



KOYULHISAR HYDRO ELECTRICITY POWER PLANT



Document Prepared by GTE Karbon Sürdürülebilir Enerji Eđt. Dan. ve Tic. A.Ş.

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

AYDEM Yenilenebilir Enerji A.S. constructed KOYULHISAR Hydro Electric Power Plant (HPP) on the Kelkit Stream, within the jurisdiction of Koyulhisar Town of Sivas Province. The host country is Turkey. The purpose of the project is electricity production using the potential energy of Kelkit Stream as a renewable resource. The purpose of the project is to supply electricity to the Turkish power grid, from a renewable source.

Therefore, the electricity is produced without causing airborne pollutants or Green House Gas (GHG) emissions. The Project Activity (PA) utilizes the Kelkit Stream 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 installed capacity of Koyulhisar HPP is 65.25 MWm/63 MWe, with 3 turbines of 21 MWe each. One of these three turbines is installed as a standby unit, intended to operate only whenever one of the other two turbines does not operate for the purpose of maintenance and repair. Hence, the total installed capacity is considered as 42 MWe (2x21 MWe). The estimated electricity generation is 193,574 MWh per year. According to this production, the estimated annual emission reduction is calculated as 89,180 tons CO_{2e}. The project has started on 17/11/2009. The estimated electricity generation by the PA was calculated as 306,492 MWh for the monitoring period, while the net electricity production is found to be 315,907 MWh during the monitoring period of 01-January-2022 to 31-July-2023. Therefore, the Project Activity led to an emission reduction of 145,538 tons CO_{2e} in this monitoring period of 01-January-2022 to 31-July-2023.

Table 1. Milestones of the project

Date	Milestone
10/02/2005	Project Generation License Granted by EMRA
18/01/2005	Water Use Agreement
27/07/2020	Water Use Agreement (Renewed)
23/06/2020	System Use Agreement
21/12/2005	Connection Agreement
20/03/2020	Connection Agreement (Renewed)
01/06/2005	Project was granted EIA not needed certification
25/04/2014	Commissioning date of Turbine 1 and Turbine 2

The Koyulhisar HPP is a runoff river reservoir type plant that was constructed at the downstream of two state owned dams, namely: Kılıçkaya Dam (124 MW) and Çamlığöze Dam (33MW). The project is collecting the water that leaves the spillway of Çamlığöze Dam. The water is collected and kept up to 5

hours behind the spill weir regulator of the Koyulhisar HPP. The water then be transferred to a set of open canals and tunnels that brings the water to a head pond from which it is loaded to the penstock that brings pass the water to the powerhouse where it reaches the 3 vertical axis Francis turbines with 21 MW capacity each. The electricity is produced by the two of these three turbines as one of the turbines is a stand-by unit. The spill weir regulator is located at an altitude of 724 m and the tail water of Koyulhisar is at an altitude of 623 m. This brings a head difference of approximately 101 m. How the project activity is operating is shown schematically below in Figure 1. Koyulhisar HPP with 63 MWe installed capacity is connected to the Turkish National Power Grid via one of the Transformer Substations by 80 km long 154 kV transmission line at the Suşehri Transfer Station and Reşadiye Transfer Station.

According to the methodology¹, baseline scenario was identified as “the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources”.

The project boundary can be seen in Figure 1.

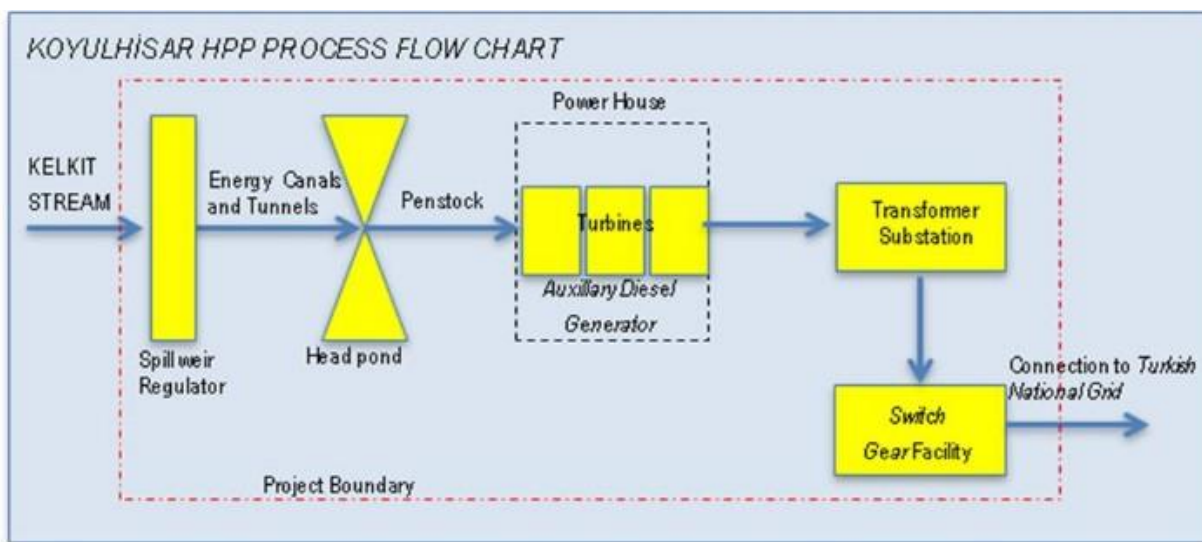


Figure 1. Project boundary of Koyulhisar HEPP

¹ <https://cdm.unfccc.int/UserManagement/FileStorage/AG07ZJQ3EXD42LT5YV9HR16M8KINPO>

1.2 Audit History

Audit Type	Period	Program	VVB Name	Number of years
Validation	17-November-2009 to 16-November-2019 (1 st crediting period)	<u>VCS</u>	<u>TÜV Rheinland (China) Ltd.</u>	10
Verification	17-November-2009 to 31-October-2011 (1 st monitoring period)	<u>VCS</u>	<u>Carbon Check</u>	~2
Verification	01-November-2011 to 31-July-2013 (2 nd Monitoring Period)	<u>VCS</u>	<u>TÜV Rheinland (China) Ltd.</u>	~2
Verification	01-August-2013 to 16-November-2019 (3 rd Monitoring Period)	<u>VCS</u>	<u>KBS Certification Services Pvt. Ltd.</u>	~6
Validation	17-November-2019 to 16-November-2029 (2 nd crediting period)	<u>VCS</u>	<u>Re-carbon</u>	10
Verification	17-November-2019 to 31-December-2021	<u>VCS</u>	<u>Carbon Check</u>	~2

	(1 st monitoring period of the 2 nd crediting period)			
Verification	01-January-2022 to 31-July-2023 (2 nd monitoring period of 2 nd Crediting Period)	<u>VCS</u>	<u>Re-carbon</u>	~2 (19 months)
Total	=	=	=	-

1.3 Sectoral Scope and Project Type

Sectoral scope ²	1
Project activity type	Energy Industries (Renewable/Non-Renewable Sources)

Complete the table below with information relevant for AFOLU projects:

This is non-AFOLU project.

Sectoral scope	
AFOLU project category ³	
Project activity type	

1.4 Project Proponent

Organization name	Aydem Yenilenebilir Enerji A.Ş.
Contact person	Özgün Gül Koparan

² Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

³ See Appendix 1 of the VCS Standard

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

1.5 Other Entities Involved in the Project

Organization name	GTE Karbon Sürdürülebilir Enerji Eğt. Dan. ve Tic. A.Ş.
Role in the project	Project consultant
Contact person	M. Kemal Demirkol
Title	Director
Address	Mustafa Kemal Mah. 2111. Sok. No: 5 06530 Cankaya - Ankara – TURKEY
Telephone	+90 312 514 63 63
Email	kemal.demirkol@gte.com.tr

1.6 Project Start Date

Project start date	17-November-2009
Justification	Provisional Acceptance date

1.7 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements) This is the second crediting period of the project and it covers ten years.
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Start and end date of first or fixed crediting period

17-November-2019 to 16-November-2029 (2nd Crediting Period)

1.8 Project Location

The project is located at the Central Anatolian geographical region of Turkey at the Sivas Province. The nearest settlement to the project activity is the Yukarıkale village which is approximately 12 km away. The coordinate of the powerhouse is as follows and as indicated on the location Map below (Figure 1). The following are the exact coordinates of the main project structures, as shown in the following table (Table 2).

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

Component's name	Latitude	Longitude
Powerhouse	40° 16' 13.48"N	37° 46' 54.58"E
Switch Gear	40° 17' 28.28"N	38° 26' 27.58"E



Figure 2. Project location



Figure 3. Location of the project activity

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0002	Grid-connected electricity generation from renewable sources	20.0
Tool	TOOL01	Tool for the demonstration and assessment of additionality	05.2.1
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	07.0
Tool	TOOL03	Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion	03.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.12 Sustainable Development Contributions

The purpose of the project is electricity production using the potential energy of Kelkit Stream, which is a branch of Yeşilirmak River, as a renewable resource. Therefore, the electricity is going to be produced without causing airborne pollutants or Green House Gas (GHG) emissions. The construction and operation of the Koyulhisar Hydro Electric Power Plant (HEPP) is delaying the addition of conventional thermal power plants to the Turkish National Electricity Grid.

The project produced 315,907 MWh net electricity for the whole monitoring period. The project is a green field project and in the absence of the project activity an equivalent amount of electricity would have been generated in the fossil fuel based national grid.

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. For this monitoring period, 315,907 MWh of clean electricity has been produced.
- SDG-8 is to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for 34 people. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.
- 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, 145,538 tCO₂ reduction for this monitoring period.

Table 1. Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	13.3	Tons of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 145,538 tCO ₂ into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 891,790 tCO ₂ into the atmosphere Over Project Lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	During the monitoring period 34 employees were recruited.	Total 34 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 315,907 MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 1,935,740 MWh electricity from hydropower which is a renewable source over project lifetime

1.13 Commercially Sensitive Information

There is no commercially sensitive information about the project.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	Through consultation meetings, stakeholders are identified.
Legal or customary tenure/access rights	No expropriation was required during the implementation period. There are no lands which was occupied by IPs.
Stakeholder diversity and changes over time	There is no change over time and stakeholder diversity was identified during the consultation meetings.
Expected changes in well-being	The project does not have any negative impacts.
Location of stakeholders	Koyulhisar District
Location of resources	Kılıçpınar Village where the stakeholder meeting was held.

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	The ongoing mechanism about the LSC is that, they communicate regularly with the village heads, and the district governorship and welcome the visitors.
Date(s) of stakeholder consultation	13-November-2006
Communication of monitored results	The project owner was open to dialogue with stakeholders.

Consultation records	There was a “communication box” in Koyulhisar District Municipality Building within the vicinity of the project and a continuous grievance policy is implemented by the project owner.
Stakeholder input	During the monitoring period there were no complaints about or demands from the project received in the complaint box.

2.1.3 Free, Prior, and Informed Consent

Consent	In these meetings general information about the construction site, duration of the construction and cost of the project, technical information about the equipment's to be used at the project, the potential environmental impacts and the measures to be taken are presented to the stakeholders.
Outcome of FPIC	There is no outcome for FPIC.

2.1.4 Grievance Redress Procedure

No grievance has been raised during the monitoring period of this project.

Grievances received	Resolution and outcome
No grievance has been received.	There is no resolution or outcome since there is no grievance received.

2.1.5 Public Comments

Summary of comments received	Actions taken
No comment received from the stakeholders.	Since there is no comment received from the stakeholders, no actions have been taken.

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	There is no risk identified.	No mitigation or preventative measure should be taken since there is no risk identified for stakeholder participation.
Working conditions	There is no risk identified.	No mitigation or preventative measure should be taken since there is no risk identified about working conditions.
Safety of women and girls	There is no risk identified.	No mitigation or preventative measure should be taken since there is no risk identified for the safety of women and girls.
Safety of minority and marginalized groups, including children	There is no risk identified.	No mitigation or preventative measure should be taken since there is no risk identified for the safety of minority and marginalized groups, including children.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	There is no risk identified.	No mitigation or preventative measure should be taken since there is no risk identified about the pollutants.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	No discrimination or sexual harassment has occurred.
Management experience	The necessary trainings are provided to the employees.
Gender equity in labor and work	Equal opportunities have been provided in the context of gender equity and pay for labor and

	work. The project creates local and regional employment both during the construction phase and operational phase. The project proponent employed 35 workers during the construction phase and 10 workers during the operation phase prioritizing local employment for the works which do not require high skilled staff.
Human trafficking, forced labor, and child labor	Project does not use victims of human trafficking, forced labor, and child labor. Türkiye has ratified ILO convention 100, 111, 122 and 142. All the workers are socially secured by the PO and protected by employment agreements. If any complaint is received by the PO, they will act on the issue right away throughout the lifetime of project activity.

2.3.2 Human Rights

The PO recognizes, respects, and promotes the protection of the rights of LCs, and customary rights holders in line with applicable international human rights law. Türkiye has ratified ILO convention 19. PO will never be complicit in violence or human rights abuses. If any complaint is received by the PO, they will act on the issue right away throughout the lifetime of project activity.

2.3.3 Indigenous Peoples and Cultural Heritage

There are no lands which was occupied by IPs.

2.3.4 Property Rights

No expropriation was required during the implementation period. There are no lands which was occupied by IPs. The project site is not a private land.

Disputes over rights to territories and resources	N/A
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Respect for property rights

No expropriation was required during the implementation period.

2.3.5 Benefit Sharing

The project does not impact property rights. So this section is N/A

Summary of the benefit sharing plan

The project does not impact property rights; therefore, there is no benefit sharing plan.

Benefit sharing during the monitoring period

There is no benefit sharing during the monitoring period.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	No mitigation or preventative measure should be taken during the monitoring period since there is no risk identified.
Soil degradation and soil erosion	No risk identified	No mitigation or preventative measure should be taken during the monitoring period since there is no risk identified.
Water consumption and stress	No risk identified	No mitigation or preventative measure should be taken during the monitoring period since there is no risk identified.
Usage of fertilizers	No risk identified	No mitigation or preventative measure should be taken during the monitoring period since there is no risk identified.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat

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.

2.4.2 Introduction of species

No adverse effects from the introduction of species identified at validation are specified; thus, this section is N/A.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A

There is no invasive species in the project location; thus, this section is N/A.

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
N/A	N/A

2.4.3 Ecosystem conversion

The project is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project start date is 17/11/2009. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions other than the water transmission channel maintenance activities.

Koyulhisar HEPP is built on Kelkit Stream, which is a branch of Yeşilırmak River. The regulator is approximately at the elevation of 724 m. The PA utilizes approximately (gross) 101 m of potential energy difference to produce electricity. Koyulhisar HEPP is connected to Turkish National Power Grid via one of Transformer Substations y 80 km long 154 kV transmission line.

There are three Vertical Francis type turbines that have an installed capacity of 63 MWe, with 21 MWe each according to the generation license which is dated 10/02/2005. The commissioning date was 17/11/2009 which is accepted as project start date.

The details about the old and current meters are given in tables below.

Table 4. Old Energy Meters

Parameters	Transformer A	
	Old Main Meter (Removed on 14/12/2019)	Old Spare Meter (Removed on 14/12/2019)
Serial no.	53030781	53030782
Brand- (Type)	ACTARIS	ACTARIS
First Index Date (First Calibration Date)	24/11/2009*	24/11/2009
Calibration Due	Removed on 14/12/2009*	Removed on 14/12/2009
Calibration frequency	10 years	10 years
Accuracy Class	0.2S – 0.5S	0.2S – 0.5S

Table 6. Current Energy Meters

Parameters	Transformer A		Transformer B	
	Main Meter	Spare Meter	Main Meter	Spare Meter
Serial no.	8923761	8923762	8923763	8923764
Brand- (Type)	EMH / LZQJ-XC	EMH / LZQJ-XC	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	14/12/2019	14/12/2019	24/12/2019	24/12/2019
Calibration Due	14/12/2029 ⁴	14/12/2029 ⁵	24/12/2029 ⁶	24/12/2029 ⁷
Calibration frequency	10 years	10 years	10 years	10 years
Test Date	09/12/2021	09/12/2021	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023	09/12/2023	09/12/2023
Test frequency	2 years	2 years	2 years	2 years
Class	0.2S	0.2S	0.2S	0.2S

The information about the generators are given in the table below.

Type of Generator	SF21.5-14/3640
Rated Power of Generator	10500 V
Rated Voltage	1390.8 A
Rated Current	180 V
Rated Frequency	50 Z

3.2 Deviations

3.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002 (version 20.0) and its related tools are applied as they are without any deviation from methodology.

3.2.2 Project Description Deviations

For the Project Proponent part, Bereket Energy was the major shareholder of Koyulhisar Üretim A.S and as the Bereket changed title as a company policy they have dissolved all the individual sister companies that hold licenses of facilities and changed the ownership as Aydem Yenilenebilir A.Ş on 27/12/2019 as stated in official gazette with registration number of 13798⁸.

⁴ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

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>

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

⁸ Official Gazette

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 TEIAS & PP i.e., Annex-3, Article 3.3 of “The Transmission System Usage Agreement dated 23/06/2020”, it has been found that the testing of energy meters is carried out every 2 years⁹.

3.3 Grouped Projects

The project is not a grouped project activity.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system”
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 03/09/2020 ¹⁰
Value applied	0.6993

⁹ System Use Agreement

¹⁰ https://enerjiapi.enerji.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf , The reference document has been submitted to the VVB.

Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,OM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources on 03/09/2020 using Version 07 of Tool 7: "Tool to calculate the emission factor for an electricity system".
Purpose of Data	For calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Building margin CO ₂ emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 03/09/2020 ¹¹
Value applied	0.3812
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,BM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources on 03/09/2020 using Version 07 of Tool 7: "Tool to calculate the emission factor for an electricity system".
Purpose of Data	For calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin Emission Factor of Turkey
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 03/09/2020 ¹²
Value applied	0.4607
Justification of choice of data or description of measurement	The $EF_{grid,CM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources on 03/09/2020. Calculated data of $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ were used.

¹¹ https://enerjiapi.enerji.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf , The reference document has been submitted to the VVB.

¹² https://enerjiapi.enerji.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf , The reference document has been submitted to the VVB.

methods and procedures applied	
Purpose of Data	For calculation of $EF_{grid,CM,y}$
Comments	-

4.2 Data and Parameters Monitored

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
Description of measurement methods and procedures to be applied	Turbine Supplier information on the equipment
Frequency of monitoring/recording	Yearly
Value monitored	63,000,000 W
Monitoring equipment	N/A
QA/QC procedures to be applied	Supplier information on the related equipment and existence of the equipment will be checked.
Purpose of the data	To monitor capacity of the project and used to calculate the power density
Calculation method	N/A
Comments	-

Data / Parameter	A_{pj}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project Site

Description of measurement methods and procedures to be applied	The reservoir area corresponding to maximum operational level has been determined via the topographic map showing the lake area.
Frequency of monitoring/recording	Once at the beginning of each crediting period
Value monitored	1,204,040 m ²
Monitoring equipment	-
QA/QC procedures to be applied	Can be checked and compared to satellite imagery available by Google Earth.
Purpose of the data	To use for calculating the power density
Calculation method	N/A
Comments	-

Data / Parameter	EG _{PP-import,y}										
Data unit	MWh										
Description	Quantity of electricity imported by the power plant from the Grid, in year y										
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity imported from the Grid.										
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.										
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.										
Value monitored	153 MWh										
Monitoring equipment	TRANSFORMER A <table border="1"> <thead> <tr> <th>Parameters</th><th>Main Meter</th><th>Spare Meter</th></tr> </thead> <tbody> <tr> <td>Serial no.</td><td>8923761</td><td>8923762</td></tr> <tr> <td>Brand-(Type)</td><td>EMH / LZQJ-XC</td><td>EMH / LZQJ-XC</td></tr> </tbody> </table>		Parameters	Main Meter	Spare Meter	Serial no.	8923761	8923762	Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
Parameters	Main Meter	Spare Meter									
Serial no.	8923761	8923762									
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC									

First Index Date (First Calibration Date)	14/12/2019	14/12/2019
Calibration Due	14/12/2029 ¹³	14/12/2029 ¹⁴
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

TRANSFORMER B

Parameters	Main Meter	Spare Meter
Serial no.	8923763	8923764
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	24/12/2019	24/12/2019
Calibration Due	24/12/2029 ¹⁵	24/12/2029 ¹⁶
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market⁵¹.

¹³ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

¹⁴ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

¹⁵ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

¹⁶ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

	They have an accuracy class of Class 002 indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Measurements are carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters is Class02, that is to say should be within the $\pm 0.2\%$ (± 0.002) range. The monthly reported meter readings by the meters, will be cross-checked against the back up meter, if the reading difference is less than ± 0.002 ($\pm 0.2\%$) than the meter readings are considered to be OK, if not then the meters will be checked. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screenshots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of the data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	$EG_{PP-export,y}$
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the grid, in year y
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value monitored	316,061 MWh
Monitoring equipment	TRANSFORMER A

Parameters	Main Meter	Spare Meter
Serial no.	8923761	8923762
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	14/12/2019	14/12/2019
Calibration Due	14/12/2029 ¹⁷	14/12/2029 ¹⁸
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

TRANSFORMER B

Parameters	Main Meter	Spare Meter
Serial no.	8923763	8923764
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	24/12/2019	24/12/2019
Calibration Due	24/12/2029 ¹⁹	24/12/2029 ²⁰
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

¹⁷ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

¹⁸ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

¹⁹ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁰ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

	Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market ⁵¹ . They have an accuracy class of Class 002 indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters is Class 002, that is to say should be within the $\pm 0.2\%$ (± 0.002) range. The monthly reported meter readings by the meters, will be cross-checked against the back up meter, if the reading difference is less than ± 0.002 ($\pm 0.2\%$) than the meter readings are considered to be OK, if not then the meters will be checked. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screenshots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of the data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	EG _{PP-net, y}		
Data unit	MWh		
Description	Quantity of electricity produced by the power plant to the grid, in year y		
Source of data	The Primary source of data is EPIAS screenshot and the secondary source is the TEİAŞ meter readings		
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.		
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEİAŞ Meter Reading Protocols, Reported annually on the VCS Monitoring Report.		
Value monitored	315,907 MWh		
Monitoring equipment	TRANSFORMER A		
	Parameters	Main Meter	Spare Meter

Serial no.	8923761	8923762
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	14/12/2019	14/12/2019
Calibration Due	14/12/2029 ²¹	14/12/2029 ²²
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

TRANSFORMER B

Parameters	Main Meter	Spare Meter
Serial no.	8923763	8923764
Brand-(Type)	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	24/12/2019	24/12/2019
Calibration Due	24/12/2029 ²³	24/12/2029 ²⁴
Calibration frequency	10 years	10 years
Test Date	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023
Test frequency	2 years	2 years
Class	0.2S	0.2S

Both meters are in compliance with the communiqué for Metering

²¹ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²² <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²³ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁴ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

	Devices to be used in the Electricity Market ⁵¹ . They have an accuracy class of Class 002 indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class02, that is to say should be within the $\pm 0.2\%$ (± 0.002) range. The monthly reported meter readings by the meters, will be cross-checked against the back up meter. If the reading difference is less than ± 0.002 ($\pm 0.2\%$) than the meter readings are considered to be OK, if not then the meters will be checked. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of the data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	$EG_{PP-net,y} = EG_{PP-export,y} - EG_{PP-import,y}$
Comments	-

4.3 Monitoring Plan

The Monitoring Plan for the project consists mainly of the net electricity generation by the project activity. Based on the baseline scenario presented above, this amount of electricity would have been produced by the Turkish National Grid.

The electricity produced is sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by four meters (two main meter and two control meters). These four meters that backup each other. Generated electricity is also monitored via the operator by the help of EPIAŞ trading software for internal monitoring.

Table 5. Old Energy Meters

Parameters	Transformer A	
	Old Main Meter (Removed on 14/12/2019)	Old Spare Meter (Removed on 14/12/2019)
Serial no.	53030781	53030782
Brand- (Type)	ACTARIS	ACTARIS
First Index Date (First Calibration Date)	24/11/2009*	24/11/2009
Calibration Due	-Removed on 14/12/2009*	- Removed on 14/12/2009
Calibration frequency	10 years	10 years
Class	0.2S	0.2S

*Transformer A, the ACTARIS brand meters were installed on 24/11/2009 and replaced with EMH Brand Meters on 14/12/2019. In order to meet the 10-year calibration frequency, the meters should have been

recalibrated/replaced within 24/11/2019 but done only on 14/12/2019. There are 20 days delay in calibration. Error factor should have been applied for the month of November and December 2019.

Table 6. Current Energy Meters

Parameters	Transformer A		Transformer B	
	Main Meter	Spare Meter	Main Meter	Spare Meter
Serial no.	8923761	8923762	8923763	8923764
Brand- (Type)	EMH / LZQJ-XC	EMH / LZQJ-XC	EMH / LZQJ-XC	EMH / LZQJ-XC
First Index Date (First Calibration Date)	14/12/2019	14/12/2019	24/12/2019	24/12/2019
Calibration Due	14/12/2029 ²⁵	14/12/2029 ²⁶	24/12/2029 ²⁷	24/12/2029 ²⁸
Calibration frequency	10 years	10 years	10 years	10 years
Test Date	09/12/2021	09/12/2021	09/12/2021	09/12/2021
Test Due	09/12/2023	09/12/2023	09/12/2023	09/12/2023
Test frequency	2 years	2 years	2 years	2 years
Class	0.2S	0.2S	0.2S	0.2S

Calibrations are done according to the Measuring Instruments Directive²⁹. Calibration of the meters are valid for 10 years based on Regulation on Metering and Metering Devices³⁰. These meters are placed on the switchgear station where the power plant gets connected to the Turkish national grid. Those meters will provide official data which will be 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

²⁵ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁶ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁷ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁸ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>

²⁹ Regulation on Measuring And Measuring Instruments (Official Gazette Date & No : 25/07/1994 & 22000)
<https://www.mevzuat.gov.tr/anasayfa/MevzuatFihristDetayIframe?MevzuatTur=7&MevzuatNo=6381&MevzuatTertip=5>

³⁰ Regulation on Measuring And Measuring Instruments (Official Gazette Date & No : 25/07/1994 & 22000)
<https://www.mevzuat.gov.tr/anasayfa/MevzuatFihristDetayIframe?MevzuatTur=7&MevzuatNo=6381&MevzuatTertip=5>

done and the meters will be checked continuously if there is a difference of 0.2% in the readings of the main and the auxiliary meters, the calibration is repeated.

The net electricity produced ($EG_{PP-net, y}$) in year y is calculated by subtracting the total electricity consumed by the hydroelectric power plant ($EG_{PP-self\ consumption, y}$), from the gross electricity generation ($EG_{PP-gross, y}$). After obtaining the net electricity production value, the emission reductions will be 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. Positions and responsibilities of the VER monitoring team members

Position	Responsibility
Koyulhisar HEPP Manager	Day to day operation of the Koyulhisar 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 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 form 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 KOYULHISAR HEPP can be cross checked, via the TEİAŞ – EPIAŞ web site³¹ 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/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

³¹ <https://seffaflik.epias.com.tr/transparency/>

multiplied by the transmission loss factor of the grid. This data is the main QA/QC data for the project activity.

The single line diagram of the project activity can be seen in figure below.

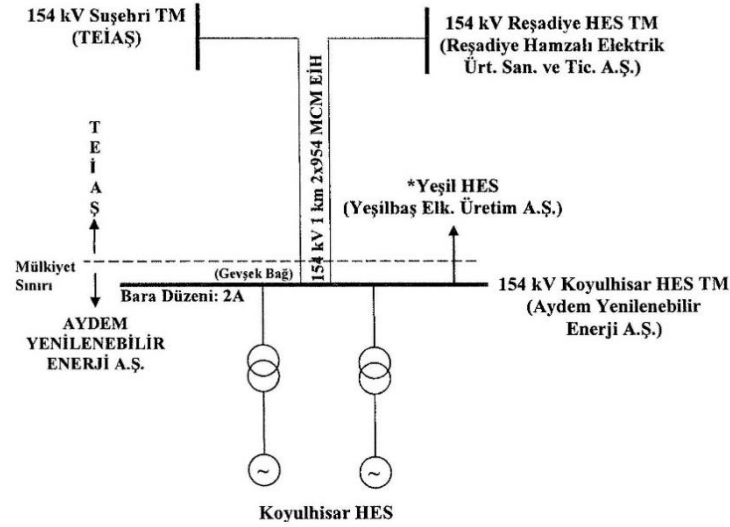


Figure 4. Single Line Diagram of the Project Activity

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

$$315,907 \text{ MWh} \times 0.4607 \text{ tCO}_2/\text{MWh} = 145,538 \text{ tCO}_2$$

$$BE_y = 145,538 \text{ tCO}_2$$

5.2 Project Emissions

As per ACM0002.: Consolidated baseline methodology for grid-connected electricity generation from renewable sources, v20.0;

“For most renewable energy project activities, $PE_y = 0$. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the indicated version of ACM0002.

- Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption)
- Emissions from water reservoirs of hydro power plants”

Therefore, as per ACM0002: Grid-connected electricity generation from renewable sources, v20.0:

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 42,000,000 MWe installed capacity and $1,204,040 \text{ m}^2$ maximum lake area.

The power density of the project activity (PD) is calculated as follows (Equation 3 in the applied methodology):

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

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,

$$Cap_{PJ} = 63,000,000 \text{ We}$$

$$Cap_{BL} = 0.0 \text{ W}$$

$$A_{PJ} = 1,204,040 \text{ (m}^2\text{)}^{32}$$

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

Therefore, PD is calculated as.

$$PD = \frac{63,000,000 - 0}{1,204,040 - 0}$$

$$PD = 52.32 \text{ W} - m^2$$

5.3 Leakage Emissions

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

$$LE_y = 0$$

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Total Emission Reduction has been determined as;

³² Reservoir area, Annex 2

$$ER_y = BE_y - PE_y - LE_y$$

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 6. Calculations for net total values

EGy	Net Generation (MWh) During Monitoring Period	315,907
EFy	Emission Factor (tCO₂-MWh)	0.4607³³
BEy	Baseline emissions in year y (tCO₂) During Monitoring Period	145,538
PEy	Project Emissions (tCO₂)	0
LEy	Leakage Emissions (tCO₂)	0
ERy	Net Emission Reduction (tCO₂) During Monitoring Period	145,538

Thus, the net emission reduction (in tons CO₂) in this monitoring period (01-January-2022 to 31-July-2023) is calculated as given in table below.

Vintage period	Baseline emissions (tCO₂e)	Project emissions (tCO₂e)	Leakage emissions (tCO₂e)	Reduction VCUs (tCO₂e)	Removal VCUs (tCO₂e)	Total VCUs (tCO₂e)
2022	90,764.86	0	0	90,764.86	0	90,764.86

³³ Fixed ex-ante CM as per Section 4.3. og registered PD

(01/01/2022 - 31/12/2022)						
2023 (01/01/2023 - 31/07/2023)	54,773.74	0	0	54,773.74	0	54,773.74
Total	145,538	0	0	145,538	0	145,538

State the non-permanence risk rating (%)	N/A
Has the non-permanence risk report been attached as either an appendix or a separate document?	☐ Yes ☒ No
For ARR and IFM projects with harvesting, state, in tCO ₂ e, the Long-term Average (LTA).	N/A
Has the LTA been updated based on monitored data, if applicable?	☐ Yes ☒ No
State, in tCO ₂ e, the expected total GHG benefit to date.	N/A
If a loss occurred (including a loss event or reversal), state the amount of tCO ₂ e lost:	N/A

Vintage period	Ex-ante estimated reductions/removals (tCO ₂ e)	Achieved reductions/removals (tCO ₂ e)	Percent difference	Explanation for the difference
2022 (01/01/2022-31/12/2022)	89,180	90,764.86	1.8 %	Since the project is a HEPP, seasonal variations in the amount of precipitation and temperature affect the monthly generation rates and may create deviations from the estimated values. It does not change even with 10% difference;

				therefore, 1.8% difference will not make a huge impact.
2023 (01/01/2023 – 31/07/2023)	52,021	54,773.74	5.3 %	Since the project is a HEPP, seasonal variations in the amount of precipitation and temperature affect the monthly generation rates and may create deviations from the estimated values. It does not change even with 10% difference; therefore, 5.3% difference will not make a huge impact.
Total	141,201	145,538	3.1 %	Since the project is a HEPP, seasonal variations in the amount of precipitation and temperature affect the monthly generation rates and may create deviations from the estimated values. It does not change even with 10% difference; therefore, 3.1% difference will not make a huge impact.

APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

There is no commercially sensitive information about the project.

Section	Information	Justification

