CEYHAN 61.7 MW HYDROPOWER PROJECT

Document Prepared by Sekans Enerji Limited Sirketi

Project Title	Ceyhan 61.7 MW Hydropower Project
Version	5
Report ID	CEYMONITORING2
Date of Issue	12 April 2022
Project ID	810
Monitoring Period	01 June 2012 - 31 May 2018
Prepared By	Sekans Enerji Limited Sirketi
Contact	Emniyet Evleri Mah. Eski Büyükdere Cad. No: 1 /1 Iç Kapi No: 1b04 Kagithane/ IstanbulE-mail: sila@sekansdanismanlik.com Phone: +90 532 438 30 29

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Ceyhan 61.7 MW Hydropower Project which is developed by Enova Enerji Üretim A.Ş. (hereafter referred to as the "project owner"), consists of Oşkan and Berkman diversion weirs and HPPs which are run-of-river hydro electrical power plants with a total installed capacity of 63.468 MWm / 61.704 Mwe. The project is located on Ceyhan River, in the city of Osmaniye, in South Anatolian Region, Turkey.

The Project has been implemented and operated by Enova Enerji Üretim A.Ş. The project aims to generate electricity from hydropower and feed it to the national electricity grid.

The project includes 6 turbines, with an estimated power supply to the grid of 239,946 MWh per annum. The project is in implementation since June 3rd, 2010, when Oşkan HPP, three of the six Pit Kaplan type turbines in the plant, commences electricity generation. The starting date of the project activity for the Berkman HPP, other three turbines in the plant, has been August 20th, 2010. The estimated amount of GHG emission reduction is 147,566 tonnes CO2e per year in the registered PDD. During this monitoring period, the actualized net electricity generation is 1,107,730.44MWh. By displacing equivalent amount of electricity consumed from the national grid, which is mostly comprised of fossil fired power plants, the actual emission reduction has been calculated as 681,250tonnes CO_2 for this monitoring period.

The implementation of the project consists of two diversion weirs and HPPs. Oşkan HPP has three Pit Kaplan type turbines with an installed capacity of 7.963 MWe each. Total installed capacity of Oşkan HPP is 23.889 MW. Berkman HPP is also equipped with three Pit Kaplan type turbines with an installed capacity of 12.605 MWe each. Total installed capacity of Berkman HPP is 37.815 MW[1]. Total installed capacity in the powerhouse is 63.468 MWm/ 61.704 MWe. Both HEPPs utilizes the head between the Aslantas Dam at the upstream of Ceyhan River and Cevdetiye irrigation structure at the downstream or power generation. The HEPPs uses the water outlet flows of the upstream Aslantaş Dam. *T*here hasn't been any increase in the reservoir area during this monitoring period.

The construction of the project started in 28-March-2008 and the project was operational on 03-June-2010[2].

[1] Ministry Acceptance Protocols showing the technical details of the turbines and the generation license are available to the VVB.

[2] Ministry Acceptance Protocols are available to the VVB..

The project has produced positive environmental benefits as displacing the electricity generated by fossil fuel fired power plants by utilising the renewable resources so as to avoid environmental pollution and GHG emissions.

Please see the vintage-based comparison of expected and achieved emission reductions for this monitoring period:

Table 1- Expected vs achieved emission reductions

Vintage	Period	Total Days	Amount achieved during this monitoring period (tCO2e)	Amount estimated ex ante (tCO2e)	Difference (tCO2e)	Difference (%)
2012	01January.2012 - 31.December.2012	214	84,605	86,518	-1,913	-2.2%
2013	01-January-2013 – 31-December-2013	365	143,627	147,566	-3,939	-2.7%
2014	01-January-2014 – 31December-2015	365	80,826	147,566	-66,740	-45.2%
2015	01-January01-2015 – 31-December2015	365	137,940	147,566	-9,626	-6.5%
2016	01-Januray2016 – 31-December2016	366	107,852	147,566	-39,714	-26.9%
2017	01-January2017 – 31-December2017	365	85,938	147,566	-61,628	-41.8%
2018	01-January2018 – 31-May2018	151	40,462	61,048	-20,586	-33.7%
Total		**2,191**	**681,250**	**885,396**	**-204,146**	**-23.1%**

Table 2 - Monitoring timeline of the Project Activity

Date (Period)	Activity
21/08/2003	Issuance of “EIA Certificate not required”
28/03/2008	Construction Start Date
03/06/2010	Commissioning of the Project
03/06/2010 - 31/05/2012	1st Monitoring Period
01/06/2012 - 31/05/2018	2nd Monitoring Period

Please see the technical description of the Project Activity through Table 3:

Table 3 - Technical description of the turbines in the Project Activity[3]

Oşkan HEPP – Pit Kaplan type turbine	
Turbine Brand	Alstom
Turbine Type	Horizontal - axis
Number of units	3
Water flow rate	89 m^3/s
Net head at 9.00 m^3/s	10.5 m
Rated power	8,198 kWm/7,963kWe
Turbine Serial Numbers	2075, 2076, 2077

Berkman HEPP– Pit Kaplan type turbine	
Turbine Brand	Alstom
Turbine Type	Horizontal - axis
Number of units	3
Water flow rate	89 m^3/s
Net head at 9.00 m^3/s	15.71 m
Rated power	12,958 kWm/12,605kWe
Turbine Serial Numbers	2078, 2079, 2080

Please see the technical details of the generators through Table 4:

Table 4- Technical description of the generators in the Project Activity[4]

[3] The photographic evidence of turbine name plates is available to the VVB.

[4] The photographic evidence of generator name plates is available to the VVB.

BERKMAN HEPP	
Generator Brand	Alstom
Generator Type	SAH 183/105/10
Generator Serial Numbers	G0N132, G0N133, G0N134
Number of units	3
Rating	12605 kVA
Frequency	50 Hz

OŞKAN HEPP	
Generator Brand	Alstom
Generator Type	SAH 150/110/10
Generator Serial Numbers	G0N129, G0N130, G0N131
Number of units	3
Rating	7963 kVA
Frequency	50 Hz

1.2 Sectoral Scope and Project Type

According to UNFCCC sectoral scopes definition for CDM projects, the Project Activity is included in the Sectoral Scope 1, category “Energy industries (renewable - / nonrenewable sources)”. The project is a single green field investment and is not part of a project group or bundle. The project is not a grouped project.

1.3 Project Proponent

Organization name	Enova Enerji Üretim A.Ş.

Contact person	Mr. Koray Keskin
Title	Trade Manager
Address	Gelincik sok. No: 2/2 Güvenevler – Ankara - Turkey
Telephone	+90 312 428 11 25
Email	koray.keskin@enovaenerji.com.tr

1.4 Other Entities Involved in the Project

Organization name	Sekans Enerji Limited Sirketi
Role in the Project	Consultant
Contact person	Sıla Duran
Title	Consultant
Address	Emniyet Evleri Mah. Eski Büyükdere Cad. No: 1 /1 Iç Kapi No: 1b04 Kagithane/ Istanbulkonaklar
Telephone	-
Email	sila@sekansdanismanlik.com

1.5 Project Start Date

The project start date is 03/06/2010 as it is the first commissioning date of the project activity. [5].

1.6 Project Crediting Period

The Project's crediting period type is renewable crediting. The Project's crediting period is ten years renewable twice: 03/06/2010 – 02/06/2020 (both days are included).

1.7 Project Location

The project is located on Ceyhan River which is in the borders of Osmaniye city in South Anatolian region of Turkey.

[5] The Ministry Acceptance Protocols are available to the VVB.

The geographical coordinates of the project sites are;

37°13'28.06" North, 36°15'8.77" East for Oşkan HEPP and 37°10'7.20" North, 36°14'1. 47" East for Berkman HEPP[6].

Figure 1. Location of the Oşkan HPP and Berkman HPP in Turkey Map

1.8 Title and Reference of Methodology

The emission reductions of the Project were calculated in accordance with the approved consolidated baseline and monitoring methodology ACM0002, Version 12.1.0: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Also, to prove additionality and to calculate the grid emission factor,

"Tool for the demonstration and assessment of additionality, Version 05.2 and

[6] Please see the registered PD.

"Tool to calculate the emission factor for an electricity system", Version 2 are used.

1.9 Participation under other GHG Programs

The project has never been included in an emissions trading program or any other binding limits. It has neither received any kind of environmental credits nor been registered under any other GHG programs.

1.10 Other Forms of Credit

The project has not created another form of credits that are included in an emissions trading program; or any other mechanism that includes GHG allowance trading

1.11 Sustainable Development

The project produces electricity from renewable energy sources using hydro as the power source and to contribute to Turkey's growing electricity demand through a sustainable and low carbon technology. The project displaces the same amount of electricity generated by the grid dominated with fossil fired power plants. The project generates 239,946 MWh annually. The project contributes to the Sustainable Development Goal, Affordable and Clean Energy. During this monitoring period, the project has generated 1,107,730.44MWh as contributing to SDG 7 Affordable ad Clean Energy.

The annual emission reduction estimated by the project is 147,566 tonnes CO2eq, approximately. While this amount of emissions is mitigated, technology transfer is also realized as benefitting from hydropower. During this monitoring period, the project has contributed to SDG 13 Climate Action as reducing 681,250tonnes CO2.

The project contributes to improve the environmental situation in the region and in the country as avoiding fossil fuel-based electricity enhanced the air quality and help to reduce the negative effects on the climate. Through renewable technologies and hydro-based electricity sustainable and climate friendly development is promoted. The project contributes to the Sustainable Development Goal, Climate Action.

During construction and operational period, the project has created employment opportunities for the local community. As contributing to SDG 8 Decent Work and Economic Growth, 31 employees are working for the project activity.

The project contributes the economic development of the region by providing sustainable energy resources. The project provides workers with a safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments. Thus,

the project contributes to the Sustainable Development Goal, Decent Work and Economic Growth.

2 SAFEGUARDS

2.1 No Net Harm

Within the scope of the project, all precautions have been taken for the environment during the design phase and the project will be implemented in line with the environmental law and related regulations.

The purpose of the project activity is to generate power in an efficient, clean, reliable and sustainable way with maximum respect on social and environmental aspects and to reduce emissions by partially substituting the electricity supply of fossil fuel fired power plants in Turkey. The consequences of the Project Activity with regards to economic, social and environmental impacts have been assessed during EIA process. The project has received an "EIA is not required" according to Turkish environmental law by Ministry of Environment and Forestry on 21/08/2003.

The project activity is not on forest land. There are agricultural lands around the project area; however, since the project is constructed on water and, no reservoir, no negative impacts are expected on agricultural land.

The operation of equipment complies with the Turkish Standards and World Bank Guidelines.

Regarding the wastes, hazardous wastes are handled appropriately in closed containers and transported by licensed transporters to the licensed processing and disposal facilities. Wastewater is collected through within the septic tank and is transferred through these wage truck. Domestic wastes are transferred by the provincial administration[7].

In line with legal requirements, needed life water is released by the project activity as stated in EIA report.

There is not any negative environmental or socio-economic impact.

[7] Records and photos are available to the VVB.

2.2 Local Stakeholder Consultation

The stakeholder meeting was held on 10th April 2009 in Karagedik Village in accordance with the World Bank Operational Manual requirements. The meeting was announced in local media and national (Bir Gün) newspapers and through Village Head of Karagedik. Also, national and local policy makers, local NGOs and the local people were invited. Residents in the village were informed about the event through the village heads of Karagedik, Karatepe and Nohuttepe. In this meeting authorized people from EN-ÇEV on behalf of the project owner Enova Enerji Üretim A.Ş. introduced project to the local people in terms of the size of the project, expected length of the construction period and to give details about how this project impacted their lives.

The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from Enova Enerji Üretim A.Ş. and relevant contact information was announced in the relevant meetings for ongoing communication.

The local workers have been given priority during the hiring for plant operation.

The Project has resulted in the creation of new jobs in the project region and improvement in local roads, contributing to living standards in the region. The project owner helped local people and the institutions in many ways.

There was no specific environmental problem that concerned the locals more than others, and environmental issues need to be solved by the government. All people considered clear signs of climate change in the region in recent years.

The contact information of the plant responsible exist at the Mukhtar of Kumarlıvillage, the project owner and local community are always in touch. The project owner regularly checks with the Mukhtar if any complaint or a request exists. Any complaint or need from the local community could directly be received by the project owner and appropriate contributions or improvements are made to the local community. No complaint has been received during the monitoring period as Mukhtar stated by his signed letter dated on 26/11/2021.

The project is operational and there is no update to the project design.

2.3 AFOLU-Specific Safeguards

N/A

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The description of the implementation and operational status of the project and the installed technology(ies), technical process and equipment are detailed in Section 1.1. There hasn't been any negative event that may impact the GHG emission reductions or removals during the monitoring period.

Other entity involved in the Project was Suen Ltd. Şti., Turkey in the project description. However, it's been changed as Sekans Enerji Limited Sirketi after the first monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

There are no methodology deviations applied during this monitoring period.

3.2.2 Project Description Deviations

Other entity involved in the Project was Suen Ltd. Şti., Turkey in the project description. However, it's been changed as Sekans Enerji Limited Sirketi after the first monitoring period.

3.3 Grouped Projects

This is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

.

Data / Parameter	$F_{i, j, y}$
Data unit	m^3 or tons
Description	Amount of fossil fuel type i consumed by the relevant power source j in year y
Source of data	TEIAS web page www.teias.gov.tr
Value applied	See Annex 3 in the registered PDD for details in
Purpose of data	Applied in the calculation of the simple OM.
Comments	-

Data / Parameter	$NCV_{i, y}$
Data unit	Tj/kt
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	Calculated using data in TEIAS web page using fuel consumption and heating values data
Value applied	See Annex 3 in the registered PDD for details
Purpose of data	Applied in the calculation of the simple OM.
Comments	-

Data / Parameter	$EF_{CO2, i, y}$
Data unit	$tCO_{2/Tj}$
Description	CO2 emission factor of fossil fuel type i in year y
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	See Annex 3 in the registered PDD for details
Purpose of data	Applied in the calculation of the simple OM.
Comments	-

Data / Parameter	**Installed Capacity**
Data unit	MW
Description	Installed capacities of hydro power and fuel-fired power of the National Turkish Grid 2002-2008
Source of data	Turkish Electricity Transmission Company (TEIAS)
Value applied	See Annex 3 in the registered PDD for details
Purpose of data	Applied in the calculation of the simple BM.
Comments	-

Data / Parameter	EG_y
Data unit	MWh
Description	Net Electricity generated and delivered to the grid by the power plant in year y

Source of data	Metering devices measuring the electricity generation of the plant and invoices prepared for billing the transmission company.
Value applied	Please Annex 3 in the registered PDD for details
Purpose of data	Applied to calculate the project emission reductions
Comments	-

Data / Parameter	**$EF_{grid,CMy}$**
Data unit	tCO_2e/MWh
Description	Baseline emission factor
Source of data	Registered PDD for the Project
Value applied	0.615
Purpose of data	Used for baseline emissions
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	**$EG_{Facility,y}$**
Data unit	MWh
Description	Annual net electricity generated by the Project Activity
Source of data	The data from the Electricity Meters are the basis for the settlement notification of EPIAS[8]. Data are gathered electronically from the meters by TEIAS and stored in secured website of EPIAS, which is accessible to project developer with a private password. For monitoring, EPIAS screenshots shall be used as source of data.
Description of measurement methods and procedures to be applied	These devices measure the net electricity supply to the national grid by the Project Activity, all losses before this point are on account of the project participant. Both metering instruments, which continuously monitor and measure the net electricity delivered by the Project Activity, are sealed and only accessible

[8] PMUM has been replaced by EPIAS as of 01/09/2015 in Turkey. Retrospective data is accessible via EPIAS

<table>
<tr><td></td><td>by TEIAS personnel. Official TEIAS data from the EPIAS web site are being used for calculating $EG_{Facility,y}$.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuously monitoring and monthly readings</td></tr>
<tr><td>Value monitored</td><td>137,569.39MWh for 2012
233,541.38MWh for 2013
131,425.55MWh for 2014
224,294.18MWh for 2015
175,370.02MWh for 2016
139,736.72MWh for 2017
65,793.21MWh for 2018</td></tr>
<tr><td>Monitoring equipment</td><td>Both exported and imported electricity are measured continuously by power meters at the grid interface and recorded monthly. There are 8 meters as , as 4 main and 4 spare meters in the project activity.
Power meters:
Oşkan HPP
<table>
<tr><th>Unit 1</th><th>Main Meter</th><th>Spare Meter</th></tr>
<tr><td>Name</td><td>Ana Sayaç</td><td>Yedek Sayaç</td></tr>
<tr><td>Brand</td><td>EMH</td><td>EMH</td></tr>
<tr><td>Serial Number</td><td>8923872</td><td>8923873</td></tr>
<tr><td>Latest Test Date of the Meters</td><td>11.10.2019</td><td>11.10.2019</td></tr>
<tr><td>Accuracy Class</td><td>0.5 S</td><td>0.5 S</td></tr>
</table>
<table>
<tr><th>Unit 2</th><th>Main Meter</th><th>Spare Meter</th></tr>
<tr><td>Name</td><td>Ana Sayaç</td><td>Yedek Sayaç</td></tr>
<tr><td>Brand</td><td>EMH</td><td>EMH</td></tr>
<tr><td>Serial Number</td><td>8923874</td><td>8923875</td></tr>
<tr><td>Latest Test Date of the Meters</td><td>11.10.2019</td><td>11.10.2019</td></tr>
</table></td></tr>
</table>

Accuracy Class	0.5 S	0.5 S

Unit 3	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	EMH	EMH
Serial Number	8923876	8923877
Latest Test Date of the Meters	11.10.2019	11.10.2019
Accuracy Class	0.5 S	0.5 S

Berkman HPP

	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	EMH	EMH
Serial Number	8923878	8923879
Latest Test Date of the Meters	11.10.2019	11.10.2019
Accuracy Class	0.5 S	0.5 S

Latest meter test date is 19/10/2019 for these meters.

Power meters that were changed on 19.10.2019. This date is also the calibration date of the new meters.

The changed power meters are as below (these are the ones used during the monitoring period):

Oşkan HPP

Unit 1	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	ELSTER	ELSTER
Serial Number	388202	388203

Accuracy Class	0.5 S	0.5 S

Unit 2	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	ELSTER	ELSTER
Serial Number	388204	388205
Accuracy Class	0.5 S	0.5 S

Unit 3	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	ELSTER	ELSTER
Serial Number	388207	388208
Accuracy Class	0.5 S	0.5 S

Berkman HPP

	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	ELSTER	ELSTER
Serial Number	388228	388227
Accuracy Class	0.5 S	4.5 S

- The calibration date of these meters is 04/03/2010.
- Latest test meter dates for these meters are 28/10/2017 and 30/10/2018.

QA/QC procedures to be applied

- Spare meters are used for crosschecking the accuracy and all meters are calibrated if required.
- The Meter Reading Forms are considered as the main source for the net electricity and the values are crosschecked with the EPIAS records.

	• TEIAS is responsible for calibration and maintenance of the devices. The periodic calibration or maintenance is under the responsibility of TEIAS and has been fixed as once in 10 years[9]. Since TEIAS meters are sealed by TEIAS, the project proponent cannot intervene with the devices. The periodic tests are executed on annual basis.
Purpose of data	Calculation of net electricity supplied to the grid and thus baseline emissions
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	**CAP_{PJ}**
Data unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Powerhouse
Description of measurement methods and procedures to be applied	Aggregation of the capacities of each turbine generator sets that are installed in the project powerhouse(s) for electricity generation
Frequency of monitoring/recording	Yearly
Value monitored	63.468 MWm / 61.704 MWe
Monitoring equipment	The data is monitored from the electricity generation license which was granted by Energy Market Regulatory Authority. The most up-to-date generation license has been provided. The installed capacity figure is 8.198 MWm / 7.963 MWe for three of the six turbines. The capacity figure for the other three turbines is 12.958 MWm / 12.605 MWe. The total installed capacity of the project is 63.468 MWm / 61.704 MWe.
QA/QC procedures to be applied	Supplier information on the equipment and existence of the equipment are being checked.

[9] http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.6381&MevzuatIliski=0&sourceXmlSearch

Purpose of data	Used for calculation of project emissions
Calculation method	-
Comments	-

Data / Parameter	**A_{PJ}**
Data unit	m^2
Description	Surface of the regulation pond after the implementation of the project activity, when the reservoir is full
Source of data	Measured by Siemens HydroRanger 200 type 7ML18302- AK Ultrasonic level measurement Measuring range: 0.3 to 15m
Description of measurement methods and procedures to be applied	Measured at the feasibility phase of the project. As stated into the project details, crest elevation is 85.5 m for the Oşkan and 75 m for the Berkman. Operational reservoir water levels for these weirs are 83 m and 72.5 m. Surface areas based on the water levels are 1,621,425.95 m^2 for the Oşkan and 1,648,560.79 m^2 for the Berkman. Instead of the surface area measurements, reservoir water levels are being measured by the Siemens meters and the measured water levels are being monitored.
Frequency of monitoring/recording	Yearly
Value monitored	Measured water levels by two Siemens meters are Berkman: 72.55 m – 72.40-45 m (equal to 1,648,560.79 m^2) Oşkan: 83.05 m – 82.95 m (equal to 1,621,425.95 m^2)
Monitoring equipment	Siemens meters
QA/QC procedures to be applied	The measurement is being performed by a qualified institute and the results are being kept during the crediting period.
Purpose of data	Used for calculation of project emissions
Calculation method	Water levels have been measured by two Siemens meters.
Comments	-

Data / Parameter	**Number of temporary and permanent employees**

Data unit	Number of Employees
Description	Number of the Permanent employees
Source of data	SGK records
Description of measurement methods and procedures to be applied	SGK records
Frequency of monitoring/recording	Annually during verification
Value monitored	31 permanent employees
Monitoring equipment	SGK records
QA/QC procedures to be applied	N/A
Purpose of data	Monitoring of project contribution to SDG 8 Decent Work and Economic Growth
Calculation method	N/A
Comments	-

Data / Parameter	**Livelihood of the poor**
Data unit	Numbers of the employees from the project region
Description	Numbers of the employees from the project region
Source of data	SGK records
Description of measurement methods and procedures to be applied	SGK records
Frequency of monitoring/recording	Annually during verification
Value monitored	31 permanent employees and 0 temporaryemployees
Monitoring equipment	SGK records

QA/QC procedures to be applied	N/A
Purpose of data	Monitoring of project contribution to SDG 8 Decent Work and Economic Growth
Calculation method	N/A
Comments	-

4.6 Monitoring Plan

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emission reductions during the whole crediting period. The Project proponent is responsible for the implementation of the monitoring plan.

The Project Proponent is responsible for the overall management of the monitoring procedures including recording, data collection, calculating emission reductions and project emissions.

Please see below the management structure for the plant operation:

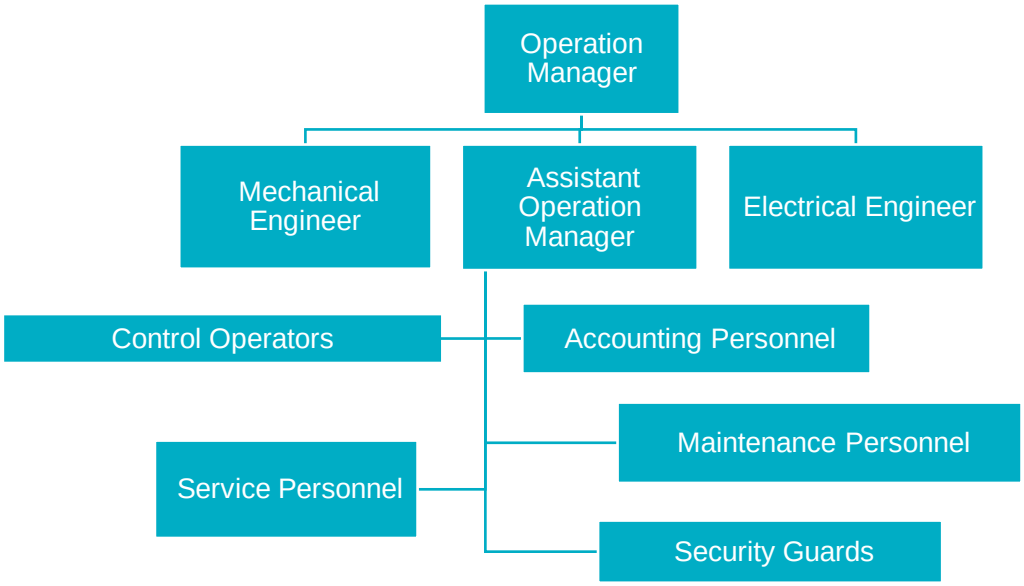

Figure 2. The management structure for the plant operation

The Operation Manager is responsible for the whole management of the Project Activity and assistant operation manager, the mechanical engineer, electrical engineer and control operators are responsible for the implementation of the Project Activity. In addition to the operators, there are five accounting personnel, five maintenance personnel, two service personnel and fifteen security guards. In total, thirty-one employees are working for the Project Activity.

Eight power meters are installed at the grid interface of the project. Four of them are the main meters and the other four are spare meters of the main meters for cross-checking. All meters are jointly inspected and sealed in order to be protected from interference by any of the parties. Both main and spare meters are owned and installed by the grid operator (TEIAS). The grid operator's is the only one authorized to deal with fixing, calibrating, or changing the meters, which is being done either by the grid operator or by a company authorized by the grid operator. During this monitoring period, there were no records of meter failure. In case of any urgent case TEIAS contacts the Plant Manager. Since the meters are within TEIAS' province, TEIAS executes all the procedures for handling non-conformities. Therefore, the Project Participant does not have any internal auditing for this purpose.

TEIAS is performing remote reading of the meters and monthly power meter readings are the basis for monitoring net electricity fed into the grid. A measuring protocol is prepared including day, peak and night hour electricity generation by the project owner and approved by governmental officers at the end of each month.

The primary source isthe Meter Reading Forms. Net electricity exported is crosschecked with EPIAS records. EPİAS is the financial settlement center of TEIAS[10]. The Meter Reading Forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available. The website of EPİAS is accessible to Project Proponent with their unique user ID and password. Once accessed, the Project Proponent is able to call electricity generation and consumption reports of their own projects. The same reports are used by the Project Proponent for invoicing TEIAS. The electricity generation data is reported monthly basis.

Quality Control and Assurance (QC/QA)

Both the main and spare (control) meters are owned and installed by the grid company. Both meters are jointly inspected and sealed in order to be protected from interference by any of the parties.

[10] PMUM has been replaced by EPIAS as of 01/09/2015 in Turkey during the verification period. Retrospective data is accessible via EPIAS.

The grid operator's Metering Officer should be notified of any failure of one of the meters. He is the only one authorized to deal with fixing, calibrating, or changing the meters, which is being done either by the grid operator or by a company authorized by the grid operator. During this monitoring period, there were no records of meter failure. The data is hourly recorded by the personnel on the plant. TEIAS Load Dispatching Center also executes remote reading during 24-hour period. The data could be remotely accessed by TEIAS.

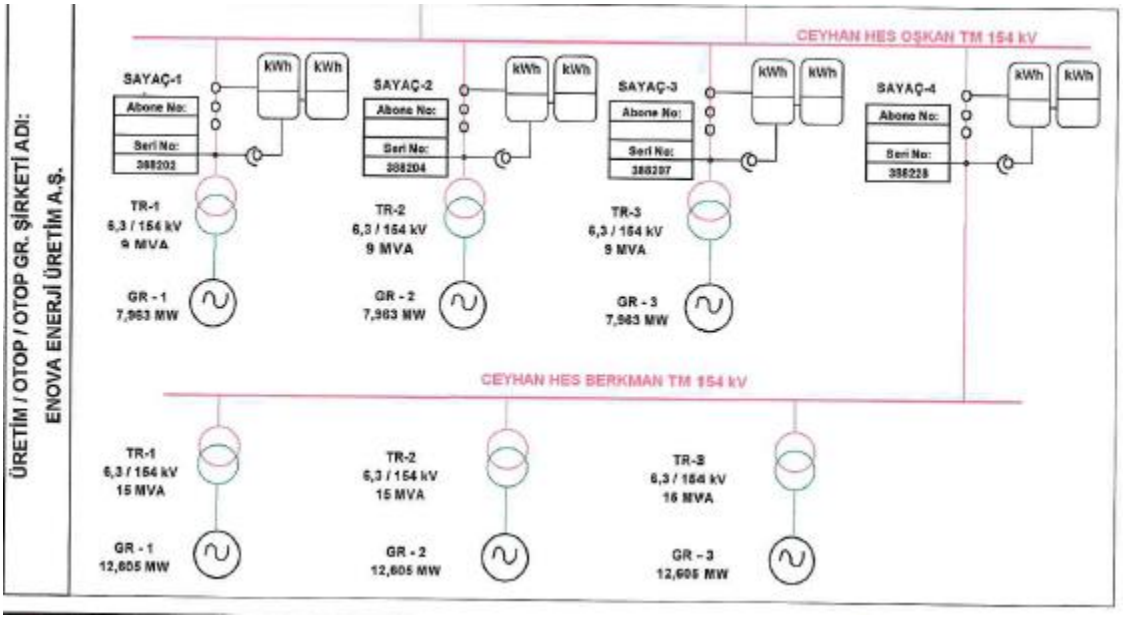

Figure3. Single Line Diagram of the Project Activity

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emission BE_y (tCO2e) during the monitoring period results from:

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

Where:

BE_y	Baseline emissions in year y (tCO_2e/y)
$EG_{PJ,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated by using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

$EF_{grid,CM,y}$ value is fixed as 0.615 tCO2/MWh for during the crediting period. Table 5 shows the baseline emissions for the verification period:

Table 5 - Baseline emissions

Month	(A) Electricity supplied to the grid [MWh]	(B) Electricity consumption from the grid [MWh]	(C) = (A) - (B) EG (ID 8) Net electricity supplied to the grid [MWh]	EF [tCO_2/MWh]	Baseline emission: ER = EG * EF [t CO_2-eq]
Jun-12	28,366.27	0.099	28,366.17	0.615	17,445
Jul-12	29,258.37	0.06	29,258.31	0.615	17,994
Aug-12	24,301.89	5.804	24,296.09	0.615	14,942
Sep-12	20,836.65	10.614	20,826.03	0.615	12,808
Oct-12	12,648.91	23.845	12,625.06	0.615	7,764
Nov-12	8,290.88	58.398	8,232.48	0.615	5,063
Dec-12	14,011.69	46.448	13,965.24	0.615	8,589
Jan-13	23,991.03	36.505	23,954.52	0.615	14,732
Feb-13	17,799.99	35.407	17,764.58	0.615	10,925
Mar-13	34,938.64	1.218	34,937.42	0.615	21,487

Apr-13	12,842.09	22.74	12,819.35	0.615	7,884
May-13	22,273.17	10.375	22,262.79	0.615	13,692
Jun-13	25,857.89	4.95	25,852.94	0.615	15,900
Jul-13	27,833.30	1.269	27,832.03	0.615	17,117
Aug-13	21,394.97	8.712	21,386.26	0.615	13,153
Sep-13	15,284.04	14.556	15,269.49	0.615	9,391
Oct-13	10,007.48	19.987	9,987.50	0.615	6,142
Nov-13	9,896.12	21.664	9,874.46	0.615	6,073
Dec-13	11,645.64	45.59	11,600.05	0.615	7,134
Jan-14	14,727.50	18.256	14,709.24	0.615	9,046
Feb-14	6,754.04	62.281	6,691.76	0.615	4,115
Mar-14	2,041.07	107.641	1,933.43	0.615	1,189
Apr-14	5,586.14	56.906	5,529.24	0.615	3,400
May-14	19,788.40	11.418	19,776.98	0.615	12,163
Jun-14	22,826.92	6.59	22,820.33	0.615	14,035
Jul-14	22,740.73	1.877	22,738.85	0.615	13,984
Aug-14	16,904.78	9.383	16,895.39	0.615	10,391
Sep-14	9,517.69	23.631	9,494.06	0.615	5,839
Oct-14	5,323.28	48.963	5,274.32	0.615	3,244
Nov-14	3,842.96	72.974	3,769.98	0.615	2,319
Dec-14	1,877.78	85.801	1,791.98	0.615	1,102
Jan-15	5,816.21	75.198	5,741.02	0.615	3,531
Feb-15	6,284.60	70.394	6,214.20	0.615	3,822

Mar-15	23,073.98	15.781	23,058.20	0.615	14,181
Apr-15	30,752.40	1.169	30,751.23	0.615	18,912
May-15	30,045.26	2.372	30,042.88	0.615	18,476
Jun-15	25,544.92	12.526	25,532.39	0.615	15,702
Jul-15	26,954.14	1.41	26,952.73	0.615	16,576
Aug-15	25,182.39	3.08	25,179.31	0.615	15,485
Sep-15	16,869.64	10.077	16,859.56	0.615	10,369
Oct-15	14,663.59	13.659	14,649.93	0.615	9,010
Nov-15	9,565.69	18.592	9,547.10	0.615	5,871
Dec-15	9,796.64	31.002	9,765.64	0.615	6,006
Jan-16	12,634.48	12.474	12,622.00	0.615	7,763
Feb-16	12,378.09	27.434	12,350.66	0.615	7,596
Mar-16	7,846.70	60.636	7,786.07	0.615	4,788
Apr-16	9,421.96	46.529	9,375.44	0.615	5,766
May-16	25,612.63	2.915	25,609.72	0.615	15,750
Jun-16	25,168.14	0.836	25,167.31	0.615	15,478
Jul-16	25,844.42	3.138	25,841.28	0.615	15,892
Aug-16	18,489.90	43.171	18,446.73	0.615	11,345
Sep-16	12,597.29	37.232	12,560.05	0.615	7,724
Oct-16	9,356.03	47.208	9,308.82	0.615	5,725
Nov-16	5,032.57	70.308	4,962.27	0.615	3,052
Dec-16	11,407.04	67.359	11,339.68	0.615	6,974
Jan-17	3,792.55	126.052	3,666.50	0.615	2,255

Feb-17	4,854.77	95.546	4,759.22	0.615	2,927
Mar-17	2,584.62	109.127	2,475.49	0.615	1,522
Apr-17	4,055.21	96.208	3,959.00	0.615	2,435
May-17	17,293.49	30.341	17,263.15	0.615	10,617
Jun-17	26,428.05	9.014	26,419.04	0.615	16,248
Jul-17	30,015.66	3.474	30,012.19	0.615	18,457
Aug-17	17,741.19	27.308	17,713.89	0.615	10,894
Sep-17	15,352.70	22.768	15,329.93	0.615	9,428
Oct-17	10,005.21	59.27	9,945.94	0.615	6,117
Nov-17	2,224.26	72.811	2,151.44	0.615	1,323
Dec-17	6,108.29	67.362	6,040.93	0.615	3,715
Jan-18	9,576.49	74.184	9,502.31	0.615	5,844
Feb-18	3,475.69	78.755	3,396.94	0.615	2,089
Mar-18	12,794.94	50.692	12,744.24	0.615	7,838
Apr-18	13,888.48	52.198	13,836.29	0.615	8,509
May-18	26,319.01	5.583	26,313.43	0.615	16,183
2012 Vintage (01.06.2012-31.12.2012)	137,714.66	145.27	137,569.39	0.615	84,605
2013 Vintage (01.01.2013-31.12.2013)	233,764.35	222.97	233,541.38	0.615	143,627
2014 Vintage (01.01.2014-31.12.2014)	131,931.27	505.72	131,425.55	0.615	80,826
2015 Vintage (01.01.2015-31.12.2015)	224,549.44	255.26	224,294.18	0.615	137,940

2016 Vintage (01.01.2016-31.12.2016)	175,789.26	419.24	175,370.02	0.615	107,852
2017 Vintage (01.01.2017-31.12.2017)	140,456.00	719.28	139,736.72	0.615	85,938
2018 Vintage (01.01.2018-31.05.2018)	66,054.62	261.41	65,793.21	0.615	40,462
Total	1,110,259.60	2,529.16	1,107,730.44	0.615	681,250

5.2 Project Emissions

Since the Project Activity is a run-of-river hydropower project, there are no expected project emissions related to the electricity generation.

As the Project Activity has a submerged area of Oşkan HEPP and Berkman HEPP, the power density was calculated to be conservative. There is no project emission resulting from the reservoir area of the Project Activity as the power density of the project is greater than 10W/m2. Accordingly, The Project Activity's power density was calculated as below:

For Oşkan HPP

=23,889,000 W / 1,621,425.95 m2[11]

=14.733 W/m2

For Berkman HPP

=37,815,000 W / 1,648,560.79 m2[12]

=22.938 W/m2

Therefore, PE= 0

[11] Please see the registered PD for the calculation. Calculation is also available in the ER Calculations file.

[12] Please see the registered PD for the calculation. Calculation is also available in the ER Calculations file.

5.3 Leakage

No leakage is to be accounted by the Project Activity. This is in line with the registered PD and applicable methodology ACM0002, Version 12.1.0. Therefore, the leakage from the Project Activity is zero.

5.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ERy = BEy - PEy$$

Where:

ERy	Emission reductions in year y (t CO2e/yr)
BE_y	Baseline emissions in year y (tCO_2e/y)
PEy	Project emissions in year y (t CO2e/yr)

The baseline emission BEy (tCO2e) during the monitoring period results from:

$BEy = EG_{PJ,\ y} * EF_{grid,\ CM,\ y}$[13]

Where:

BE_y	Baseline emissions in year y (tCO_2e/y)
$EG_{PJ,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated by using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

[13] Please see ER calculations.

Table 4 - Net GHG Emission Reductions and Removals:

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	84,605	0	0	84,605
2013	143,627	0	0	143,627
2014	80,826	0	0	80,826
2015	137,940	0	0	137,940
2016	107,852	0	0	107,852
2017	85,938	0	0	85,938
2018	40,462	0	0	40,462
Total	681,250	0	0	681,250

PEy =0

In total, for this monitoring period:

$ERy = BEy - PEy$

= 681,250-0

= 681,250