhuriyet Caddesi Gürsel Plaza No:123 Kat:3 Kavacık/Beykoz/İstanbul Turkey
Telephone	0216 537 81 41
Email	tbasacar@boyabatelektrik.com.tr

[1] The signing of the construction contract is highlighted in this table as this date is considered as the investment decision date.

1.4 Other Entities Involved in the Project

Organization name	Ekobil Environmental Services and Consultancy Ltd. [2]
Role in the project	Preparation of the Monitoring Report
Contact person	Aslı Sezer Özçelik
Title	Dr.
Address	Ahlatlıbel Mahallesi, Güneykent Sitesi 1839. Sk. No 56, 06805 Ankara, Turkey.
Telephone	+90 312 489 1338
Email	info@ekobil.com

1.5 Project Start Date

Project start date is 29 November 2012 as indicated on the substantial completion document issued by the ministry of Energy and Natural Resources.

1.6 Project Crediting Period

The project crediting period is 10 years: 29.11.2012-28.11.2022 (both days inclusive). The crediting period is renewable twice.

1.7 Project Location

The host party is the Republic of Turkey[3].

The Project is located at the Central Black Sea Geographical Region/ Sinop Province.

The following are the coordinates of the four random points from around project area .

	Latitude:	Longitude
Dam Body	41°20.316' N	35°0.068' E

[2] Registered to the Ankara Chamber of commerce with the registration number 145009 and the full tittle of Ekobil Çevre Hizmetleri Danışmanlık Eğitim Tarım Hayvancılık Madencilik İnşaat İthalat İhracat Turizm ve Ticaret Limited Şirketi (www.ekobil.com)

[3] The host country Turkey is an Annex 1 country under UNFCCC, and a party to Kyoto protocol without a binding emission reduction target. For more detail please visit : http://www.mfa.gov.tr/united-nations-framework-convention-on-climate-change-_unfccc_-and-the-kyoto-protocol.en.mfa

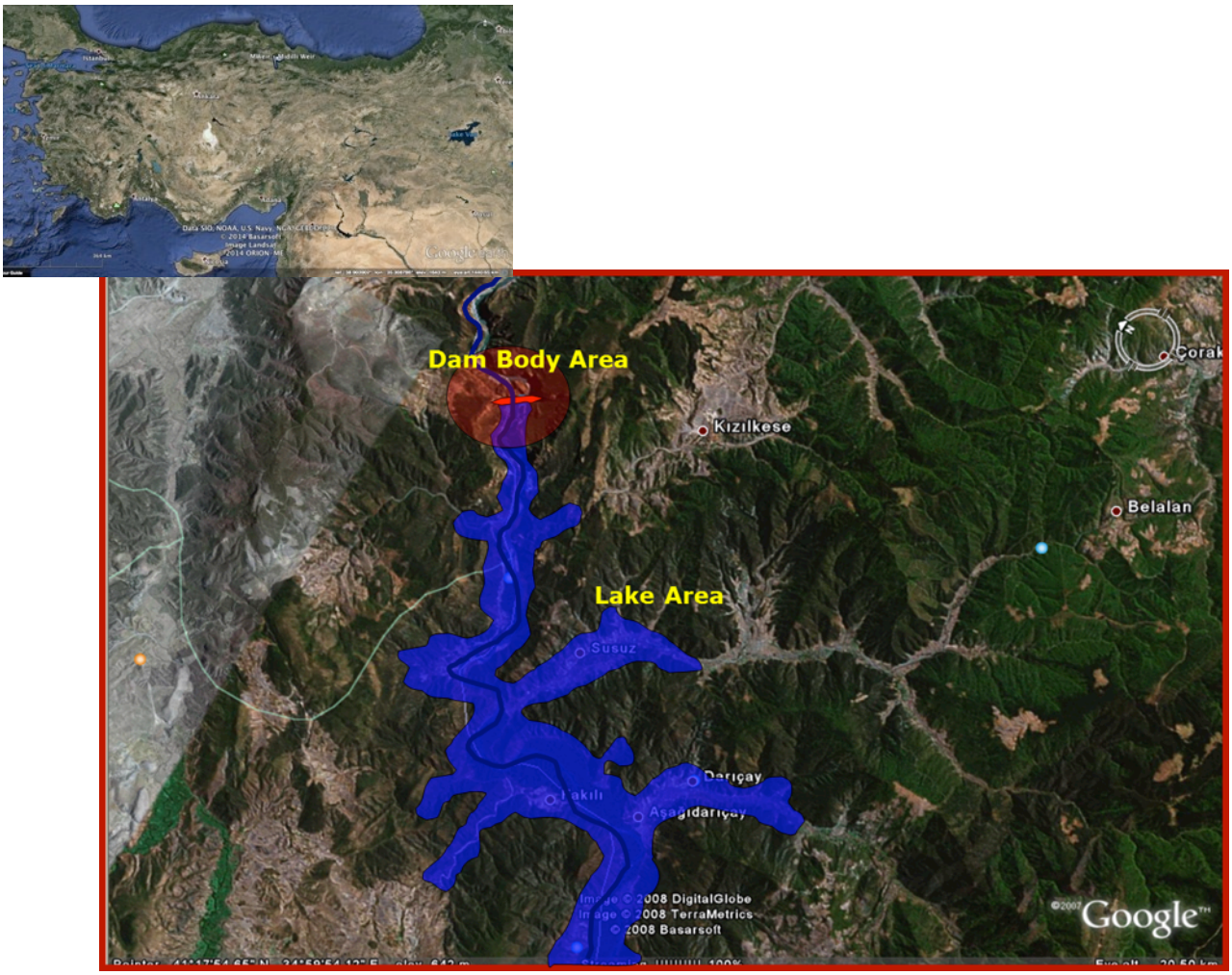


Figure 3: Google Earth image showing the exact project location within Turkey.

1.8 Title and Reference of Methodology

Approved consolidated baseline and monitoring methodology ACM0002 “Large-scale Consolidated Methodology; Grid-connected electricity generation from renewable sources.” Version 14.0.0.

The Approved Methodology refers to the following tools:

“Tool for the demonstration and assessment of additionality” (Version 07.0.0; EB 70 -Annex 8)

“Tool to calculate the emission factor for an electricity system”. (Version 04.0.0;EB 75-Annex 15)

"Guidelines on the assessment of investment analysis” (Version 5; EB62-Annex 5)

1.9 Other Programs

- Emission Trading Programs and Other Binding Limits: Not applicable. The project is a voluntary project and the host country, Turkey cannot host CDM or JI projects. The project has not been registered under any other voluntary GHG program.
- Other Forms of Environmental Credit: Not applicable. The project will not generate other form of environmental credits such as Green Power Certificates.
- Participation under Other GHG Programs: Not applicable. The project is a voluntary project and the host country, Turkey cannot host CDM or JI projects. The project has not been registered under any other voluntary GHG program.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project construction was completed in November 2012, and on 22nd November, 2012 DSI approved the project, and on 29 November 2012, The Ministry of Energy and Natural resources approved the project and the project started to official export electricity to the host country grid.

During the monitoring period (29-11-2012 to 31-07-2014, both days inclusive). The project activity was operational and there were no major incidences to report.

2.2 Deviations

2.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002/ Version 14.0.0 and its related tools have been applied without any deviations.

2.2.2 Project Description Deviations

There are no deviations from the monitoring plan described in the validated PDD, during this monitoring period.

2.3 Grouped Project

Not applicable, project activity is not a grouped project or part of a debundled activity.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

The following are the data and parameters available at validation:

Data / Parameter	$FC_{i,y}$
Data unit	Volume Unit (cubic meter)
Description	Amount of fuel *i* consumed by relevant power plants in Turkey in years, 2010, 2011, 2012.
Source of data	Official publications at the Turkish Electricity Transmission Company (TEIAŞ) Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/yakıt48-53/49.xls)
Value applied:	-
Justification of choice of data or description of measurement methods and procedures applied	Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation
Purpose of Data	Please see Annex 2-Table-1
Comments	-
	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
	Data used for the calculation of $EF_{grid,OM,Simple,y}$

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/Mass or Volume Unit
Description:	Net Calorific Values for fossil fuel type *i* in year, for the years 2010, 2011 and 2012
Source of data:	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/ yakıt48-53/49.xls http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/ yakıt48-53/51.xls)
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the *ex ante* and for the second and third crediting period, only once *ex ante* at the start of the second crediting period
Value applied:	Please see Annex-2-Table-5
QA/QC Procedures	-
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.

Any comment:	Data used for the calculation of $EF_{grid,OM,Simple,y}$. As data on the NCV is not published directly on the TEİAŞ website, this data is calculated using the heating values of fuels and the volume or mass of fuels consumed for each year.

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the *ex ante* and for the second and third crediting period, only once *ex ante* at the start of the second crediting period
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table-2.
Justification of choice of data or description of measurement methods and procedures applied:	According to the "Tool to calculate the emission factor for an electricity system" version 04.0.0 , if values provided by the fuel supplier of the power plants in invoices or regional or national average defaults values are not available the IPCC default values at the lower limit of uncertainty must be used.
Any comment:	Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity generated in the project electricity system in other words, net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y
Source of data:	Turkish Electricity Transmission Company Web Site http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/34(84-12).xls
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the *ex ante* and for the second and third crediting period, only once *ex ante* at the start of the second crediting period
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table 3 and Table 4.
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,OM,Simple,y}$

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power unit m in year y
Source of data:	Turkish Electricity Transmission Company Web Site (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 2010[4], 2011[5] and 2012[6].
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the *ex ante* and for the second and third crediting period, only once *ex ante* at the start of the second crediting period
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table 8.
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,BM,y}$

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit m in year y
Source of data:	The default values provided at the Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 04.0.0)" are used
Measurement procedures (if any):	
Monitoring frequency:	Once for the crediting period
QA/QC Procedures	N/A as the default values provided in Annex 1 are used.
Value applied:	Please see Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 04.0.0)"
Justification of choice of data or description of measurement methods and procedures applied:	According to the "tool to calculate emission factor for an electricity system if documented manufacturer's specifications or data from the utility, the dispatch center or official records are not available then the default values given in Annex 1 of the tool shall be used. The first two options are not available for the power plants supplying the Turkish grid, therefore the default values are used.
Any comment:	Data used for the calculation of EFgrid,BM,y

3.2 Data and Parameters Monitored

The following are the data that will be available during the monitoring.

[4] http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf
[5] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf
[6] http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf

Data / Parameter:	**EF_{Res}**
Data unit:	$kgCO_2e/MWh$
Description:	Default emission factor for emissions from reservoirs
Source of data:	Decision by EB 23
Value to be applied:	90 $kgCO_2e/MWh$
Any comment:	-

Data / Parameter:	$EG_{PP\text{-}self\ consumptionTEDAŞ,\ y}$
Data unit:	MWh
Description:	Quantity of electricity imported by the power plant from the 31.5 kVA grid for self consumption, in year y
Measured /Calculated /Default:	Measured
Source of data:	The Primary source of data will be the main TEDAŞ meter readings recorded remotely and provided to the Boyabat HPP Management via monthly invoices.
Description of measurement methods and procedures to be applied:	Measurements are to be made by an electricity meter that belong to the distribution company TEDAŞ. The meter is located in Güngören Köyü. The meter measures the electricity imported from the grid continuously, and operators read the index monthly and invoice it to the Project Activity Management. The amount consumed is mentioned in the meter.
Frequency of monitoring/recording:	Recorded continuously, read remotely by TEIAS, and accessible monthly via the PMUM/MFRC web site , Reported annually on the Monitoring Report.
Value applied:	Will be determined at the monitoring stage
Monitoring equipment:	As defined in the official TEDAŞ invoice the Meter Brand Type is MSY and the Serial Number of the Meter is 60023357. The meters is in compliance with the communiqué for Metering Devices to be used in the Electricity Market[7]. They have an accuracy class of Class 0,5S indicating an accuracy range of ±0.5%.
QA/QC procedures to be applied:	N/A
Calculation method:	Direct continuous measurement
Any comment:	Data will be used to calculate net electricity supplied to the grid.

Data / Parameter:	$EG_{PP\text{-}self\ consumption,\ y}$
Data unit:	MWh
Description:	Quantity of electricity imported by the power plant from the Grid for self consumption, in year y
Measured /Calculated /Default:	Measured
Source of data:	The Primary source of data will be the main TEIAS bi-directional meter readings recorded remotely on the main meter monthly protocols and accessible via the PMUM/MFRC web site[8]. The secondary source of data will be the back-up TEIAS bi-directional meters. But these are only recorded incase when the main meter

[7] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44
[8] PMUM/MFRC Piyasa Mali Uzlaştırma Merkezi / Market Financial Reconciliation Centre.

	malfunctions.
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The internal consumption data is the sum of the amount of electricity recorded to be imported from the grid by these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid. The meter readings are accessible via an Automatic Meter Reading Software remotely by the project owner, via a software, and data is automatically recorded to the PMUM/MFRC servers to be obtained as monthly screen outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording:	Recorded continuously, read remotely by TEIAS, and accessible monthly via the PMUM/MFRC web site , Reported annually on the Monitoring Report.
Value applied:	Will be determined at the monitoring stage
Monitoring equipment:	Main Electricity U1 ANA : "ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452660 Main Electricity U2 ANA: ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452662 Main Electricity U3 ANA: ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452664 Back-up Electricity U1 YEDEK: "YEDEK SAYAÇ"-1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2 YEDEK: "YEDEK SAYAÇ"-2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U3 YEDEK: "YEDEK SAYAÇ"-3: ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[9]. They have an accuracy class of Class 0,5S indicating an accuracy range of ±0.2%.
QA/QC procedures to be applied:	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class0,2S, that is to say should be within the ±0.5% (±0.005) range. The monthly reported meter readings (provided on main meter monthly protocols) by the main meters, will be cross-checked against the data presented on "Annual BOYABAT HPP_Operation Report"
Calculation method:	Direct continuous measurement
Any comment:	Data will be used to calculate net electricity supplied to the grid.

Data / Parameter:	**Cap_{PJ}**
Data unit:	W

[9] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site
Measurement procedures (if any):	Determined via the turbine plates
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$EG_{PP\text{-}GrossProduction,\ y}$
Data unit:	MWh
Description:	Quantity of electricity exported by the power plant to the Grid, in year y
Measured /Calculated /Default:	Measured;' \
Source of data:	The Primary source of data will be the main TEIAS bi-directional meter readings recorded remotely on the main meter monthly protocols and accessible via the PMUM/MFRC web site[10]. The secondary source of data will be the back-up TEIAS bi-directional meters. But these are only recorded incase when the main meter malfunctions.
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The gross production data is the sum of the amount of electricity recorded to be exported to the grid via these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the gross and the net electricity supplied to the grid. The meter readings are accessible via an Automatic Meter Reading Software remotely by the project owner, via a software, and data is automatically recorded to the PMUM/MFRC servers to be obtained as monthly screen outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording:	Recorded continuously, read remotely by TEIAS, and accessible monthly via the PMUM/MFRC web site , Reported annually on the Monitoring Report.
Value applied:	Will be determined at the monitoring stage
Monitoring equipment:	Main Electricity U1 ANA : "ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452660 Main Electricity U2 ANA: ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452662 Main Electricity U3 ANA: ANA SAYAÇ" ELSTER A 1500 Serial Number: 00452664 Back-up Electricity U1 YEDEK: "YEDEK SAYAÇ"-1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2 YEDEK: "YEDEK SAYAÇ"-2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U3 YEDEK: "YEDEK SAYAÇ"-3: ELSTER A 1500 Serial

[10] PMUM/MFRC Piyasa Mali Uzlaştırma Merkezi / Market Financial Reconciliation Centre.

	Number: 00452665 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[11]. They have an accuracy class of Class 0,2S indicating an accuracy range of ±0.2%.
QA/QC procedures to be applied:	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class0,2S, that is to say should be within the ±0.2% (±0.002) range. The monthly reported meter readings (provided on main meter monthly protocols) by the main meters, will be cross-checked against the data presented on "Annual BOYABAT HPP_Operation Report"
Calculation method:	Direct continuous measurement
Any comment:	Data will be used to calculate the gross and the net electricity supplied to the grid.

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site
Measurement procedures (if any):	Indirectly determined using the Volume Area Depth curve presented in Annex-1. The Water level data is determined via the Water Level Measurement that consist of 5 transmitters for: - 1x Head Water - 3x Head Water after Trash Rack - 1x Tail Water **Transmitter Type:** - Rittmeyer MPB - Submersible Pressure Transmitter 4-20mA 2-wire[12] The measured depth is than recorded via the SCADA system, and presented as an excel sheet to the carbon consultant.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	Maximum depth is considered to calculate the power density.

3.3 Monitoring Plan

Objectives of the monitoring program

The Monitoring plan is developed to ensure that the Project Activity is well organized from the start in terms of the collection and archiving of complete and reliable data that is needed to ensure reliable and accurate measurements of actual emission reductions.

Who will be performing the monitoring

[11] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

[12] The specifications of the pressure gauge is provided to the validating DOE.

The monitoring will be conducted by the Verified Emission Reduction (VER) Monitoring Team. The VER Team Members, and their position and duties for the monitoring is outlined in the following table (Table 21):

Table 21: Positions and responsibilities of the VER monitoring team members.

Position Responsibility

Boyabat HPP Manager:

- Day to day operation of the Boyabat HPP,
- Compliance of the project activity with the host country rules and regulations
- Coordination of the data collection and recording for the monitoring report.

Chief Electrical Technician:

- Day to day follow up of electrical equipment
- Recording and monitoring of the electricity generation data via the meters located at the Boyabat Switchyard
- Making regular checks of the consistency of the back up meters to ensure the operation of the main meters.
- Preparation and update of BOYABAT HPP_Operation Reports

Accounts Manager:

- Data keeping for power sales
- Extracting the main meter readings (main meter monthly protocols) from the PMUM/MFRC website with the help of the account credentials assigned to the project owner.

Chief Mechanical Technician:

- Day to day operation of the power plant
- Keeping records of malfunctions and repairs

Carbon Consultant :

- Emission reduction calculations
- Scripting of the periodic monitoring report
- Follow up of the verification process

Please note that the internal consumption meter located at the Güngören village is also compliant with e above mentioned regulations but with an accuracy class of CI = 1S

Further Explanation about Measuring the Water Level:

The water level at the reservoir lake is monitored to directly calculate the reservoir area. The reservoir area value is then used to check if the power density of the project activity is greater than 4 m^2/W. After measuring the water level the data is recorded at every 15 minutes, and sampled daily. At the end of each monitoring period the maximum water level is obtained from the recorded data, and that number is utilized to calculate maximum aerial extent of the reservoir lake as shown in Annex1.

The water level is measured via pressure gauges. The features of the pressure gauges are as follows:

Features

· Two Wire technique
· Piezoresistive sensing element
· Output signal 4-20 mA

· Pressure type Gauge, Absolute
· Accuracy ±0.1 % FS
· Calibration in bar / psi / mWC
· Standard DIN measuring ranges between
0 …100 mbar and 0 …25 bar or selection of
measuring ranges in psi or mWC
· Adjustable within 1 : 4 of the nominal pressure range
· Temperature compensated within
-10°C ... +50°C [+14°F ... +122°F] or
-25°C ... +85°C [-13°F ... +185°F]

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The following table (Table 3) is the Baseline emissions of the project calculated for the monitoring period (29 November 2012 to 31 July 2014 –both days inclusive). Table exhibits the baseline emissions realized on a monthly basis.

Table 3: Monthly baseline emissions realized for the monitoring period

		A-Gross Electricity Production	**B1-Self Electricity Consumption**	**B2-Self Electricity Consumption**	**C-Net electricity production C=A-B1-B2**	**Baseline Emissions = $EG_{PP\text{-}net,y}$ * EF_{CM}**	**National Grid Emission Factor**
	Symbol	$EG_{PP\text{-}gross,\ y}$	$EGPP_{\text{-self consumption TEDAS},\ y}$	$EG_{PP\text{-}self\ consumption,\ y}$	$EG_{PP\text{-}net,\ y}$	BE1	EF_{CM}
YEAR	Units	MWh	MWh	MWh	MWh	tCO_2e	tCO_2e/MWh
							0.5140
	November	4,016.14	2.619	0	4,013.52	2,062.95	
2012	December	118,606.50	256.765	62.46	118,287.28	60,799.66	
Total in 2012 (November 29th to December 31st)							62,863
2013	January	152,945.28	165.499	45.53892	152,734.24	78,505.40	
	February	82,324.58	109.918	44.0244	82,170.64	42,235.71	
	March	27,157.70	33.999	178.24716	26,945.46	13,849.97	
	April	12,905.31	22.538	262.30092	12,620.47	6,486.92	
	May	17,332.00	13.398	150.4062	17,168.19	8,824.45	
	June	38,958.88	24.139	165.41028	38,769.33	19,927.44	
	July	105,542.40	34.677	202.80708	105,304.92	54,126.73	
	August	105,721.92	26.95	82.38132	105,612.59	54,284.87	
	September	96,236.52	76.882	116.61048	96,043.03	49,366.12	
	October	51,906.32	122.041	120.55428	51,663.72	26,555.15	
	November	37,777.28	324.417	61.8282	37,391.04	19,218.99	
	December	142,897.15	249.113	39.44808	142,608.59	73,300.82	
Total in 2013 (January 1st to December 31st)							446,683
2014	January	36,766.70	397.423	65.835	36,303.437	18,659.97	
	February	32,363.79	405.201	6.37812	31,952.206	16,423.43	
	March	1,351.68	501.9	0.46872	849.311	436.55	
	April	9,406.78	395.724	0.0504	9,011.009	4,631.66	
	May	10,396.94	405.727	0	9,991.213	5,135.48	
	June	16,681.40	473.017	0	16,208.386	8,331.11	
	July	78,657.29	433.108	0	78,224.179	40,207.23	
Total in 2014 (January 1st to July 31st)							93,825
						GRAND TOTAL	604,125

4.2 Project Emissions

During this monitoring period the maximum reservoir area is observed to be 65,000,000 m^2 (see Annex 1 for details). Therefore the power density calculates as follows 513,000,000 W /64,000,000 m^2=8.01 W/m^2. Since power density (8.01 W/m^2) is >4 W/m^2 but < 10 W/m^2 the project emissions needs to be calculated.

The reservoir related project emissions can be calculated according to the following formula:

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000}$$

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (t CO_2e/yr)

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year *y* (kg CO_2e/MWh) (Which is 90 kg CO_{2e}/MWh)

TEG_y = Total electricity produced by the project activity, including the electricity supplied t the grid and the electricity supplied to internal loads, in year *y* (MWh)

The calculate dproject emissions are as shown in the following table (Table 4).

Table 4: Project Emissions on a monthly basis.

		A-Gross Electricity Production	Project Emissions	EF_{res}
	Symbol	EGPP-gross, y	Pey	EF_{res}
YEAR	Units	MWh	tCO_{2e}	$kgCO_{2e}/MWh$
				90
	November	4,016	361	
2,012	December	118,607	10,675	
Total in 2012 November 29th to December 31st)				11,036
2,013	January	152,945	13,765	
	February	82,325	7,409	
	March	27,158	2,444	
	April	12,905	1,161	
	May	17,332	1,560	
	June	38,959	3,506	
	July	105,542	9,499	
	August	105,722	9,515	
	September	96,237	8,661	
	October	51,906	4,672	
	November	37,777	3,400	
	December	142,897	12,861	
Total in 2013 (January 1st to December 31st)				78,453
2,014	January	36,767	3,309	
	February	32,364	2,913	
	March	1,352	122	
	April	9,407	847	
	May	10,397	936	
	June	16,681	1,501	
	July	78,657	7,079	
Total in 2014 (January 1st to June 30th)				16,706
GRAND TOTAL				106,195

4.3 Leakage

Boyabat HPP is a green field project activity, thus no leakage emissions related to the project are expected and regarded.

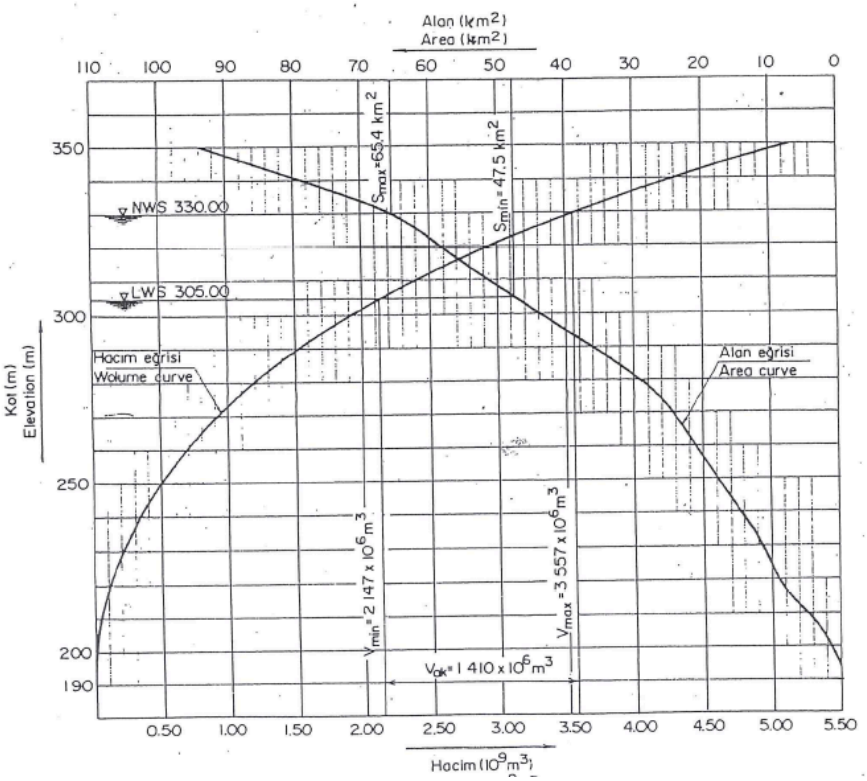
4.4 Net GHG Emission Reductions and Removals

The following table provides a summary of the emission reductions that result from the project activity during this monitoring period:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2012 (29/11 to 31/12)	62,862.61	11,036.04	-	51,826.58
2013 (01/01 to 31/12)	446,682.56	78,453.48	-	368,229.08
2014 (01/01 to 31/07)	93,825.43	16,706.21	-	77,119.22
Total	603,370	106,195	0	497,174

ANNEX 1-AREA OF RESERVOIR LAKE OF BOYABAT HPP

The area of reservoir lake is determined indirectly as a correlation to the lake level using the following graph.



Kot E.L. (m)	Hacim Capacity (10^6 m³)	Alan Area (km²)
194	–	.0
200	4	1.5
210	36	4.7
220	104	9.0
230	208	11.6
240	339	14.6
250	500.	17.7
260	694	21.1
270	922	24.4
280	1 190	29.2
290	1 517	36.3
300	1 918	43.8
310	2 393	51.2
320	2 940	58.2
330	3 557	65.4
340	4 277	78.6
350	5 137	93.4

Reference: Feasibility Study Report, see pages 39-40 (pdf 46-47).

The maximum water level recorded during the monitoring period is 325.17 m. (Reference : Cell C605 in Tab “Lake Level Data” in the “BoyabatDataWorkbookVersion3.00.xls”)

The Lake area that corresponds to that level is determined to be approximately 64,000,000 m^2.

Accordingly the power density is calculated as follow:

513,000,000 W /64,000,000 m^2=8.01 W/m^2

Since power density (8.01 W/m^2) is >4 W/m^2 but < 10 W/m^2 the project emissions needs to be calculated.