



**Verified Carbon
Standard**

MONITORING REPORT TITLE

ÇIRAKDAMI HYDROELECTRIC POWER PLANT

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EĞİTİM DANIŞMANLIK VE TİC. A.Ş.

Project Title	Cirakdami Hydro Electricity Power Plant
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Karadeniz Hidroelektrik Enerjiden Elektrik Üretim Santrali Ltd (KARHES) which is owned by Aydem Yenilenebilir Enerji A.S. constructed Cirakdamii 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 PA is displacing electricity that would otherwise be generated by the existing grid of the host country. The project was designed as a runoff river reservoir type power plant as per EPDK license states (EÜ/365-2/478). The installed capacity of the project is 49.11 MWe with two turbines each having installed capacity of 24.55 MWe (29.33 MWm). The annual generation is 165,990 MWh and 88,510 tCO₂e as per registered PD and the previous monitoring report. The electricity achieved is reported as 81,260 MWh and emission reductions of 43,330 tCO₂e during this MP (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 Cirakdami HPP project.

Table 1. Milestones of ÇIRAKDAMI HYDROELECTRIC POWER PLANT

Date	Milestone	Source
18/01/07	The Electricity Production License is granted	License
23/06/10	EIA Exemptions certification issued	Certificate
30/09/10	Amendment to the Water Usage Agreement Signed	Amendment Declaration Letter
07/12/10	Grid Connection	Agreement
21/06/19	Revised TEİAŞ Agreement	Agreement
28/06/12	Commissioning Date for Unit 2	Provisional Acceptance
26/04/13	Commissioning Date for Unit 1	Provisional Acceptance

The Cirakdami HPP is made up of one hydro power plant. There is one regulating body that is taking up the water from the 492 m elevation level and the tail water level is 475 m. The potential energy of water at approximate gross head level of 23 m is utilized and the electricity is produced by the power plant. The

project start period is 28/06/2012 and the project has been operational since that day including the monitoring period of 01October2020 to 31-December-2021.

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

The water is entering to the regulatory body and the water collecting area over the Aksu River at the 492 m elevation level. Then the water is settled at the sedimentation pool and is transferred to a tunnel. The water that passes this tunnel is transferred to a canal and transferred to the loading pool via penstock and passed to the hydro power plant building where the electricity is produced. The water is than be left back to the Aksu River at the 475 m elevation level. How the project activity operating is shown below in Figure 1:

Figure 1: Flow chart showing the basic operational principles of the project activity.

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 17.5 km long 154 kV transmission line at the Ordu-Giresun Transfer Station¹.”

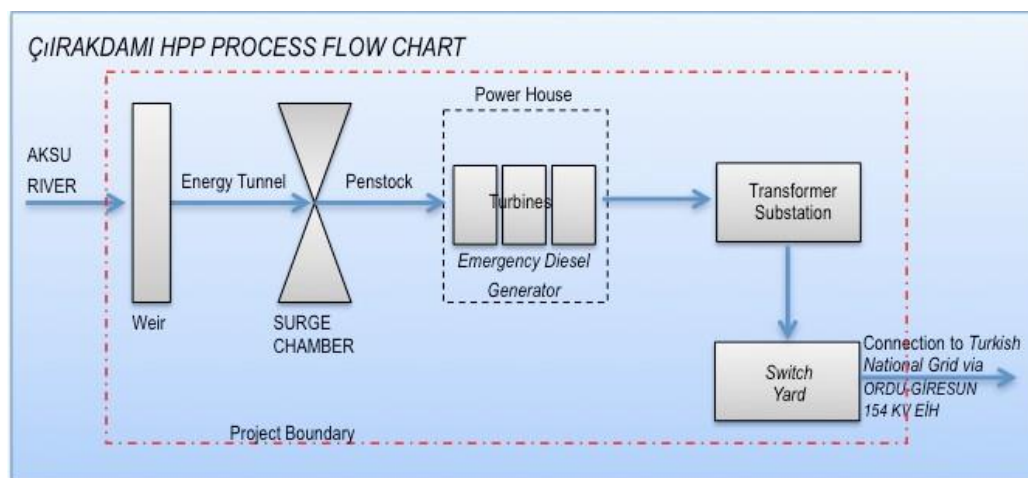


Figure 1. Project boundary

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, stand-alone project.

1.3 Project Proponent

Organization name	Aydem Yenilenebilir Enerji A.Ş.3
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¹ System Use Agreement

Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
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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 Danışmanlık Ve Ticaret A.Ş
Contact person	M. Kemal DEMİRKOL
Title	Director
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1.5 Project Start Date

Project start date is 28/06/2012.

1.6 Project Crediting Period

The project crediting period is 10 years: 28/06/2012 to 27/06/2022 (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
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Weir	40°41'24.29"N	38°26'22.67"E
Powerhouse	40°43'58.23"N	38°26'33.02"E

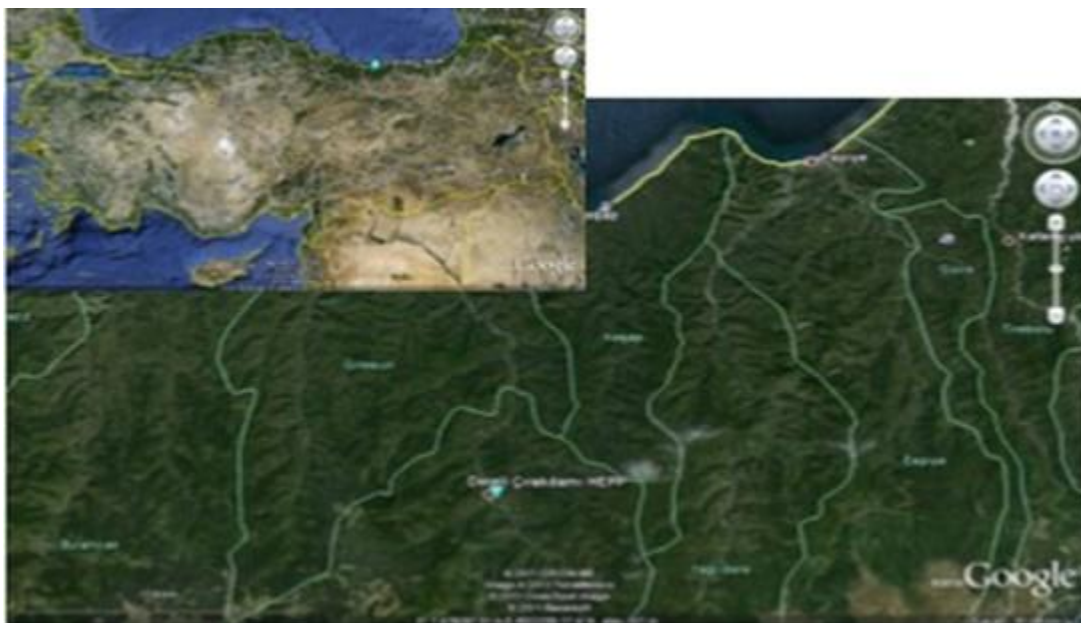


Figure 2. Project location

1.8 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilized:

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 14.0.0.

The Approved Methodology refers to the following tools:

- “Tool for the demonstration and assessment of additionality” (Version 07.0.0)
- “Tool to calculate the emission factor for an electricity system”. (Version 04.0)
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)
- “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 5.0.0.

Only the following tools are utilized:

- “Tool for the demonstration and assessment of additionality” (Version 07.0.0)
- “Tool to calculate the emission factor for an electricity system”. (Version 04.0.0) GHG program

- “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 5.0.0)

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 energy source by reducing the dependence on fossil fuels without producing air pollution or toxic by-products. Hydroelectric Power Plant supplies the increasing national electricity demand in a cleaner and sustainable manner.

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.

SDG-8 is to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.

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.

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	Tonnes of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 43,330tCO ₂ into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 416,823.43 tCO ₂ into the atmosphere Over Project Lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	There is no recruitments recorded for this monitoring period.	Total 13 people were employed over project lifetime. This number will be maintained during the first crediting period.
3)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project generated 81,260MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 781,701.83 MWh 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 21/10/2021, 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 31/12/2021, 15/06/2021, 12/12/2020, 29/12/2021, 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.

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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 box" in a gas station within the vicinity of the project (Kuşluhan Neighborhood) for a continuous grievance policy that is implemented by the project owner. Every month the PP consults with local stakeholders at the box 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 the unit 2 was 28/06/2012 which is accepted as project start date. The unit 1, on the other hand, was commissioned on 26/04/2013. Since these dates, 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 EPIAŞ received Market Operating License on 01/09/2015, market operations were transferred from PMUM to EPIAŞ.

According to the revised agreement between TEİAŞ & 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 The total capacity of Cirakdami HEPP was recorded as 49,11 MWe, having three turbine units, two with 20 MW capacity and one with 9.11 MW capacity, in validated PD (version 2.00)

(EPDK license on 14/09/2004). However, an amendment EPDK license was approved on 29/12/2005, in which the total capacity of project remained the same as PD, however, the number of turbines and their capacity changed to 2x24.55 MWe, for a total of 49,11 MWe.

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 (TEİAŞ) 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 2.00)
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 2.00).
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 2.00)
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 2.00).

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 ² , 2011 ³ and 2012 ⁴ .
Value applied	Please see Appendix-2-Table 8 in the validated PD version 2.00
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 2 in the validated PD version 2.01.
Justification of choice of data or description of	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

² <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>
³ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf>
⁴ <http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf>

measurement methods and procedures applied	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	-

4.2 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	81,260.30 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: 53077777 Back-up Electricity Meter: Actaris-Serial Number: 53077778 Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market⁸. 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: 9798711 Back-up Electricity Meter: EMH-Serial Number: 9798712 Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market⁸. 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 EPIAŞ trading software for internal monitoring. The Calibration dates of the meters and their validity is as follows: <table><tr><td></td><td>Main Meter (Replaced on 19/11/2020)</td><td>Spare Meter (Replaced on 19/11/2020)</td><td>Main Meter</td><td>Spare Meter</td></tr><tr><td>Serial no.</td><td>53077779</td><td>53077780</td><td>9798711</td><td>9798712</td></tr><tr><td>Brand-(Type)</td><td>Actaris</td><td>Actaris (SL761B071)</td><td>EMH-(LZQJ-XC)</td><td>EMH-(LZQJ-XC)</td></tr><tr><td>Next Calibration date</td><td>-</td><td>-</td><td>19/11/2030⁵</td><td>19/11/2030⁶</td></tr><tr><td>Calibration frequency</td><td></td><td></td><td>10 years</td><td>10 years</td></tr><tr><td>Test Date</td><td></td><td></td><td>19/11/2022</td><td>19/11/2022</td></tr><tr><td>Test frequency</td><td></td><td></td><td>2 years</td><td>2 years</td></tr><tr><td>Class</td><td>0.5S</td><td>0.5S</td><td>0.5S</td><td>0.5S</td></tr></table>		Main Meter (Replaced on 19/11/2020)	Spare Meter (Replaced on 19/11/2020)	Main Meter	Spare Meter	Serial no.	53077779	53077780	9798711	9798712	Brand-(Type)	Actaris	Actaris (SL761B071)	EMH-(LZQJ-XC)	EMH-(LZQJ-XC)	Next Calibration date	-	-	19/11/2030 ⁵	19/11/2030 ⁶	Calibration frequency			10 years	10 years	Test Date			19/11/2022	19/11/2022	Test frequency			2 years	2 years	Class	0.5S	0.5S	0.5S	0.5S
	Main Meter (Replaced on 19/11/2020)	Spare Meter (Replaced on 19/11/2020)	Main Meter	Spare Meter																																					
Serial no.	53077779	53077780	9798711	9798712																																					
Brand-(Type)	Actaris	Actaris (SL761B071)	EMH-(LZQJ-XC)	EMH-(LZQJ-XC)																																					
Next Calibration date	-	-	19/11/2030 ⁵	19/11/2030 ⁶																																					
Calibration frequency			10 years	10 years																																					
Test 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 “Çırakdamı Hydroelectricity Power Plant” project activity for that crediting period.																																								

Data - Parameter	Capex
Data unit	W

⁵ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>
⁶ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

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	49,110,000 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:	AP _J
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.
Measured /Calculated /Default:	Indirectly measured based on the reservoir area map provided in Appendix-2.
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 during each monitoring period
Value applied:	2,827 m ²
Monitoring equipment:	-
QA/QC procedures to be applied:	The value was 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
Any comment:	-

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 was 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 was compared to the reservoir area map, presented in Appendix 2.

The electricity produced is sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by two meters placed on the switchgear station where the power plant gets connected to the Turkish national grid. Those 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 is repeated. For Cirakdami HEPP, the next calibration date of electricity meters 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 and a certain percentage is lost during the transmission. 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
Çirakdami HEPP Manager	Day to day operation of the Çirakdami HEPP, 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 EPIAŞ 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 were performed by using the main metering devices and the auxiliary metering devices for accuracy checks only. Data from metering devices is recorded by TEİAŞ on monthly agreed protocols and form the basis for invoicing. In addition to the readings of the two metering devices, generation data of the Çirakdami HEPP can be cross checked, via the TEİAŞ – EPIAŞ web site (<https://seffaflik.epias.com.tr/transparency/>) which is accessible by a password available to the electricity generation companies. The electricity generation data at the Market Financial Reconciliation Centre (MFRC/EPIAŞ) web page exhibits the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from EPIAŞ web site needs to be multiplied by the transmission loss factor of the grid.

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.

Meter Serial Number	Brand	Calibration Year	Valid Until	Accuracy Class
Main Meter:53077777	ACTARIS	2010	2020	0.5S (+-%1)
Control Meter:53077778	ACTARIS	2010	2020	0.5S (+-%1)
Main Meter:9798711	EMH	2020	2030	0.5S (+-%1)
Control Meter:9798712	EMH	2020	2030	0.5S (+-%1)

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.

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-m² for 49.110 MWe installed capacity and 2,827m² 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-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.

For proposed project HEPP,

Cap_{PJ} = 49,110,000 We

Cap_{BL} = 0.0 W

$$A_{PJ} = 2,827 \text{ (m}^2\text{)}^7$$

$$A_{BL} = 0.0 \text{ (m}^2\text{)}$$

Therefore, PD is calculated as;

$$PD = \frac{49,110,000 - 0}{2,827 - 0}$$

$$PD = 17,371.77 \text{ W - m}^2$$

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 (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)

The project emissions and leakage are considered as “0”. Thus, $ER_y = BE_y$

Table 5. Calculations for net total values

EG_y	Net Generation (MWh) During Monitoring Period	81,260
EF_y	Emission Factor (tCO ₂ -MWh)	0.5332 ⁸
BE_y	Baseline emissions in year y (tCO ₂) During Monitoring Period	0

⁷ Çırakdamı HEPP reservoir area, Annex 6 of registered PD

⁸ Fixed ex-ante CM as per Section 4.3. og registered PD

PE _y	Project Emissions (tCO ₂)	0
LE _y	Leakage Emissions (tCO ₂)	0
ER _y	Net Emission Reduction (tCO ₂) During Monitoring Period	43,330

Thus, the net emission reduction (in tonnes CO₂) in this monitoring period (01-October-2020 to 31-December-2021) is calculated as given in table below.

Table 6. Summary of Emission Reductions

Year	Baseline Emissions (tCO ₂ e)	Project Emissions (tCO ₂ e)	Leakage Emissions (tCO ₂ e)	Net GHG Emission Reductions or Removals (tCO ₂ e)
2020 (01/10/2020 – 31/12/2020)	1,645	0	0	1,645
2021 (01/01/2021 – 31/12/2021)	41,685	0	0	41,685
Total	43,330	0	0	43,330

Total emission reductions were realized as 43,330.43 tCO₂ for this monitoring period (Table 4). When the estimated electricity generation figure of the power plant for each year in the validated VCS PD (165,990 MWh-year) is considered, the total emission reductions should be approximately 110,639 tCO₂ (Table 5) for the monitoring period (12 months). Percent difference is calculated as -60.8%, which means the project reduced 60.8% less CO₂ 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)

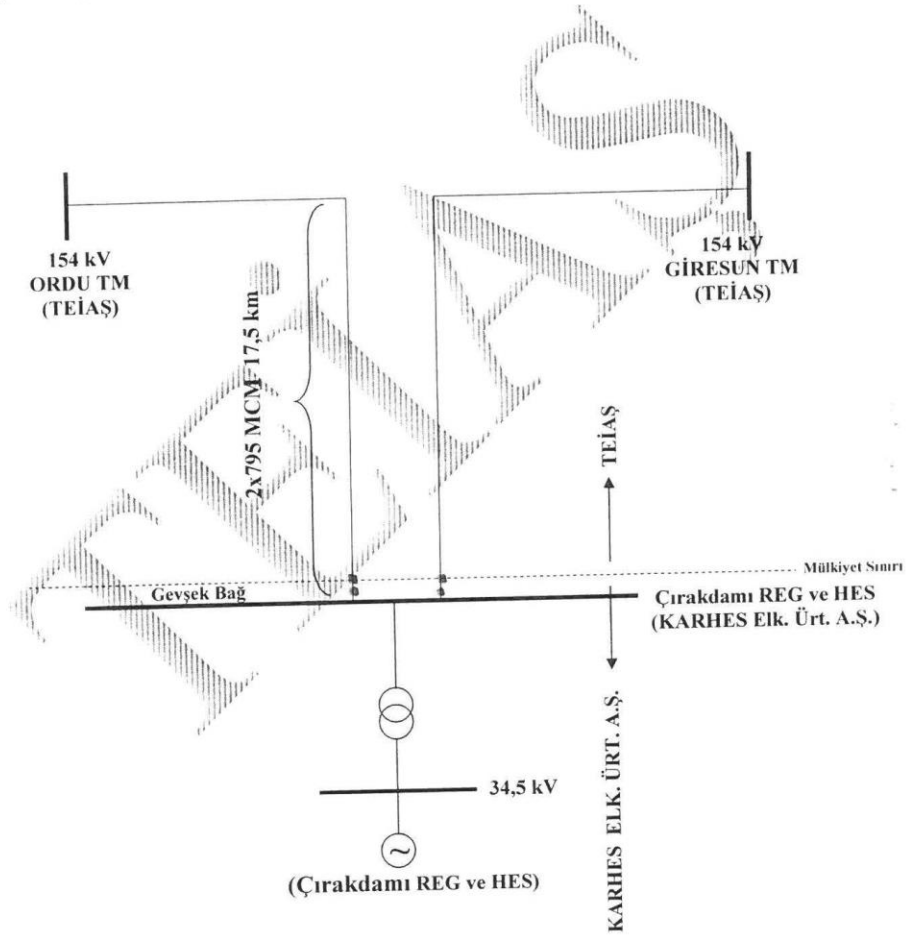
Project Baseline Estimate	Actual Values Achieved in the Monitoring Period
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Year	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO ₂ e)	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO ₂ e)
2020	41,498	22,128	3,085	1,645
2021	165,990	88,511	78,175	41,685
Total	207,488	110,639	81,260	43,330

APPENDIX 1: 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: RESERVOIR AREA

