



Monitoring report form (Version 05.1)			CDM-MR-FORM
MONITORING REPORT			
Title of the project activity	Çamlıca II HEPP		
UNFCCC reference number of the project activity	GS1173		
Version number of the monitoring report	06		
Completion date of the monitoring report	07/12/2017		
Monitoring period number and duration of this monitoring period	Monitoring period # 1 26 months between 01/01/2015-31/12/2015 01/01/2016-31/12/2016 01/01/2017- 28/02/2017		
Project participant(s)	1-Derin Enerji Üretim San. Ve Tic. AŞ (Project Owner) 2-Global Tan Energy Ltd (GTE CARBON) (Project Developer)		
Host Party	Turkey		
Sectoral scope(s)	Sectoral Scope 1 "Energy Industry – Renewable Sources "		
Selected methodology(ies)	Methodology: ACM0002, version 13.0.0 "Consolidated baseline methodology for grid connected electricity generation from renewable sources"		
Selected standardized baseline(s)	-		
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	According to PDD, 49,436 tons CO ₂ annually and 107,111tons CO ₂ emission reduction is expected for 26 months of this monitoring period		
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards	
	-	78,606 tons CO ₂	

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

Çamlıca II Hydro Electrical Power Plant (HEPP) has installed capacity of 17.58 MWe and built as run-of-river type project on river Zamanti. The main principle behind the project design is to make use of the elevation difference of 69m which is approximately 1500m away from the Çamlıca Village.

Annual expected generation in license was given as 89.558 GWh/y and based on this figure, about 49,436 tCO₂e emission reduction was estimated. On the other hand, total net generation is 142,405GWh and 78,606 tCO₂e emission reduction has been realized during monitoring period. The Electricity generated within the project boundaries were transferred to the national grid.via Çamlıca I substation

Prior to project implementation, there exists only one hydro power plant which is Çamlıca I HEPP, located upstream. The project is utilizing tail water from Çamlıca I Regulator and HEPP.Çamlıca I HEPP has the installed capacity of 84MW and it has been operational since 1998. Water released from Çamlıca I HEPP transferred to the energy transmission channel by 1500m long and 50.00 m³/sec capacity water transfer channel. At the 1347.50 m, the channel connected to the surge tank by free-flow through 10,485 m tunnel chamber and at the end of surge chamber water transferred to penstock, passing through turbines at a power of 3x28 MW. The penstock continued until the generation area. 30 m³/sec flow enter the plant and the tail water transferred back to the river Zamanti.

Used turbine type is Francis and total installed power is 17.58 MWe. Total number of units is 3 x (5.96 MWm/5.86MWe). Turbine gross elevation and net elevation values are 69 and 66 respectively.

Main purpose of the project is to produce clean, sustainable and environment-friendly energy. Since the project activity involves generating electricity from renewable natural resources, the risks it bears were considerably low and the project was designed in the most efficient way possible while keeping the local sources and nature unharmed. All the necessary and legally mandatory documents were obtained and environmental impact assessment proved that the project has not been posing any threats for the nature.

Additionally, the project was expected to provide an impetus for the economic activities in the nearby regions, while increasing the awareness about environmental issues. The project was also directly contributed to local area by creating job opportunities and improving know-how through trainings and site visits.

On the macro scale, project activities were result in expanding the share of renewables in the national energy pool and reduced the dependency on the imports which immediately translates into saving currency.

Main milestones of the project are given in table below.

Milestone	Date
Water Right Utilization Agreement	03/01/2011
License Issuance	09/02/2011
EIA Exemption Letter	21/02/2011
Carbon Certification Proposal	08/06/2011
Project Consultancy Services Agreement	12/07/2011
Bank Loan Agreement	25/07/2011
Construction Agreement	08/08/2011
Carbon Certification Agreement	20/10/2011

LSC Meeting	26/01/2012
Equipment Agreement	23/02/2012
Start of Construction*	01/05/2012
State Hydraulic Works Project Approval	27/12/2012
Ecosystem Assessment Report	24/04/2013
Revised Exemption from EIA Certificate	20/05/2013
System Connection Agreement	07/08/2013
Energy Transmission Line Approval	02/09/2013
Commissioning Date	02/05/2014

Table 1. Milestones for Camlica II HEPP

*Project start date as per GS Toolkit and Requirements v2.1

A.2. Location of project activity

Host Party	Turkey
Region/State/Province	Central Anatolia within the boundaries of Kayseri province
City/Town/Community	Yahyalı district
Physical/Geographical location	120 km away to the south of Kayseri city centrum

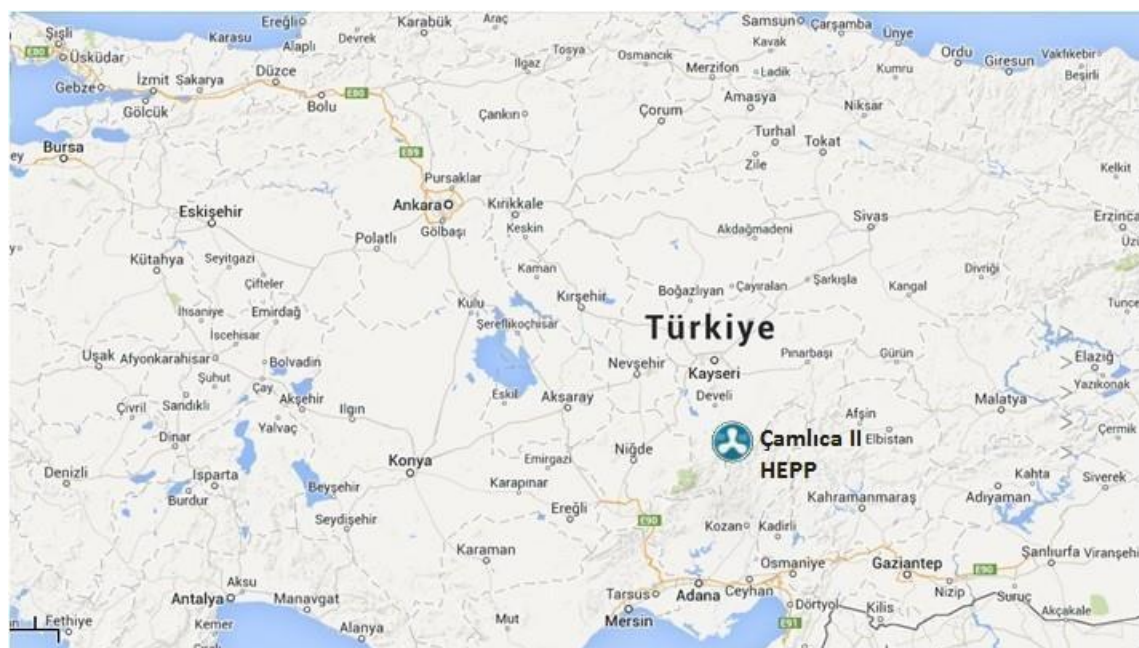
**Figure 2: Çamlıca II HEPP Project Site**



Figure 1: Çamlıca II HEPP Project Site

Related coordinates are given in Table below.

	Longitude	Latitude
Weir	E 35.4912182	N 37.9034788
Tunnel Inlet-Outlet	35.4938434 - 35.4909861	37.9179036 - 37.9040153
Forebay	37.9045992 - 37.9045096	35.4910740 - 35.4910483

Table 2. Project site weir and main structures coordinates

Technical characteristics of Çamlıca II HEPP have been summarized in table below.

Specifications for the built tunnel are as follows:

Tunnel length	1500 m
Progress rate	1.25m/shift
Average drilling rate	6 cm/d
Time allocated for drilling	40% shift (168d)
Cartridge diameter	2.5 cm
Geological formation	Limestone

Air Conditioning	Ventilation
Average length of sewage pit	1.40 m
Cross-sectional area of the tunnel	7.5 m ²
Holes per unit drilling area	2.2/m ²
Total holes	13
Unit amount of explosives	1.125 kg/m
Ventilation duration	15 min
Explosives per hole	0.65 kg/hole

Table 4: Tunnel Specifications

During the construction approximately 100,000 m³ of excavation is processed in two separate grinding units. All of the obtained materials are either be used in construction or stockpiled in appropriate storage areas. These areas are shown in the detailed project layout map.

The energy from the power house is transmitted to Camlica I substation by using a 154.00 kV 1 x 477.00 MCM line. Technical details of each unit that are used in the project are given in the project introductory document.

Specifications for the used turbines are as follows:

Turbine brand	Kössler
Turbine Type	Francis
Turbin Serial No	005041
Turbine 1 No	20064
Turbine 2 No	20065
Turbine 3 No	20066
Total Installed Power	17.58 MWe
Total Number of Units	3 x (5.96 MWm/5.86MWe)
Gross Elevation	69m
Maximum Net Elevation	66m
Minimum Net Elevation	66m

Table 5: Turbine Specifications

Specifications for the generator is as follows

Generator brand	Leroy Somer
Type	LSA 58 125/12 P
Serial no:	
Unit 1	604756-1
Unit 2	604756-2
Unit 3	604756-3
Power	5860 kW

There has not been any breakdown take place in continued operation of the plant during the monitoring period.

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (Yes/No)
Turkey (Host)	Derin Enerji Üretim San. ve Tic. A.Ş. (Project Owner- Private Entity) Global Tan Energy Ltd (Project Developer- Private Entity)	No

A.4. Reference of applied methodology and standardized baseline

The UNFCCC approved simplified baseline and monitoring ACM0002, version 13.0.0 11/05/2012 was applied for the project activity.

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ACM0002 refers to the following tools:

- “Tool for the demonstration and assessment of additionality”, Version 07.0.04², and,
- “Tool to calculate the emission factor for an electricity system”, Version 3.05³

A.5. Crediting period of project activity

This crediting period is the first crediting period. Project uses renewable crediting period. Crediting period of the project is initially planned as 7 years between 02/05/2014 and 01/05/2021. Although provisional acceptance of plant has been completed on 02/05/2014, due to completion of missing works during start-up phase, actual full performance commissioning has taken place by end of 2014 and no significant generation has occurred in 2014. Therefore, crediting period has been postponed to 2015. So, crediting period of the project is 7 years between 01/01/2015 and 31/12/2021

¹ <http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT>

² http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf/history_view

³ http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf/history_view

valid from

A.6. Contact information of responsible persons/entities

Project Participants	Role/Responsibilities	Contact Information
Derin Enerji Üretim Sanayi ve Ticaret Anonim Şirketi	Owner of the VER rights of the project. Construction and Operation of the power plant in line with regulations. Implementation of monitoring plan and collecting and	Serkan Veziroğlu Rafet Canıtez Cad. Arif Nihat Asya Sokak No:2 Oran/ Çankaya / ANKARA Tel: 0 312 490 9838
	archiving monitoring data	Gsm: 05303704276 E-mail: serkan@zeynepenerji.com
Global Tan Energy Ltd	Development of project documents. Managing validation and verification processes for the project.	M.Kemal Demirkol Ehlibeyt Mahallesi 1259 sk 7/2 Balgat Cankaya Ankara TURKEY Tel:90 312 472 35 00 Fax: 90 312 472 33 66 E-mail: gte@gtecarbon.com

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

The proposed project is located in central Anatolia within the boundaries of Kayseri province. Nearest settlement to the project site is Çamlıca village within the boundaries of Yahyalı district. Total installed power of the facility has been 17.58 MWe.

Project has started operation in 02/05/2014.

B.2. Post registration changes**B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

N/A

B.2.2. Corrections

No correction has been made.

B.2.3. Changes to start date of crediting period

Provisional acceptance of plant has been completed on 02/05/2014 however, due to completion of missing works during start up phase, actual commissioning has taken place by end of 2014 and no significant generation has occurred in 2014. Therefore, crediting period has been postponed to 2015. Thus, start of crediting period has been changed from 02/05/2014 to 01/01/2015.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

NA

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

Commissioning date which represents the approval of commissioning by relevant agencies is 02/05/2014 however, start-up phase and completion of final technical issues has been realized by end of 2014 and no significant operation has taken place in 2014. Therefore, start of crediting period has been delayed to 2015.

B.2.6. Changes to project design of registered project activity

N/A

B.2.7. Types of changes specific to afforestation or reforestation project activity

N/A

SECTION C. Description of monitoring system

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established. Project has been registered as a GS-VER project. In addition to the parameters monitored in PDD, there exist sustainable development indicators as given in GS passport document.

In order to demonstrate the emission reduction, only the required data is the net electricity delivered to the grid by the project activity.

Net electricity generation records were gathered from EPIAS which are also be used for billing purposes. Therefore, no new additional protocol was needed for monitoring emission reduction. Power Plant Manager was responsible for the electricity generated, gathering all relevant data and keeping the records.

Generation data collected during crediting period has been submitted to GTE Carbon who was responsible for calculating the emission reduction subject for verification. Generation data was used to prepare monitoring reports which is used to determine the vintage from the project activity. These reports were submitted to the duly authorized and appointed Designated Operational Entity (DOE) during each verification period.

Verification Team is composed from;

Plant Manager: Overall responsibility of compliance with VER monitoring plan

Electrical Engineer: Responsible for day to day running of plant, recording and monitoring of relevant data and periodic reporting

Accounting Manager: Responsible for keeping data about power sales, invoicing and purchasing.

GTE Carbon: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of metering devices and data monitoring were carried out according to the regulations and control process of TEIAS. Two metering devices (one of them used as spare) were used for monitoring the electricity generated by the power plant. Readings were done using main metering device and spare

metering device was used for comparison only. Data from metering devices will be recorded by TEIAS monthly (through remote reading). In addition to the two metering devices, generation of the HEPP can be cross checked from TEIAS – PMUM web site (<http://pmum.teias.gov.tr>) which is accessible using a password provided to electricity generation companies. ISVM (Electricity fed to the grid) and UECM(Electricity consumed from the grid) data given in PMUM records will be used for cross checking of emission reduction calculations.

All data will be kept for at least two years after the crediting period for QA/QC purposes. Calibration of the metering devices is made on 03/05/2014 and sealed before the commissioning of the power plant. According to the related regulation on calibration of metering devices, next calibration will be done in 2024 and so there is no need to provide any calibration study in this monitoring period. The maintenance and test study on metering devices are done and controlled by TEIAS yearly and when there is an inconsistency between two devices (main and spare one).

The lake area at maximum height has been defined in the project documents. Although it is not possible to exceed maximum lake area, as the excess water can spill over the weir, the water level and maps of reservoir area were used to monitor the maximum area covered.

The monitoring system organization chart is shown in figure below, in which the authority and responsibility of project management are defined.

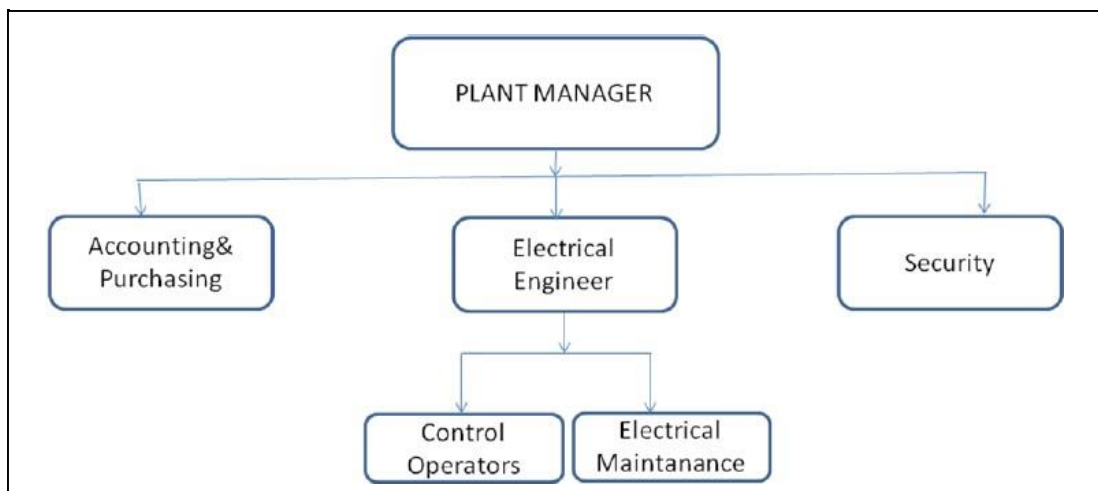


Figure 3. Operational structure of Çamlıca II HEPP

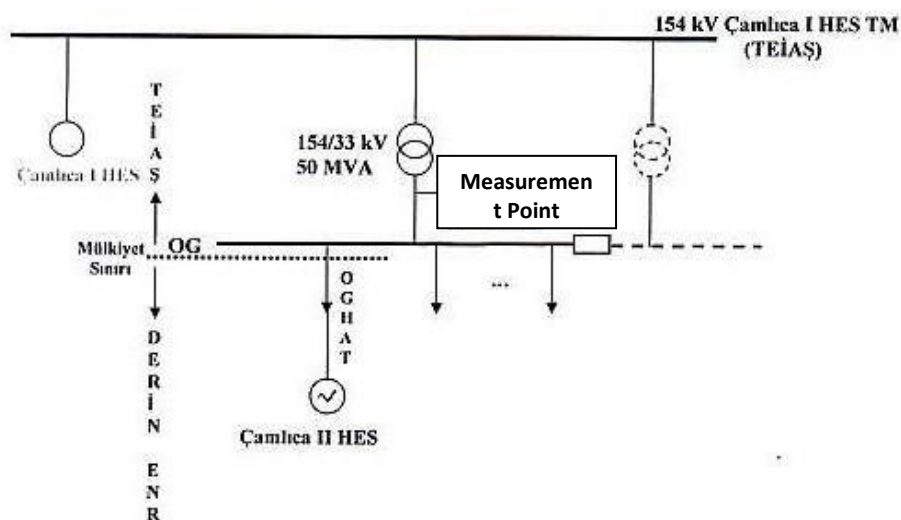


Figure 4. Grid connection point for Çamlıca II HEPP

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	EGy
Unit:	GWh
Description:	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants in year y
Source of data :	Gross generation electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants in year y ⁴ Net generation and imported electricity ^{5, 6}

Value(s) applied:	<table> <tr> <th>Year</th><th>Amount</th></tr> <tr> <td>2009</td><td>150,333</td></tr> <tr> <td>2010</td><td>149,750</td></tr> <tr> <td>2011</td><td>162,713</td></tr> </table> 462,796 GWh between 2009-2011	Year	Amount	2009	150,333	2010	149,750	2011	162,713
Year	Amount								
2009	150,333								
2010	149,750								
2011	162,713								
Purpose of data	Data used for emission reduction calculation (for calculation of OM, Net- to- Gross electricity ratio and share of low-cost must-run sources)								
Additional comment	-								

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest available version of the "Tool to calculate the emission factor for an electricity system"
Source of data	As per the "Tool to calculate the emission factor for an electricity system"
Value(s) applied	0.552
Choice of data or Measurement methods and procedures	As per the "Tool to calculate the emission factor for an electricity system"
Additional comment	-

⁴ [http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/kgucunkullan%C4%B1m\(13-21\)/13.xls](http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/kgucunkullan%C4%B1m(13-21)/13.xls)

⁵ [http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim\(22-45\)/23.xls](http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/23.xls)

⁶ [http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim\(22-45\)/33\(84-11\).xls](http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls)

Data/parameter :	$EF_{CO_2, i, y i}$																
Unit	tCO ₂ /TJ																
Description	CO2 emission factor of fossil fuel type "i" in year "y"																
Source of data	-For EF of fossil fuels, IPCC values at the lower limit have been used.																
Value(s) applied)	<table border="1"> <thead> <tr> <th>Fuel Source</th><th>EF(tCO₂/Tj)</th></tr> </thead> <tbody> <tr> <td>Coal</td><td>89.5</td></tr> <tr> <td>Lignite</td><td>90.9</td></tr> <tr> <td>Fuel Oil</td><td>75.5</td></tr> <tr> <td>Diesel</td><td>72.6</td></tr> <tr> <td>LPG</td><td>61.6</td></tr> <tr> <td>Naphta</td><td>69.3</td></tr> <tr> <td>Natural Gas</td><td>54.3</td></tr> </tbody> </table>	Fuel Source	EF(tCO ₂ /Tj)	Coal	89.5	Lignite	90.9	Fuel Oil	75.5	Diesel	72.6	LPG	61.6	Naphta	69.3	Natural Gas	54.3
Fuel Source	EF(tCO ₂ /Tj)																
Coal	89.5																
Lignite	90.9																
Fuel Oil	75.5																
Diesel	72.6																
LPG	61.6																
Naphta	69.3																
Natural Gas	54.3																
Choice of data or measurement methods and procedures	According to the applied tool, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.																
Purpose of data	EF calculations																
Additional comments	-																

Data / Parameter Unit	η _{m,y}	
Description Source of data	Average net energy conversion efficiency of power unit m or k in year y Appendix 1. Default efficiency factors for power plants of Tool to calculate the emission factor for an electricity system Version 03.0.0	
Value(s) applied		Generation Efficiency
	Coal	39.0%
	Lignite	39.0%
	Fuel Oil	39.5%
	Diesel	39.5%
	LPG	39.5%
	Naphtha	39.5%
	Natural Gas	60.0%
Choice of data or Measurement methods and procedures	Default values are used as a conservative approach.	
Additional comment		

Data/parameter	FC_{i,y}
Unit	Tons or 1000 m ³ for gases
Description	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data	TEIAS Statistics ^{7,8}

Value(s) applied)	FC _{i,y} unit [Ton, except for Natural Gas (NG) (1000 m)]				
	Fuel Type	2009	2010	2011	Total
	Hard				
	Coal	6,621,177	7,419,703	10,574,434	24,615,314
	Lignite	63,620,518	56,689,392	61,507,310	181,817,220
	Fuel Oil	1,594,321	891,782	531,608	3,017,711
	Diesel				
	Oil	180,857	20,354	15,047	216,258
	LPG	111	0	0	111
	Naphtha	8,077	13,140	0	21,217
	Natural Gas	17,034,548	20,457,793	21,607,635	59,099,976
Choice of data or measurement methods and procedures	Data from Grid Operator has been used				
Purpose of data	Data is used for OM calculation				
Additional comments	-				

⁷ <http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/yak%C4%B1t46-49/47.xls>

⁸ <http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/yak%C4%B1t46-49/49.xls>

Data/parameter:	NCV_{i,y}		
Unit	Tj/kt		
Description	Net Calorific Values of Fuel combusted in power plants.		
Source of data	TEIAS statistics ⁹		
Value(s) applied		Weighted Average for years 2009 , 2010 , 2011	
	<i>Hard Coal</i>	22.49	
	<i>Lignite</i>	6.94	
	<i>Fuel Oil</i>	40.25	
	<i>Diesel Oil</i>	42.49	
	<i>LPG</i>	46.47	
	<i>Naphta</i>	37.36	
	<i>Natural Gas</i>	37.22	
Choice of data or measurement methods and procedures	Data has been calculated from Grid Operator's (TEIAS) statistics. Consumed obtained energy to determine NCV of each type.		
Purpose of data	Data used for OM and BM calculation		
Additional comments	-		

Cap_{BL}	Cap BL
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Value(s) applied	
Choice of data or Measurement methods and procedures	As the hydro power plant is new this value is 0
Additional comment	-

⁹ <http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/yak%C4%B1t46-49/47.xls>

Data/Parameter	ABL
Unit	m ²
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full
Source of data	Project Site
Value(s) applied	0
Choice of data or Measurement methods and procedures	As the hydro power plant is new this value is 0
Additional comment	-

D.2. Data and parameters monitored

Data / Parameter	EG _y			
Unit	MWh/y			
Description	Net Electricity generated and delivered to the grid by the project in year y			
Measured/ Calculated / Default:	Measured			
Source of data	Records from the metering devices used in the power plant are used to calculate the annual generation of energy. PMUM records are used as a cross- check both for generation and internal consumption.			
Value(s) of monitored parameter:	During monitoring period, generation has been realized as 142,405 MWh. Monthly and annual generation records have been presented in the excel worksheet for verification calculations.			
		Gross Generation	Consumption	Net Generation
	2015	82,840.267	17.571	82,822.696
	2016	57,314.662	41.287	57,273.375
	2017	2,337.731	28.123	2,309.608

Monitoring equipment:	Specifications of the metering devices are as follows:				
	Manufacturer	Device Model	Serial Number	Last Calibration	Precision
	EMH	LZQJ-XC	4241381	03.05.2014	< 0.05 %
	EMH	LZQJ-XC	4241382		< 0.05 %
	Calibration tests were performed during this monitoring period on 03.05.2014.				
Measuring/ Reading/ Recording frequency:	Continuous measuring and monthly recording				
Calculation method (if applicable):	Generation data is recorded by two metering devices continuously. These records are providing the data for the monthly invoicing to TEIAS. Generation is recorded via remote reading system. This record is form the basis for monthly invoicing.				
QA/QC procedures	Two calibrated ammeters are back up each other. Maintenance and calibration of the metering devices are made by TEIAS. If there is a noticeable difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment is done before waiting for the periodical maintenance. The meters should comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit as given in document in link (http://www.epdk.gov.tr/web/elektrik- piyasasi-dairesi/44) As per the regulations, calibration is valid for 10 years ¹⁰ .				
Purpose of data	Emission Reduction calculations				
Additional comment	-				

Data / Parameter	CapPJ
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Measured/ Calculated / Default:	Measured
Source of data	Project license
Value(s) of monitored parameter:	17,580,000
Monitoring equipment : procedure	Checking project documents and equipment labels

Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	-
QA/QC procedures	-
Purpose of data	Ensuring validity of project documentation
Additional	-

Data / Parameter	APJ
Unit	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Measured/ Calculated / Default:	Data from Project Site
Source of data	Project site
Value(s) of monitored parameter:	10091.016 m ²
Monitoring equipment:procedu res	N/A
Measuring/ Reading/ Recording frequency:	Yearly
Calculation method (if applicable):	N/A
QA/QC procedures	-
Purpose of data	Maximum area is already calculated in feasibility report and considered in calculations. Annual measurements are not expected to be higher than this value.
Additional comment	-

D.3. Implementation of sampling plan

N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks**E.1. Calculation of baseline emissions or baseline net GHG removals by sinks**

The *ex-ante* emission reductions (ER_y) are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (tCO₂)

BE_y = Baseline emissions in year y (tCO₂)

PE_y = Project Emissions in year y (tCO₂)

LE_y = Leakage emissions in year y (tCO₂)

Baseline emissions

Baseline emission is calculated according to the formula

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

Where:

EG_y = Net electricity delivered to the grid by the project activity in year y excluding transmission losses of the grid.

EF_y = Emission factor calculated according to selected methodology. Emission factor has been calculated ex-ante in PDD which is also used in calculating the baseline emissions. EF value used is 0.552 tCO₂/MWh

As it can be seen detail in excel spread sheet used for calculations;

-

Realized baseline emissions are calculated as follows:

$$EGy = 142,405 \text{ MWh}$$

$$EF_{\text{grid,CM,y}} = 0.552 \text{ tCO}_2/\text{MWh}$$

$$BEy = (142,405 \text{ MWh}) \times (0.552 \text{ tCO}_2/\text{MWh}) = 78,606 \text{ tCO}_2\text{e}$$

E.2. Calculation of project emissions or actual net GHG removals by sinks

The proposed project activity involves the generation of electricity by a hydroelectric power plant which has power density higher than 10W/m² therefore emissions from reservoir is ignored as per the applied methodology.

The UNFCCC approved baseline and monitoring methodology ACM0002, version 13.0.0¹¹ valid from 11/05/2012 was applied for the project activity.

ACM0002 refers to the following tools:

- “Tool for the demonstration and assessment of additionality”, Version 07.0.0¹², and,
- “Tool to calculate the emission factor for an electricity system”, Version 3.0¹³

The project activity involves the generation of electricity by a hydro power plant. As per the methodology applied, reservoir emissions are considered as below;

Reservoir emissions of the project activity is neglected since the power density is higher than 10W/m². Details of the PD calculation are below.

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

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

Where:

- PD = Power density of the project activity (W/m²)
- 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.

Although about half of the reservoir area is already river bed, A_{BL} has been assumed as zero. A_{BL} had been estimated as 10091.016 m^2 in the as per the reservoir map

For proposed project HEPP,

$$\begin{aligned} \text{Cap}_{PJ} &= 17,580,000 \text{ We} \\ \text{Cap}_{BL} &= 0.0 \text{ W} \\ A_{PJ} &= 10091.016(\text{m}^2) \\ A_{BL} &= 0.0 (\text{m}^2) \end{aligned}$$

Therefore PD is calculated as ;

$$\text{PD} = \frac{17580000 - 0}{10091.016 - 0}$$

$$\text{PD} = \sim 1742 \text{ W/m}^2$$

Since 1742 W/m^2 is far greater than 10 W/m^2 , project emissions are considered 0.

E.3. Calculation of 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, transport). These emissions sources are neglected

Also the energy generating equipment is not transferred from or to another activity. Therefore leakage is considered as "0".

As a result: Total Emission Reduction is;

$$\text{LE}_y = 0$$

$$\text{ER}_y = \text{BE}_y$$

E.4. Remarks on difference from estimated value in registered PDD

Item		Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	78,606 (26 months)	0	0	-	78,606tCO ₂	78,606 tCO ₂

E.5. Comparison of calculation of emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO₂e)	107,111(for 26 months of this monitoring period) (tCO ₂ e)	78,606(for 26 months of this monitoring period) (tCO ₂ e)

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO₂e)	2015 (full year) – 49,436 tCO ₂ e 2016 (full year) – 49,436 tCO ₂ e 2017 (2 months) –8.239 tCO ₂ e Total:107,111 tCO₂ e	2015(full year) – 45,718 tCO ₂ e 2016(full year) –31,614 tCO ₂ e 2017(2months) – 1,274 tCO ₂ e Total: 78,606 tCO₂ e

E.6. Remarks on difference from estimated value in registered PDD

In registered PDD, average annual estimated electricity generation and emission reduction values are 89.558 GWh and 49,436 tCO₂ respectively. However, realized annual electricity generation and net emission reduction values are 65.725 GWh and 36,280 tCO₂ respectively for 12 months period based on average generation. Both actual electricity generation and actual emission reduction values are lower than the estimated values. The value in the registered PDD is calculated ex-ante for duration of one complete year and assuming a certain incoming flow rate. Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable. On the other hand, the electricity generation is dependent on water flow estimation; which is a natural phenomenon and cannot be estimated with 100% accuracy, and minor deviations from the calculated values are acceptable.

APPENDIX 1. Contact information of project participants and responsible persons/entities

Organization name	Derin Enerji Üretim Sanayi ve Ticaret Anonim Şirketi
Street/P.O. Box	Turan Güneş Bulvarı
Building	75/4
City	Ankara
State/Region	Cankaya
Postcode	06550
Country	Turkey
Telephone	+90 312 490 98 38
Fax	+90 312 490 48 40
E-mail	info@derinenerji.com
Website	http://www.derinenerji.com/
Contact person	
Title	Manager
Salutation	Mr
Last name	Veziroğlu
Middle name	-
First name	Serkan
Department	-
Mobile	-
Direct fax	+90 312 490 9840
Direct tel.	+90 312 490 98 38
Personal e-mail	serkan@zeynepenerji.com

Organization name	GTE CARBON
Street/P.O. Box	Ehlibeyt Mah 1259. Sokak
Building	7/2
City	Ankara
State/Region	-
Postcode	06520
Country	Turkey
Telephone	(0090) 312 472 35 00
Fax	(0090) 312 472 33 66
E-mail	gte@gtecarbon.com
Website	www.gtecarbon.com
Contact person	
Title	Managing Director
Salutation	Mr.
Last name	DEMİRKOL
Middle name	Kemal
First name	Mehmet
Department	Management
Mobile	-
Direct fax	(0090) 312 472 33 66
Direct tel.	(0090) 312 472 35 00
Personal e-mail	kemal@gtecarbon.com

Monitoring of Sustainable Development Parameters

Indicator		Air Quality
Mitigation measure		Not required
Chosen Parameters		1-SO ₂ emissions reductions 2-NO _x emissions reductions
Current Situation of the Parameters		1- Total SO₂ emission related to electricity generation is about 621.31 Gg in 2011 according to National Inventory of Turkey¹⁴. Considering that electricity generation in 2011 is 229,395.1 GWh¹⁵, SO₂ emission per MWh is calculated as 2.71 kg/MWh. In parallel to the electricity generation, actual SO₂ emission reduction has been realized as about 385.9 tons during monitoring period 2- Total NO_x emission related to electricity generation is about 263.97 Gg in 2011 according to National Inventory of Turkey. NO_x emission per MWh is calculated as 1.15 kg. In parallel to the electricity generation, actual NO_x emission reduction has been realized as about 163.9 tons during monitoring period..
Future Target for Parameters		1-SO ₂ emission reduction corresponding to annual generation. 2- NO _x emission reduction corresponding to annual generation
Way of Monitoring	How	Electricity generated by the project
	When	Yearly
	By Who	Project Owner

Indicator		Biodiversity
Mitigation measure		Since Turkey is a part of Bern Convention, species under special protection will be protected by the project owner by taking required measures
Chosen Parameters		Number of effected species
Current Situation of the Parameters		Fish passage has been designed and built as per the expert recommendations.
Future Target for Parameters		Natural flora and fauna of the region As per the Bern Convention, the natural habitat of the region will be protected.

¹⁴http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur-2013-crf-12apr.zip

¹⁵[http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim\(22-45\)/23.xls](http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/23.xls)

Way of Monitoring	How	The assessment/opinion of independent expert on effectiveness of the project design has been prepared and submitted to GS and validation DOE. Design of fish passage has been revised as per the expert reports. Also, an ecosystem assessment report has been prepared for the project.
	When	Once after project is completed.
	By Who	Project Owner

Indicator	Quality of Employment		
Mitigation measure	All recruited technical staff is trained for operation and maintenance of equipment and Health and safety measures. Also, staff working with high voltage equipment is certified (also required by regulations). The trainings are renewed for new staff if necessary. All health and safety measurements are applied according to local regulations.		
Chosen Parameters	Number of certificates issued/trainings provided.		
Current Situation of the Parameters	Existing and new staff are being continuously trained in relevant disciplines		
	Attendee	Provided By	Subject
	Özgür Mum	Kapadokya Danışmanlık	Basic HSE
	Eren Çelebi Arslan	Kapadokya Danışmanlık	Basic HSE
	Selim Bakır	Kapadokya Danışmanlık	Basic HSE
	Fethi Akagündüz	Uçarkuş	Basic HSE
	İlyas Kahveci	Uçarkuş	Basic HSE
	Mikayil Kahveci	Uçarkuş	Basic HSE
	Çağlar Karakoç	Uçarkuş	Basic HSE
	Muhammet Çakar	Uçarkuş	Basic HSE
	Mustafa Çetin	Uçarkuş	Basic HSE
	Adem Aydın	Uçarkuş	Basic HSE
	Özgür Mum	Uçarkuş	Basic HSE
	Erhan Fırat	Uçarkuş	Basic HSE

				(4hours)
	Duran Geyik	Uçarkuş	Basic HSE	13/01/2017 (4hours)
	Attendee	Provided By	Subject	Date
	Özgür Mum	Electricity Generation Company	High Voltage Working Permit Certificate in High Current Facilities	29/05/2014
	Eren Çelebi	Electricity Generation Company	High Voltage Working Permit Certificate in High Current Facilities	27/10/2010
	Erhan Fırat	Electricity Generation Company	High Voltage Working Permit Certificate in High Current Facilities	12/05/2009
Future Target for Parameters		All relevant staff employed by project owner to be trained for Health and safety issues and relevant staff should be certified for working at high voltage environment.		
Way of Monitoring	How	Through review employment records and training documents/certificates		
	When	Yearly		
	By Who	Project Owner		

Indicator	Balance of payments
Mitigation measure	Not required
Chosen Parameters	Currency saving due to avoided fuel import.

Current Situation of the Parameters		In 2011, about 22.8 bn m³ natural gas been used¹⁶ for about 103,916 GWh electricity generation¹⁷ about € 6.2 bn has been spent¹⁸. During monitoring period, about 31, 251 million m³ NG has been saved which corresponds to € 5,085,629.
Future Target for Parameters		Natural gas consumption avoidance parallel to actual annual electricity generation.
Way of Monitoring	How	Through comparing electricity generated by Çamlica II and natural gas that would be used to produce the same amount of electricity according to baseline scenario.
	When	Yearly
	By Who	Project Owner

Indicator	Water Quality and Quantity
Mitigation measure	Project has a channel which provides the required water from the tail water of Çamlica I HEPP needs 30m³ /sec flow.¹⁹ Domestic waste generated at the construction site is handled according to the national regulations on handling domestic waste.²⁰
Chosen Parameters	Amount of water released.

¹⁶ [http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim\(22-45\)/23.xls](http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/uretim%20tuketim(22-45)/23.xls)

¹⁷ [Tukey National Greenhouse Gas Inventory Report 1990-2011, p17](#)

¹⁸ http://www.igdas.com.tr/Dynamic/Individual_Natural_Gas_Price_List.aspx?MI=2&CMI=2 based on 01/01/2011 Natural Gas price

Current Situation of the Parameters		Hydrogeological and hydrobiological assessment report is prepared by independent experts. Flow released is monitored and recorded by DSI. Data for flow released is submitted to DOE and GS, together with assessment report and flow measurement records. Released flow is in compliance with biological requirements and mandates of relevant institutions.
Future Target for Parameters		Minimum amount of water to maintain for aquatic life ²² in riverbeds will be met.
Way of Monitoring	How	Flow measurement at the downstream of the weir
	When	Flow is monitored continuously and recorded by the gauging device
	By Who	Facility Manager and impartial expert

¹⁹ PIF page 11²⁰ PIF page 97²¹ PIF page 120²² Ecosystem Assessment Report page 27

Indicator	Quantitative employment and income generation
Mitigation measure	Mitigation measure is not required for this indicator.
Chosen Parameters	Payment made to the staff

Current Situation of the Parameters		Number of employees recruited on site is 12. The positions of the employees are given in the table below
		# Name of Employee Position
		1 Fethi AKAGÜNDÜZ Operating Chief
		2 Mustafa CETİN Mechanical Maintenance Responsible
		3 Adem AYDIN Electrical Maintenance Responsible
		4 Özgür MUM Switchboard Operator
		5 Erhan FIRAT Switchboard Operator
		6 Çağlar KARAKOÇ Switchboard Operator
		7 Eren ÇELEBİ ASLAN Switchboard Operator
		8 Muhammet ÇAKAR Cleaning Staff
		9 Sinan BAKIR Cleaning Staff
		10 İlyas KAHVECİ Cleaning Staff
		11 Duran GEYİK Cleaning Staff
		12 Mikail KAHVECİ Cleaning Staff
Future Target for Parameters		Project will create new job opportunities compared to baseline scenario.
Way of Monitoring	How	Pay checks and other employment documents.
	When	Annually
	By Who	Project Owner

Indicator		Soil Condition
Mitigation measure		Excavation is stored appropriately and be placed on top of present landscape
Chosen Parameters		Storage of excavation
Current Situation of the Parameters		Excavation aggregates have either been used as filling material or stored as per the permission from local authorities.
Future Target for Parameters		Landscaping activities will be performed as per regulations and there will not be a need for excavation management after the water transfer channel has been built.
Way of Monitoring	How	Through site visits
	When	Once after construction works are complete

	By Who	Project Owner
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Indicator		Soil Condition
Mitigation measure		Suitable places around the project site will be afforested as a mitigation measure against impacts on flora.
Chosen Parameters		Afforestation
Current Situation of the Parameters		Afforestation activities began as soon as the construction works were over and the landscape has been restored.
Future Target for Parameters		Planted trees will be protected.
Way of Monitoring	How	Through site visits
	When	Once after construction works are complete
	By Who	Project Owner

Indicator		Other pollutants
Mitigation measure		In order to mitigate noise pollution, explosives are only used during specific times of day and are performed under supervision of regional authorities. Dust emissions calculations are made and it has been concluded that it is under legal limits to use 6.4 kg of explosives/day taking into account the closest settlement.
Chosen Parameters		Noise and dust pollution
Current Situation of the Parameters		Noise and dust emissions management is carried out as per the regulations and commitments. Parameter is relevant to construction period and there is no dust/noise disturbance during operation.
Future Target for Parameters		Noise and dust pollution will be prevented once the plant is operational
Way of Monitoring	How	Through site visits,
	When	Once after construction works are complete
	By Who	Project Owner

Indicator		Other pollutants
Mitigation measure		Waste oil has been collected and stored under confined conditions and as per regulations.
Chosen Parameters		Solid waste and waste oil treatment

Current Situation of the Parameters		The plant does not use high amounts of oil, once the containers are full, waste oil is removed by an authorized company or municipality services. Residential wastes and solid wastes due to daily operation of the personnel have been stored in containers under confined conditions. Wastes are either be collected by the local municipality or dumped to sites designated by the local authorities.
Future Target for Parameters		Waste oil will be used and stored appropriately. Service receipts will be kept and used to track operations.
Way of Monitoring	How	By checking service receipts or operation logs.
	When	Yearly
	By Who	Project Owner