DERELI HYDROELECTRIC POWER PLANT

Document Prepared by GTE KARBON SÜRDÜRÜLEBİLİR ENERJİ

EĞİTİM DANIŞMANLIK VE TİC. A.Ş.

Project Title	Dereli Hydroelectric Power Plant
Version	2.04
Report ID	DERELI VCSMR-02
Date of Issue	01/11/2022
Project ID	1758
Monitoring Period	01-October-2020 to 31-December-2021
Prepared By	GTE KARBON SÜRDÜRÜLEBİLİR ENERJİ EĞİTİM DANIŞMANLIK VE TİC. AŞ (Project Developer)

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Karhes Hidroelektrik Enerjiden Elektrik Üretim Santrali Ltd (KARHES) which is owned by Aydem Yenilenebilir Enerji A.S. constructed DERELİ Regulator and Hydro Electric Power Plant (HPP) on the Aksu River, within the jurisdiction of Dereli Town of Giresun Province. The purpose of the project is electricity production using the potential energy of Aksu River as a renewable resource. The purpose of the project is to supply electricity to the Turkish power grid, from a renewable source.

The Project Activity (PA) utilizes the Aksu River to generate electricity with zero carbon emissions for the Turkish Power Grid. The project was designed as a runoff river reservoir type power plant as per EPDK license states (EÜ/391-1/500). The PA is displacing electricity that would otherwise be generated by the existing grid of the host country. The installed capacity of the project is 49.2 MWe with two turbines each having installed capacity of 24.6 MWe. The annual generation is 157,500 MWh and 83,983 tCO2e as per registered PD and the previous monitoring report. The electricity achieved is reported as 78,273 MWh and emission reductions of 41,737 tCO2e during this Monitoring period (01-October-2020 to 31-December-2021).

The Environmental impact of the project is kept to a minimum and all the regulations that are in act in Turkey is obeyed during the operation stages of the DERELİ HPP project.

Table 1. Milestones of DERELİ HYDROELECTRIC POWER PLANT

Date	Milestone	Source
06/12/04	The Electricity Production License is granted for the project activity	License number EÜ/391-1/500
10/01/14	Project Start Date	The Provisional acceptance protocol
28/11/06	Water usage agreement signed with DSI1	WUA
23/06/10	EIA Exemptions certification issued	Certificate
30/09/10	Amendment to the Water Usage Agreement Signed	Amendment Declaration Letter

[1] DSI-Devlet Su İşleri –General Directorate of State Hydraulic Works is the intitution responsible for all the ground and surface water resources of the host country.

Date	Milestone	Source
07/12/10	Grid Connection	Agreement
03/09/13	TEIAS agreement	Agreement
24/06/19	TEIAS agreement after amendment	Agreement

The Dereli HEPP is made up of one hydro power plant. There is one controlled weir through which the water is taken up from the 778 m elevation level and is transferred to a derivation tunnel of 8113m. From there the water arrives to the valve chamber and is fed to a penstock of 630 m where it is pressurized and arrives to the power plant that is built at a level of 495 m. The potential energy of water at approximate gross head level of 263 m is utilized and the electricity is produced by the power plant. The project start period is 10/01/2014 and the project has been operational since that day including the monitoring period of 01-October-2020 to 31-December-2021. How the project activity operates is as shown below in Figure 1.

The generation voltage is 10,5 kV and the produced electricity is fed to the Turkish National Power Grid via one of the Transformer Substations by 5.6 km long 154 kV transmission line at the Dereli HES Transfer Station[2].

The plant has two generators which are Zhejiang Brand and SF24.6 type. The generators have 10.5 kV voltage and nominal capacity of 24.6 MW.

Project boundary is shown in the figure below.

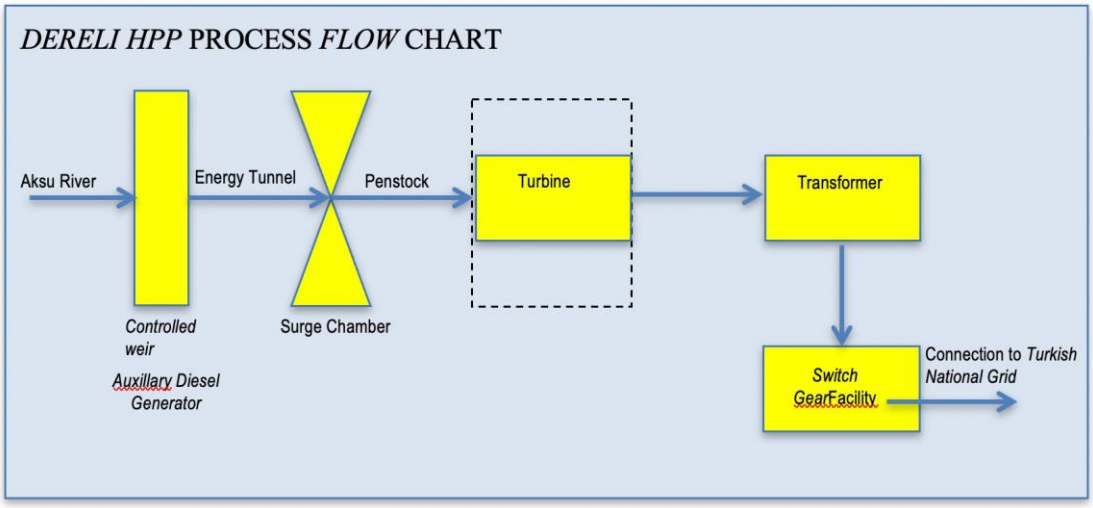


Figure 1. Project boundary

[2] System Use Agreement

1.2 Sectoral Scope and Project Type

The project category is Sectoral Scope 1: Energy industries (renewable-/non –renewable sources). The project is a non-grouped, standalone project.

1.3 Project Proponent

Organization name	Aydem Yenilenebilir Enerji A.Ş.
Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
Address	Gazi Mustafa Kemal Bulvarı 15 Mayıs Mah. 832 Sok. No:2 75.Yıl Esnaf Sarayı K:2 Denizli-Turkey
Telephone	+90 258 242 27 76
Email	ozgun.gulkoparan@aydemenerji.com.tr

1.4 Other Entities Involved in the Project

Organization name	GTE Karbon Sürdürülebilir Enerji Eğitim Danişmanlik Ve Ticaret A.Ş
Contact person	M. Kemal DEMİRKOL
Title	Director
Address	MAIDAN - Mustafa Kemal Mah. 2118. Cad. No: 4 C Blok 42 06510 Çankaya - Ankara – TURKEY
Telephone	+90 312 514 63 63
Email	kemal.demirkol@gte.com.tr

1.5 Project Start Date

Project start date is 10/01/2014.

1.6 Project Crediting Period

The project crediting period is 10 years: 10/01/2014 to 09/01/2024 (both days included). The crediting period is renewable twice.

1.7 Project Location

The project is located at the Northern Black Sea region of Turkey at the Giresun Province as shown in the location Map below (Figure 2). The coordinates of the weir and the powerhouse are indicated in the below table (Table 2):

Table 2: The geographical coordinates indicating the location of the major components of the project activity:

Component's name	Latitude	Longitude
Spill water	40°41'15.00"N	38°26'27.58"E
Powerhouse	40°41'20.42"N	38°26'17.57"E

Figure 2. Project location

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 16.0.0.

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)
- "Methodological tool Investment analysis" (Version 06.0; EB85-Annex 12)

In addition to this as the Tool for the demonstration and assessment of additionality refers to common practice analysis, we have also made use of the following methodological tool:

- "Methodological tool: Common practice" (Version 03.1; EB 84 - Annex 7).

1.9 Participation under other GHG Programs

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.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits: There is no other form of environmental credit generated by the project because there is no such system within the host country. The projects originate from Turkey do not comply for renewable energy certificates of EU because there is no energy trade between EU and Turkey because of different grid structures.

Other Forms of Environmental Credit: There is no other form of environmental credit generated by the project because there is no such system within the host country. The project does not generate other form of environmental credits such as Green Power Certificates. The projects originate from Turkey do not comply for renewable energy certificates of EU because there is no energy trade between EU and Turkey because of different grid structures

1.11 Sustainable Development Contributions

The project aims to generate electricity by using hydroelectric power to supply the increasing national electricity demand in a cleaner and sustainable manner. It reduces the air pollution caused by the grid-connected power plants which are mostly fossil fuel fired.

The following is a list of the project's contribution to the UN SDG:

- SDG 7 on access to affordable, reliable, and sustainable energy, as the project is not relying on imported fossil fuels. In this monitoring period, 78,273 MWh renewable electricity has supplied to national grid that supports to increase the renewable energy share in the energy mix.
- SDG-8 decent work and economic growth. As the project is providing a decent and secure work environment. All personnel working at the power plant are receiving regular trainings about occupational health and safety.

- SDG-12 Responsible consumption and production as the hydroelectric power plants are producing clean source of energy. They are replacing the fossil fuel based national grid. Because of that these plants drives people to consume more sustainable type of energy.
- SDG 13 on urgent action to combat climate change, as the project is replacing the fossil fuel based national grid and it is producing emission reductions. In this particular project the power plant prevented the release of 41,737 into the atmosphere in this monitoring period.

Table 3: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.3	Tones of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 41,737 tCO2 into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 488,084 tCO2 into the atmosphere over project lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	During the monitoring period 2 employees were recruited.	Total 19 people were employed during over project lifetime.
3)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project generated 78,273 MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 914,990.9MWh electricity from hydropower which is a renewable source over project lifetime
4)	12.4	Environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks.	Implemented activities to increase	The project is taking actions towards the safe disposal of chemicals and all wastes.	The project is taking actions towards the safe disposal of chemicals and all wastes.

2 SAFEGUARDS

2.1 No Net Harm

During the project design phase, the following measures are undertaken in order to minimize the impacts during operational periods:

Water & Wastewater Management

Water for domestic use is supplied by tankers to the site and wastewater is collected in septic tanks which is emptied regularly. The wastewater is discharged in accordance with Water Pollution Control regulations of the host country.

Sewage truck records are provided dated 14/10/2021, 10/03/2021.

Waste Oil

The waste oil is collected in impermeable containers and transferred to recycling centers in accordance with Hazardous Waste Control Regulations and Waste Oil Control Regulations. A photograph of the hazardous waste storage area is provided.

Collection records are provided dated 24/08/2021, 15/06/2021, 12/12/2020, 10/01/2022. These records include collection of hazardous wastes generated at the site.

Solid Waste

Solid waste is collected, and recyclables are separated to be sent to recycling centers. The rest is disposed to the nearest landfill site in coordination with Dereli District Municipality. The solid waste here also covers the E-Waste. Hence the disposal is realized in accordance with Regulation on Waste Management, Regulation on Electrical and Electronic Waste Control, and Regulation on Battery and Accumulator Wastes.

Collection records are provided dated 15/12/2021, 15/06/2021, 12/12/2020, 31/12/2021, 10/01/2022.

Biodiversity

Necessary precautions are taken for the species under conservation by international conventions, The field is regularly observed in terms of any change and irregularity of the biodiversity. Regular ecosystem reporting mechanism is applied for the field.

2.2 Local Stakeholder Consultation

The relationship with the local stakeholders deemed to be very important and before the project was implemented a stakeholder's consultation meeting was held at the project site. In addition to this there is a "grievance logbook" in coffeehouses and mukhtar's office within the vicinity of the project (Alancik and Kurtulmuş Village) for a continuous grievance policy that is implemented by the project owner. Every month the PP consults with local stakeholders at the book locations and discuss their grievances as well as positive comments. During the monitoring period there were no complaints about or demands from the project.

2.3 AFOLU-Specific Safeguards

The project is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The commissioning date of both units is 10/01/2014 which is accepted as project start date. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions.

3.2 Deviations

3.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002 and its related tools are applied as they are without any deviation from methodology.

3.2.2 Project Description Deviations

Title of the company changed from Bereket Enerji Üretim San. ve Tic. A. Ş. to Aydem Yenilenebilir Enerji A.Ş which is the current project proponent on 24/12/2019 as stated in official gazette with registration number of 13798.

The project activity is in compliance with the scenario described at the Project Design Document. After EPİAŞ received Market Operating License on 01/09/2015, market operations were transferred from PMUM to EPİAŞ.

According to the revised agreement between TEIAS & PP i.e., Annex-3, Article 3.3 of "The Transmission System Usage Agreement dated 25/01/2019", it has been found that the testing of energy meters will be carried out every 2 years.

According to the registered PD, the first index date of the energy meters is 2010, however, the start date of the project is 2014 and the actual first installment date of the energy meters is 12/07/2013. The necessary corrections are made in this verification report[3]

3.3 Grouped Projects

The project scope is Sectoral Scope 1: Energy industries (renewable--non -renewable sources). The project is a non-grouped, standalone project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data – Parameter	$FC_{i,y}$
Data unit	m^3
Description	Amount of fuel i consumed by relevant power plants in Turkey in years, 2009, 2010, 2011
Source of data	Turkish Electricity Transmission Company (TEIAŞ) Web Site https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Please see Appendix 2 (Table 1) in the validated PD (version 2.01)
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.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

Data - Parameter	$NCV_{i,y}$
Data unit	GJ-Mass or Volume Unit
Description	Net Calorific Values for fossil fuels in years 2009, 2010 and 2011
Source of data	Turkish Electricity Transmission Company Web Site: https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Please see Appendix-2 –Table 5 in the validated PD (version 2.01).

[3] Energy meters test reports

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.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	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	CO2 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
Value applied	Please see Appendix 2-Table 2 in the validated PD (version 2.01)
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 2, 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.
Purpose of Data	Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$
Comments	-

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
Value applied	Please see Appendix 2, Table 3, and Table 4 in the validated PD (version 2.01).
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.

Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

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 (https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri). Data is extracted from the relevant annexes of the capacity projection reports for the years 2010[4], 2011[5] and 2012[6].
Value applied	Please see Appendix-2-Table 8 in the validated PD version 2.01
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.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

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 system (Version 5.0, EB87Annex 9)" are used
Value applied	Please see Annex 2in the validated PD version 2.01.
Justification of choice of data or description of measurement methods and procedures applied	According to the "tool to calculate emission factor for an electricity 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 shall be used. The first two options are not available for the power plants supplying the Turkish grid; therefore, the default values are used.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

[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

4.2 Data and Parameters Monitored

Data – Parameter	EG_y
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant to the grid in MP
Source of data	Electricity Meters
Description of measurement methods and procedures to be applied	Data is measured directly from meters and records on TEİAŞ readings protocol papers.
Frequency of monitoring-recording	Annually
Value monitored	78,273 MWh
Monitoring equipment	Data is monitored continuously by redundant metering devices. The recording meter is in compliance with the communiqué for Metering Devices to be used in the Electricity Market. By regulation, the accuracy class is 0.5 %. The two electricity metering devices were replaced with new ones on 19/11/2020 as the previous ones reached their end of validity period of 10 years. The electricity meters used till 19/11/2020 are: Main Electricity Meter: Actaris, Serial Number: 53077779 Back-up Electricity Meter: Actaris-Serial Number: 53077780 Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[8]. They have an accuracy class of Class 002 indicating an accuracy range of 0,5%. The electricity meters used after 19/11/2020 are: Main Electricity Meter: EMH, Serial Number: 9798713 Back-up Electricity Meter: EMH-Serial Number: 9798714 Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[8]. They have an accuracy class of Class 005 indicating an accuracy range of 0,5%.
QA-QC procedures to be applied	There are two meters that backup each other. Generated electricity is also monitored via the operator by the help of EPİAŞ trading software for internal monitoring. The Calibration dates of the meters and their validity is as follows:

	Main Meter (Replaced on 19/11/2020)	**Spare Meter (Replaced on 19/11/2020)**	**Main Meter**	**Spare Meter**
Serial no.	53077779	53077780	9798713	9798714
Brand- (Type)	Actaris	Actaris (SL761B071)	EMH-(LZQJ-XC)	EMH-(LZQJ-XC)
First Index	12/07/2013	12/07/2013	19/11/2020	19/11/2020

	Calibration Due date	-	-	19/11/2030[7]	19/11/2030[8]
	Calibration frequency			10 years	10 years
	Test Due Date			19/11/2022	19/11/2022
	Test frequency			2 years	2 years
	Class	0.5S	0.5S	0.5S	0.5S
Purpose of the data	Data to be used for the calculation of Baseline Emissions.				
Calculation method	Direct Continuous Measurement				
Comments	The collected data is kept by Aydem Yenilenebilir Enerji AS. During the crediting period and until two years after the last issuance of VERs for the "DERELİ Hydroelectricity Power Plant" project activity for that crediting period.				

Data - Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site computers with SCADA system and the turbine name plates.
Description of measurement methods and procedures to be applied	Observed via the SCADA system of the project activity.
Frequency of monitoring-recording	Once for each monitoring period
Value monitored	49,200,000 W
Monitoring equipment	SCADA System of the Project activity
QA-QC procedures to be applied	Turbine labels checked with SCADA System reading.
Purpose of the data	To monitor capacity of the project
Calculation method	N-A
Comments	

Data - Parameter	A_{PJ}

[7] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5
[8] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5

Data 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 at its maximum fullness.
Source of data	Surface area determined using the lake surface area map provided in Appendix-2.
Description of measurement methods and procedures to be applied	The reservoir area corresponding to maximum operational level has been determined via the topographic satellite images showing the lake area, presented in Appendix-2.
Frequency of monitoring-recording	Once for each monitoring period
Value monitored	3,865 m^2
Monitoring equipment	-
QA-QC procedures to be applied	The value checked and compared to satellite imagery available by Google Earth.
Purpose of the data	Data to be used for the calculation of Baseline Emissions.
Calculation method	N-A
Comments	

4.3 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.

Data to be monitored

Given that the emission factor is calculated on an ex-ante basis, the first data to be monitored is the net electricity supplied to the grid.

The second data to be monitored is the installed capacity of the Project Activity. Using the SCADA system installed capacity is measured automatically.

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. In order to make verification of the reservoir area, the reservoir lake can be compared to the reservoir area map, presented in Annex-4.

The electricity produced is sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by meters. Those TEIAŞ meters provide official data which is read and recorded monthly by TEİAŞ officers for invoicing. TEİAŞ also conducts the calibration and maintenance of these meters and thus, ensures the accuracy and quality of the measurements. The quality standards that the meters need to comply is "The ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S)" The calibration of the meters is done every ten years and the test of electricity meters are performed every two years. If the meters exhibit any error or fault during the test, the electricity meters would be calibrated or replaced with the new ones. The meters are checked continuously if there is a difference of 0.2 % in the readings of the main and the auxiliary meters, the calibration for Dereli HEPP is recorded as 19/11/2030.

The net electricity produced is calculated by subtracting the total electricity consumed by the hydroelectric power plant, from the gross electricity generation. After obtaining the net electricity production value, the emission reductions are calculated by multiplying the net electricity with the Combined Margin calculated above.

The monitoring is 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 5):

Table 4. Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Dereli HPP Manager	Day to day operation of the Dereli HPP, Compliance of the project activity with the host country rules and regulations Coordination of the data collection and recording for the VCS monitoring report.
Chief Electrical Engineer	Day to day follow up of electrical equipment Recording and monitoring of the electricity generation data
Accounts Manager	Data keeping for power sales Data entry to EPİAŞ system
Chief Mechanical Engineer	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

The power generation meter readings are performed by using the main metering devices and the auxiliary metering devices for accuracy checks only. Data from metering devices is recorded by TEİAŞ and forms the basis for the electricity production data. In addition to the readings of the main and auxiliary (back-up) metering devices, generation data of the Dereli HPP can be cross checked, via

the TEİAŞ – EPİAŞ web site (https://seffaflik.epias.com.tr/transparency/) which is accessible by a password available to the electricity generation companies (in the case of project activity the project owner has this capacity). The electricity generation data at the Market Financial Reconciliation Centre (MFRC/EPİAŞ) web page exhibits the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from EPİAŞ web site needs to be multiplied by the transmission loss factor of the grid. This data is the main QA/QC data for the project activity.

The two electricity metering devices were replaced with new ones on 19/11/2020 as the previous ones reached their end of validity period of 10 years.

	Main Meter (Replaced on 19/11/2020)	Spare Meter (Replaced on 19/11/2020)	Main Meter	Spare Meter
Serial no.	53077779	53077780	9798713	9798714
Brand- (Type)	Actaris	Actaris (SL761B071)	EMH-(LZQJ-XC)	EMH-(LZQJ-XC)
First Index	12/07/2013	12/07/2013	19/11/2020	19/11/2020
Calibration Due date	-	-	19/11/2030[9]	19/11/2030[10]
Calibration frequency	-	-	10 years	10 years
Test Due Date	-	-	19/11/2022	19/11/2022
Test frequency	-	-	2 years	2 years
Class	0.5S	0.5S	0.5S	0.5S

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:

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

[9] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5
[10] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5

EF_y = Emission factor calculated according to selected methodology

5.2 Project Emissions

The proposed project activity involves the generation of electricity by hydroelectric power plant therefore project activity does not result in greenhouse gas emissions. Power density of the projects higher than 10 W-m^2 for 49.200 MWe installed capacity and 3865 m^2 maximum lake area.

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-m^2)

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

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

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

For proposed project HEPP,

Cap_{PJ} = 49,200,000 We

Cap_{BL} = 0.0 W

A_{PJ} = 3865 (m^2)[11]

A_{BL} = 0.0 (m^2)

Therefore, PD is calculated as;

$$PD = \frac{49{,}200{,}000 - 0}{3865 - 0}$$

$$PD = 12729.62\ W - m^2$$

[11] Reservoir area, Annex 6 of registered PD

5.3 Leakage

The energy generating equipment is not transferred from or to another activity. Therefore, leakage is also considered as "0".

$$LE_y = 0$$

5.4 Net GHG Emission Reductions and Removals

Total Emission Reduction has been determined as;

$ER_y = BE_y - PE_y - LE_y$

Where;

ER_y = Emission reductions in year y (tCO_2)

BE_y = Baseline emissions in year y (tCO_2)

PE_y = Project Emissions in year y (tCO_2)

LE_y = Leakage emissions in year y (tCO_2)

The project emissions and leakage are considered as "0". Thus, ERy = BEy

Table 5. Calculations for net total values

EG_y	Net Generation (MWh) During Monitoring Period	78,273
EF_y	Emission Factor (tCO_2-MWh)	0.5332[12]
BE_y	Baseline emissions in year y (tCO2) During Monitoring Period	0
PE_y	Project Emissions (tCO_2)	0
LE_y	Leakage Emissions (tCO_2)	0
ER_y	Net Emission Reduction (tCO_2) During Monitoring Period	41,737

Thus, the net emission reduction (in tonnes CO_2) in this monitoring period (01-October-2020 to 31-December-2021) is calculated as given in table below.

[12] Fixed ex-ante CM as per Section 4.3. og registered PD

Table 6. Summary of Emission Reductions

Year	Baseline Emissions (tCO_2e)	Project Emissions (tCO_2e)	Leakage Emissions (tCO_2e)	Net GHG Emission Reductions or Removals (tCO_2e)
2020 (01/10/2020 – 31/12/2020)	998	0	0	998
2021 (01/01/2021 – 31/12/2021)	40,739	0	0	40,739
Total	**41,737**	0	0	**41,737**

Total emission reductions were realized as 41,737 tCO_2 for this monitoring period (Table 7). When the estimated electricity generation figure of the power plant for each year in the validated VCS PD (157,500 MWh-year) is considered, the total emission reductions should be approximately 83,984 tCO_2 (Table 5) for the monitoring period (12 months). Percent difference is calculated as -60,2%, which means the project reduced 60,2% less CO_2 than the estimated amount. 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.

Table 7. Summary of net electricity supply to the grid versus emissions reductions (estimate and actual values for this monitoring period)

	Project Baseline Estimate		Actual Values Achieved in the Monitoring Period	
Year	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO_2e)	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO_2e)
2020	39,375	20,996	1,872	998
2021	157,500	83,984	76,401	40,739
Total	**196,875**	**104,980**	**78,273**	**41,737**

APPENDIX 1: PROJECT'S SINGLE LINE DIAGRAM

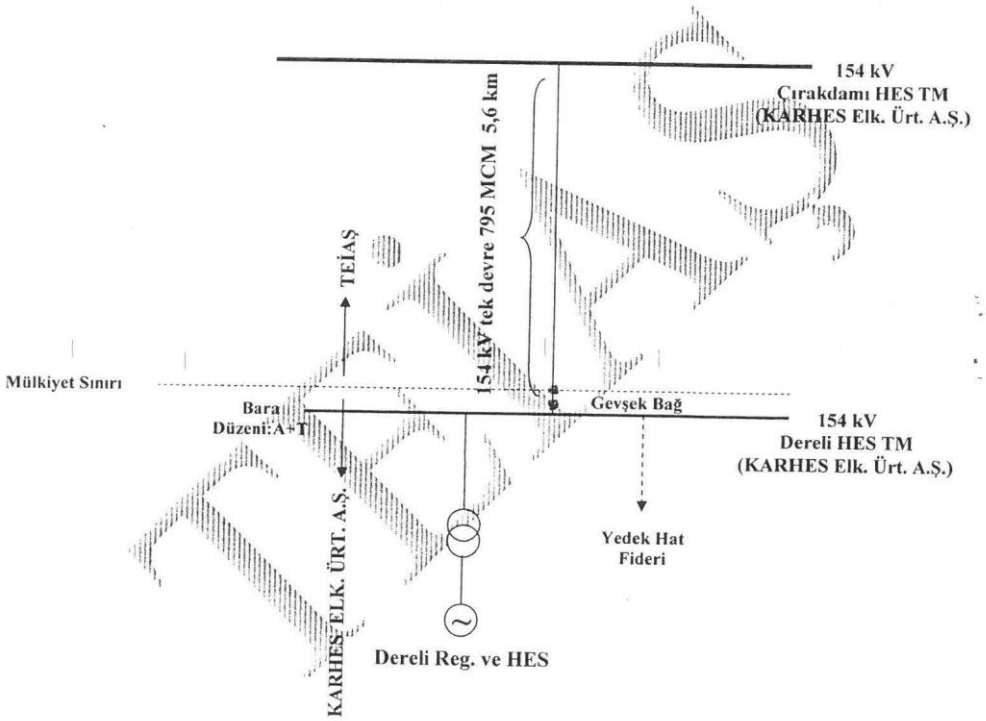
BAĞLANTI ANLAŞMASI

EK-3

MÜLKİYET SINIRLARI

a) **Mülkiyet sınırının yazılı ifadesi:** Üretim tesisi şalt sahasından sonraki nihayet direği ile üretim tesisi şalt sahası arasındaki gevşek bağlantı hariç, enerji iletim hatları TEİAŞ'ın mülkiyetindedir.

b) **Mülkiyet sınırının Prensip Tek Hat Şeması üzerinde gösterimi:**



APPENDIX 2: PROJECT'S RESERVOIR AREA