DERELI HYDROELECTRIC POWER PLANT

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Project Title	Dereli Hydroelectric Power Plant
Version	1.04
Report ID	DereliVCSMR-01
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Karhes Elektrik Üretim A.Ş. which is owned by Aydem Yenilenebilir Enerji A.S. operates the Dereli Regulator and Hydroelectric 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. Therefore, the electricity is produced without causing airborne pollutants or Green House Gas (GHG) emissions. The construction and operation of the Dereli Hydro Electric Power Plant (HEPP) is delaying if not avoiding the addition of conventional thermal power plants to the Turkish National Electricity Grid.

As shown on the EMRA approved electricity production license[1] *the established* capacity of Dereli HEPP is 49.2 MW. The project is expected to produce a total of 157,500 MWh of electricity per year[1] ., therefore the plant load factor of the project calculates to be, 38.59 %, as shown in the below calculation:

$$\frac{157{,}500\ MWh}{49.2\ MWX365X24h} = \frac{157{,}500}{430{,}992} = 0.3859 = 36.54\%$$

To be able to produce and sell electricity to the Turkish national electricity grid the project has obtained electricity production license from the Energy Market Regulatory Agency (EMRA) with the license number License number EÜ/391-1/500 (EMRA Decision date 06/12/2014) . Based on Turkey's Combined Margin Emission Factor of 0.5332 CO_{2e} tonnes /MWh, the project activity is expected to produce 83,983 tonnes of CO_{2e} GHG reductions each year.

The project start date is 10/01/2014. Since this date,which is also includes the monitoring period, the project activity produced 836,717.90 MWh of electricity and 446,347 tonnes of CO2e Emission reduction.

The major milestones at the project development history can be summarized as shown in the table below under the section 3.1 (Table 1).

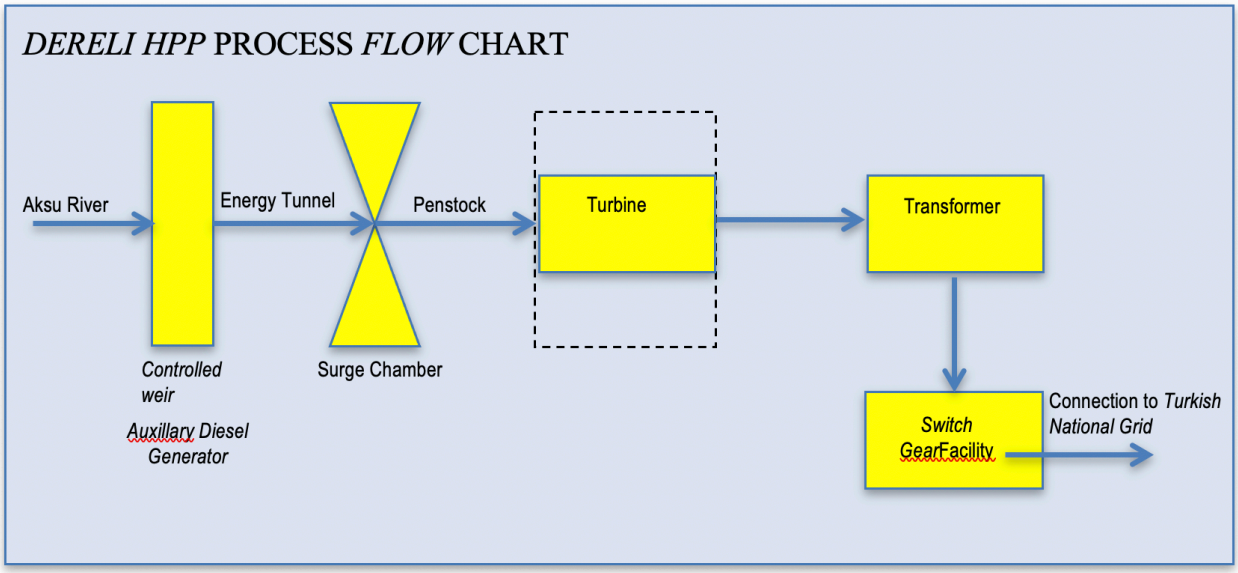
The Dereli HEPP is made up of one hydro power plant. There is one controlled weir through which the water is taken up from the 778 m elevation level and is transferred to a derivation tunnel of 8113m . From there the water arrives to the valve chamber and is fed to a penstock of 630 m where it is pressurized and arrives to the power plant that is built at a level of 495 m.

[1] Dereli Electricity Production Licence Dated 06/12/2004 numbered EÜ/391-1/500 pdf page 10

[2] In the registered VCS PD the PP is "Karhes Elektrik Üretim A.Ş". However Karhes was a company set up for the purpose of license obtaining than the ownership

The potential energy of water at approximate gross head level of 263 m is utilized and the electricity is produced by the power plant. How the project activity operates is as shown below in Figure 1.

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



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 YENİLENEBİLİR ENERJİ A.Ş.[2]
Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
Address	Adalet Mah. Hasan Gönüllü Bulvarı No:15-1 Merkezefendi Denizli- Turkey

[2] In the registered VCS PD the PP is "Karhes Elektrik Üretim A.Ş". However Karhes was a company set up for the purpose of license obtaining than the ownership passed to Aydem Yenilenebilir Enerji A.Ş. which is the mother company. Now it is owned by Aydem Yenilenebilir A.S..

Telephone	+90 258 242 27 76
Email	ozgun.gulkoparan@aydemenerji.com.tr

1.4 Other Entities Involved in the Project

Organization name	Ekobil Environmental Services and Consultancy Limited[3][4]
Role in the Project	Preparation of the Project Description Document and the monitoring report
Contact person	Dr. Aslı Sezer Özçelik
Title	Partner
Address	Ahlatlıbel Mah. 1839. Sk. No.56 06805 Çankaya-Ankara-Turkey
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1.5 Project Start Date

10.01.2014, is the date when the project started to supply electricity to the Turkish grid as substantiated by the partial acceptance letter sent to the Governance of Giresun Province, Giresun-Turkey.

1.6 Project Crediting Period

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

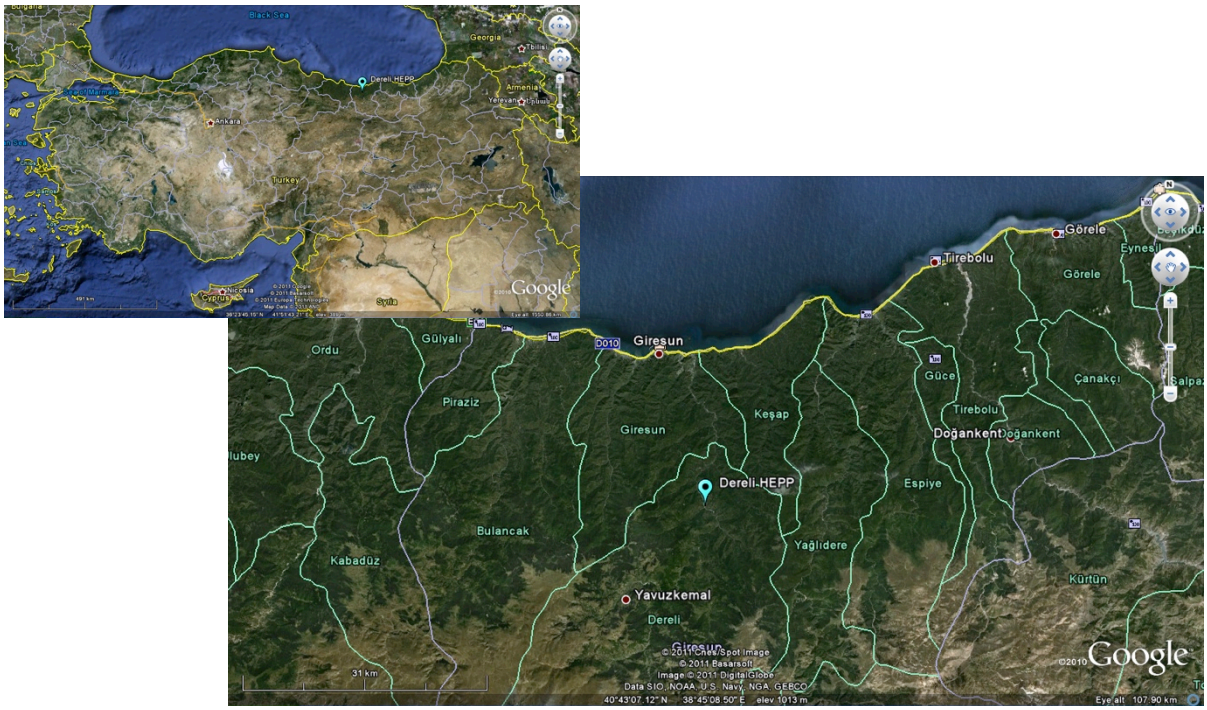
[3] Ekobil is a limited liability company registered to the Ankara Chamber of Commerce with the registration number of 145009 and with the full tittle of Ekobil Çevre Hizmetleri Danışmanlık Eğitim Tarım Hayvancılık Madencilik İnşaat İthalat İhracat Turizm ve Ticaret Limited Şirketi

[4] Turkuaz Karbon Varlık Yönetimi Enerji Proje ve Dan. San. İth. İhr. Ltd. Şti. subcontracted Ekobil for PDD writing and the project owner contracted Ekobil directly for the monitoring stage.

The coordinates of the major project structures are as follows:

	Latitude	Longitude
Power House	40°41'20.42"N	38°26'17.57"E
Spill Weir	40°41'15.00"N	38°26'27.58"E

Figure 2:Location Map



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

Not applicable.

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.

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1.11 Sustainable Development

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, 836,717.90 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 446,347 tCO2 into the atmosphere.
In addition to the above the contribution of the project to sustainable development, social, economic and environmental situation is given explained to be:"...The project contributes to sustainable development in Turkey in two major ways:

Hydropower presents significant environmental benefits:

- Generating electricity from hydropower energy does not result in emissions of pollutants into the atmosphere with zero residuals that carry adverse impacts on soil, water etc.
- Regular emissions from conventional electricity generation such as sulphur dioxide, nitrogen oxide and particulates will not occur in this case.
- As a renewable energy source hydropower can be used without jeopardizing the supply of primary energy sources in the future
- The proposed project will significantly contribute to the reduction of GHGs.

Hydropower presents significant economic benefits:

- The region is energy poor and the industry is undeveloped. Although agriculture is not undertaken with advanced methods and the region is poor in agricultural land availability, agriculture is destined to be the main livelihood in the region. Agricultural land is scarce and difficult to work on as the land is steep and the soil is not deep everywhere. Emission of pollutants such as sulphur dioxide through shifting to fossil fuel based electricity generation in the region to satisfy the needs of fast growing industry will result in damaging the quality of agriculture and cause economic harm in the region.

The project pursues significant social benefits to the communities in the project area, such as:

- Construction of Dereli HPP and operation of the plant resulted in extra employment in the local area where unemployment is a socio-economic problem. Priority will be given

to local labor force and necessary trainings will be organized to improve vocational capacity of the candidates.

- Construction materials are, if possible, supplied through local resources.

2 SAFEGUARDS

2.1 No Net Harm

In the validated VCS-PDD,the positive impact of the project to the social, economical and environmental situation is mentioned as:"...to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The specific benefits of the project are:

•To reduce greenhouse gas emissions in Turkey compared to the business-as-usual scenario,

•To help stimulate private sector participation in hydro power industry in Turkey,

•To create employment during the construction and the operation phase of the plant,

•To help relatively reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,

•To help to diminish Turkey's increasing energy deficit,

•To diversify the electricity generation portfolio and reduce dependency on import of other energy sources."

2.2 Local Stakeholder Consultation

The project owner have organized a local stake holders meeting on 09/04/2006 in the Muhtarship room of the Kuşluhan Sub district which is a close settlement near the project site.

The meeting was announced by announcements placed at the Muhtarship board and several places at the nearby settlements. These announcements were given to the Muhtar on 20/03/2006 and announced the meeting time and place.

The meeting was held in the afternoon at 14:00 and the Muhtar coordinated the meeting. Here is a translation summary of the meeting minutes that is provided to the validating DOE:

Muhtar Ç. Aydoğan: Made an introduction and explained that the meeting was held upon written

request sent by the project owner on March 20, 2006, and the purpose of the meeting was to provide information about the project that would be constructed within the borders of their neighbourhood.

Company Representor Mr. Karaduman: Mr. Karaduman explained the characteristics of the project in detail but with a plain language, and explained that 60% of the project area was forestry land, 20 % would be on Private land that was acquired by the project owner in accordance with their owners and 20% of the project land was over the land that would be expropriated. Mr. Karaduman also provided numeric information about how much energy would be produced by the project activity, he then added that the project will be operating without creating any waste, dirt or noise and would be environmentally friendly.

Mr. Saray: asked if there would be any job opportunities and how many people would have a chance to work for the project.

The company HR answered and explained that it was planned to start by employing 50 people than the number would increase towards 200 and taking into account the subcontractors it would increase up to 250 people throughout the course of the construction period.

Mr. H. Aksu asked if there was any agricultural land in the area where reservoir was planned to be constructed. The project owner representors answered and explained that the reservoir would only cover a small area in a narrow part of the valley and there were no agreeable land in that area, except 5 lots of high sloped, rocky lands that have some barns. They have also added that the owners of these barns were informed and their lands were acquired with their consignment.

Based on this explanation Mr. Aksu raised and added that they were very happy about the situation and he expressed his gratitude. On this topic, Mr. Mustafa Yenidede and Mr. Hayati Yenidede who have also sold their lands to support the project, also raised and explained that they were very happy to sell their lands to the project owner, and they have also expressed their gratitude.

In addition to this Muhtar Ç.Aydogan also added that both him and the board of elderly were involved in these land acquisition agreements and they have also witnessed, and the sales were made upon agreed protocols that the landowners were happy with the results.

Mr. Aksu mentioned that the local inhabitants were familiar with this type of constructions and some of them had worked in similar constructions, and asked if the local inhabitants would be considered if the employment opportunities will arise. Mr. Karaduman answered that especially for the security positions and for other suitable positions their intention was to prefer 70% of the employees from the local area.

Mr. Yılmaz Gürses asked if there would be any noise herd from the power house building during the operation stage. The project owner representor explained that there would be no noise from the power house building and all the necessary precautions to eliminate noise would be taken

and this would also be checked by the Ministry of Energy representors at the stage of commissioning and approval of the power house.

The Muhtar Mr. Aydoğan asked if there were other citizens who would like to ask questions. Seeing that there were no more questions he thanked the project owners for organizing this meeting and he mentioned that they were informed and happy to have the project in their neighbourhood.

The project representor raised and thanked to the citizens for attending the meeting and thank to the muhtar for moderating the meeting.

Finally The Muhtar Mr. Aydoğan mentioned that as far has he knows al the local citizens were happy to have the project and they had no complaints about the project, that they were supporting it. And he announced the closure of the meeting as of 09/04/2006 at 17:30.

Then the Muhtar, the board of elderly and the representors of the Project owner have signed the written minutes of the meeting. These minutes and the list of the attendees are provided to the validating DOE.

2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project start date is 10-01-2014. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions. The following table summarizes the project milestones:

Table 1 : Chronological history of the project development and the Significant dates for the project monitoring period:

Date	Milestone	Reference
05/11/04	Water usage agreement signed with DSI	Water usage agreement
06/12/04	The Electricity Production License is granted for the project activity	License number EÜ/391-1/500
21/03/06	Local Stake holder Consultation is announced	Announcement documents
09/04/06	Local Stake holder Consultation meeting is held	Meeting Minutes

27/04/06	EIA Exemption certification issued	Certificate
04/09/06	Grid connection agreement signed	Agreement
01/12/06	Board decision to take VER revenues into account.	Board Decision
01/02/07	Construction Started	NHS Records
29/08/07	The Loan agreement is signed between Karhes and the crediting banks	Loan agreement
12/01/11	DOE Contracted for Validation	Contract
02/08/11	The project site is visited with the DOE	DOE Testimonial
10/01/14	Project Start Date	The Provisional acceptance protocol
11/19/20	Meter Changes	Calibration Documents

3.2 Deviations

3.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002 (v16.0.0) and its related tools are applied as they are and without any deviation.

3.2.2 Project Description Deviations

In the registered VCS PD the PP is “Karhes Elektrik Üretim A.Ş”. However Karhes was a company set up for the purpose of license obtaining than the ownership passed to Bereket Enerji. Then, 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.

Other than that the project activity is in compliance with the scenario described at the Project Design Document, and validated by the validation report dated 07-10-2015.

3.3 Grouped Projects

The project is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Following are the data that was available at the time of validation:

Data / Parameter	$FC_{i,y}$
Data unit	Volume Unit (cubic meter)
Description	Amount of fuel *i* consumed by relevant power plants in Turkey in years, 2011, 2012, 2013.
Source of data	Official publications at the Turkish Electricity Transmission Company (TEIAŞ) Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2013/yakıt48-53/49.xls)
Value applied	Please see Annex 2-Table-1 in the validated PDD (version 2.01)
Justification of choice of data or description of measurement methods and procedures applied	Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation
Purpose of Data	Data used for the calculation of EFgrid,OM,Simple,y
Comments	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.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/Mass or Volume Unit
Description:	Net Calorific Values for fossil fuel type *i* in year, for the years 2010, 2011 and 2012
Source of data:	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2013/yakıt48-

	53/49.xls http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2013/yakıt48-53/51.xls)
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the *ex ante* and for the second and third crediting period, only once *ex ante* at the start of the second crediting period
Value applied:	Please see Annex-2-Table-5 in the validated PDD(version 2.01)
QA/QC Procedures	-
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.
Comment:	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 Unit / Parameter	$EF_{CO2,i,y}$
Data unit	tCO_2/GJ
Description	CO_2 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 Annex 2-Table 2 in the validated PDD (version 2.01)
Justification of choice of data or description	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

of measurement methods and procedures applied	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	NA

Data Unit / Parameter	EG_y
Data unit	MWh
Description	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 http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls
Value applied	Please see Annex 2, Table 3 and Table 4 in the validated PDD(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	NA

Data Unit / Parameter	EGm,y
Data unit	MWh
Description	Net quantity of electricity generated and delivered to the grid by power unit m in year y

Source of data	Turkish Electricity Transmission Company Web Site (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 2011[5] and 2012[6].
Value applied	Please see Annex 2-Table 8 in the validated PDD (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 EFgrid,BM,y
Comments	NA

Data Unit / 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 sector (version 4.0.0)" are used
Value applied	Please see Annex 2 in the validated PDD
Justification of choice of data or description of measurement methods and procedures applied	According to the "tool to calculate emission factor for an electricity system if documented manufacturer's specifications or data from the utility, the dispatch centre or official records are not available then the default values given in annex 1 of the tool 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	NA

[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	Electricity
Source of data	Net Amount of Electricity supplied to the "Turkish National Grid" by the proposed project
Description of measurement methods and procedures to be applied	Data are measured directly from meters and records on TEIAS readings protocol papers.
Frequency of monitoring/recording	Annually
Value monitored	836,717.90
Monitoring equipment	Data will be monitored continuously by redundant metering devices, which will provide the data for the monthly invoicing to TEİAŞ. All meters will be in compliance with the communiqué for Metering Devices to be used in the Electricity Market[7].
QA/QC procedures to be applied	There will be meters that will backup each other. Generated electricity will also be monitored by the operator via the SCADA software for internal monitoring and QA/QC purposes.
Purpose of the data	Data to be used for the calculation of Baseline Emissions.
Calculation method	Direct Continuous Measurement
Comments	The collected data will be kept by Karhes Elektrik Üretim A.Ş. During the crediting period and until two years after the last issuance of VERs for the "Dereli Hydro Electricity Power Plant" project activity for that crediting

[7] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

	period.

Data / Parameter:	CapPJ
Data unit:	W
Description:	Installed capacity of the hydropower plants after the implementation of the Project Activity.
Measured /Calculated /Default:	Measured
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 applied:	49,200,000
Monitoring equipment:	SCADA system of the Project Activity
QA/QC procedures to be applied:	Can be confirmed also by the parameter readings on the design plates of each turbine and by summing the two units.
Calculation method:	N/A
Any comment:	-

Data / Parameter:	A_{PJ}

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 Annex-4 in the validated PDD(version 2.01)
Source of data:	Surface area determined using the lake surface area map provided in Annex-4 of the PDD (version 2.01)
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, presented in Annex-4 in the validated PDD (version 2.01)
Frequency of monitoring/recording:	Once during each monitoring period
Value applied:	3,894 m^2
Monitoring equipment:	-
QA/QC procedures to be applied:	Can be checked and compared to satellite imagery available by Google Earth.
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 will be 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 visited during the verification site visit and be compared to the reservoir area map, presented in Annex-4.

The electricity produced will be sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by meters. Those TEIAŞ 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 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 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 will be calculated by multiplying the net electricity with the Combined Margin calculated above.

The monitoring will be 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 2):

Table 2: 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 PMUM 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 will be performed by using the main metering devices and the auxiliary metering devices for accuracy checks only. Data from metering devices will be recorded by TEİAŞ and will 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 Dereli HPP can be cross checked, via the TEİAŞ – PMUM web site (http://pmum.teias.gov.tr) 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/PMUM) web page will exhibit the net electricity generated less transmission loss, to be able to produce comparable numbers , the figures taken from PMUM web site needs to be multiplied by the transmission loss factor of the grid. This data will be the main QA/QC data for the project activity. Details of the meters are given in the table below(Table 3):

Table 3:Information about the meters

Meter Serial Number	Manufacturer	Calibration Year[8]	Valid Until	Accuracy Class
Main Meter:53077779	ACTARIS	2010	2020	0.5S (+-%1)
Control Meter:53077780	ACTARIS	2010	2020	0.5S (+-%1)
Main Meter:9798713	EMH	2020	2030	0.5S (+-%1)
Control Meter:9798714	EMH	2020	2030	0.5S (+-%1)

[8] Within the scope of this Regulation in Turkey (https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5), the stamp year is taken as basis and the year it is stamped is counted as the first year, regardless of the date in the year and the remaining period is calculated from the year following the year it was stamped.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions (BEy) are calculated based on the following formula:

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

Bey = Baseline emissions in year y (tCO2-yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh-yr)

$EF_{grid,CM,y}$ = Combined margin CO2 emissions factor in year y (tCO2-MWh)And

And

$EG_{PJ,y} = EG_{Facility,y}$

$EG_{Facility,y}$ = Quantity of net electricity generation supplied by the project plant to the grid in year y (MWh-y)

The Combined margin CO_2 emissions factor in year y (tCO_2 -MWh), $EF_{grid,CM,y}$, is fixed ex-ante for the duration of the crediting period, and is 0.5332 tCO_{2e} -MWh.

The following table shows the original data as reported in the monthly meter reading records, which are the result from remote meter readings sent by TEIAS staff being e-mailed to Uşak WPP Operation management, at the end of each month. The meter reading records serve as basis for all sub-sequent processes, especially settlement and billing for electricity supplied to the grid. The collected data is kept by Aydem Yenilenebilir Enerji Üretim A. Ş. during the crediting period and until two years after the last issuance of VCUs for the Uşak WPP project activity for the crediting period under consideration. The following table is the Baseline emissions of the project calculated for the monitoring period.

(10 January 2014 to 30 September 2020 –both days inclusive).

Table 4: Baseline emissions of the project calculated for the monitoring period (National Grid Emission Factor EF_{CM} is 0.5332 tCO2e-MWh).

		A-Gross Electricity Production	**B-Self Electricity Consumption**	**C-Net electricity production C=A-B**	**Baseline Emissions = $EG_{PP-net,y}$ * EF_{CM}**
	Symbol	$EG_{PP-gross, y}$	$EG_{PP-self\ consumption, y}$	$EG_{PP-net, y}$	BE1
YEAR	**Units**	MWh	MWh	MWh	tCO_2e
2014	January	1,185.78	41.80	1,143.98	609.97
	February	2,040.56	37.02	2,003.54	1,068.29
	March	10,092.71	8.08	10,084.63	5,377.12
	April	18,415.44	0.20	18,415.24	9,819.01
	May	20,005.74	0.11	20,005.63	10,667.00
	June	10,577.57	4.52	10,573.05	5,637.55
	July	2,090.15	30.15	2,060.00	1,098.39
	August	1,168.77	33.49	1,135.28	605.33
	September	4,625.32	22.49	4,602.83	2,454.23
	October	8,065.71	13.52	8,052.19	4,293.43
	November	10,858.03	0.97	10,857.06	5,788.98
	December	14,074.49	2.88	14,071.61	7,502.98
Total in 2014		103,200.27	195.23	103,005.04	54,922
2015	January	6,253.46	2.30	6,251.16	3,333.12
	February	5,851.68	3.34	5,848.34	3,118.33
	March	15,735.94	0.12	15,735.82	8,390.34
	April	26,152.18	0.49	26,151.69	13,944.08
	May	33,418.81	0.00	33,418.81	17,818.91
	June	22,358.37	0.00	22,358.37	11,921.48
	July	10,213.02	5.53	10,207.49	5,442.63
	August	2,421.55	22.48	2,399.07	1,279.18
	September	1,475.72	30.46	1,445.26	770.61
	October	1,163.73	32.63	1,131.10	603.10
	November	6,445.12	15.99	6,429.13	3,428.01
	December	3,746.19	17.38	3,728.81	1,988.20
Total in 2015		135,235.77	130.72	135,105.05	72,038
2016	January	6,411.31	14.41	6,396.90	3,410.83
	February	16,535.71	2.32	16,533.39	8,815.60
	March	19,408.83	0.06	19,408.77	10,348.76
	April	30,062.12	1.03	30,061.09	16,028.57
	May	21,506.78	2.43	21,504.35	11,466.12
	June	16,356.91	2.57	16,354.34	8,720.13
	July	11,797.14	2.35	11,794.79	6,288.98
	August	1,236.57	31.65	1,204.92	642.46

	September	759.59	34.12	725.47	386.82
	October	2,277.70	28.52	2,249.18	1,199.26
	November	2,144.87	30.05	2,114.82	1,127.62
	December	1,946.07	34.58	1,911.49	1,019.21
Total in 2016		130,443.60	184.09	130,259.51	69,454
2017	January	2,000.92	34.38	1,966.54	1,048.56
	February	2,785.87	26.32	2,759.55	1,471.39
	March	14,352.55	0.24	14,352.31	7,652.65
	April	27,494.92	0.00	27,494.92	14,660.29
	May	34,213.32	0.00	34,213.32	18,242.54
	June	20,705.42	0.05	20,705.37	11,040.10
	July	3,654.56	20.08	3,634.48	1,937.90
	August	1,178.26	31.66	1,146.60	611.37
	September	780.05	31.78	748.27	398.98
	October	2,889.01	26.78	2,862.23	1,526.14
	November	4,120.06	20.55	4,099.51	2,185.86
	December	7,373.74	16.46	7,357.28	3,922.90
Total in 2017		121,548.68	208.30	121,340.38	64,698
2018	January	4,638.77	20.51	4,618.26	2,462.46
	February	8,095.67	5.70	8,089.97	4,313.57
	March	23,387.08	0.94	23,386.14	12,469.49
	April	20,059.96	0.00	20,059.96	10,695.97
	May	29,158.33	0.10	29,158.23	15,547.17
	June	17,115.19	0.03	17,115.16	9,125.80
	July	4,159.36	17.08	4,142.28	2,208.66
	August	1,571.61	31.24	1,540.37	821.33
	September	1,283.28	31.17	1,252.11	667.63
	October	4,463.43	26.30	4,437.13	2,365.88
	November	6,767.94	13.66	6,754.28	3,601.38
	December	11,049.63	8.47	11,041.16	5,887.15
Total in 2018		131,750.25	155.20	131,595.05	70,166
2019	January	6,986.87	12.68	6,974.19	3,718.64
	February	5,851.13	11.62	5,839.51	3,113.63
	March	11,649.97	3.70	11,646.27	6,209.79
	April	26,865.59	0.27	26,865.32	14,324.59
	May	35,023.65	0.03	35,023.62	18,674.59
	June	17,815.45	0.26	17,815.19	9,499.06
	July	4,242.31	21.58	4,220.73	2,250.49
	August	1,988.83	27.82	1,961.01	1,045.61
	September	607.85	31.50	576.35	307.31
	October	2,056.88	30.47	2,026.41	1,080.48
	November	3,013.93	23.44	2,990.49	1,594.53
	December	2,813.05	33.78	2,779.27	1,481.91
Total in 2019		118,915.51	197.15	118,718.36	63,300

2020	January	2,517.26	39.35	2,477.91	1,321.22
	February	5,788.38	16.76	5,771.62	3,077.43
	March	18,377.01	0.56	18,376.45	9,798.32
	April	20,940.80	0.00	20,940.80	11,165.63
	May	33,049.08	0.00	33,049.08	17,621.77
	June	12,159.62	2.81	12,156.81	6,482.01
	July	3,189.80	23.02	3,166.78	1,688.53
	August	788.47	33.41	755.06	402.60
	September	430.52	33.33	397.19	211.78
Total in 2020		96,810.42	115.91	96,694.51	51,769
Grand Total		837,904.50	1,186.60	836,717.90	446,347

5.2 Project Emissions

As methodology states the PEy in case of a hydro power project will be calculated:

"Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

For hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:"

_"...the power density of the project activity (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:"

As shown by the following calculation, The project has a power density of 12,634 W/m^2, this is greater than 10 W/m^2,

Project Activity	Installed Capacity	/	Reservoir Area[9]	=	Power Density
Dereli HEPP	49,200,000 W	/	3,894 m^2	=	12,634 W/m^2

therefore

$$PE_{HP,y} = 0$$

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_{2e}/yr)

5.3 Leakage

There are no leakage emissions related to project activity. There may be one diesel generator installed within the project boundary. This is only going to be utilized as a back-up or

[9] The reservoir Area map that indicates the aerial extent of the reservoir at maximum operation level is provided in Annex-4.

emergency generator, therefore, the emissions from this back up generator have been deemed negligible as per the ACM0002 (version 16.0.0) methodology.

5.4 Net GHG Emission Reductions and Removals

The following table (Table 5) gives a summary of the project activity related emission reductions with respect to vintage years:

Table 5 : Project activity related emission reductions with respect to vintage years.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2014 (10/01/2014 to 31/12/2014)	54,922	0	0	54,922
2015 (01/01/2015 to 31/12/2015)	72,038	0	0	72,038
2016 (01/01/2016 to 31/12/2016)	69,454	0	0	69,454
2017 (01/01/2017 to 31/12/2017)	64,698	0	0	64,698
2018 (01/01/2018 to 31/12/2018)	70,166	0	0	70,166
2019 (01/01/2019 to 31/12/2019)	63,300	0	0	63,300
2020 (01/01/2020 to 30/09/2020)	51,769	0	0	51,769
Total	446,347	0	0	446,347