DERELI HYDROELECTRIC POWER PLANT

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

Project title	Dereli Hydroelectric Power Plant
Project ID	1758
Monitoring period	01-January-2022 to 09-January-2024
Original date of issue	26-july-2023
Most recent date of issue	03-September-2024
Version	07
***VCS Standard* Version**	4.7
Prepared by	GTE Karbon Sürdürülebilir Enerji Eğt. Dan. ve Tic. A.Ş.

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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

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

The Project Activity (PA) utilizes the Aksu River to generate electricity with zero carbon emissions for the Turkish Power Grid. The project start date is 10/01/2014, which is the date of provisional acceptance protocol. The project was designed as a runoff river reservoir type power plant as per EPDK license states (EÜ/391-1/500). The PA is displacing electricity that would otherwise be generated by the existing grid of the host country. The installed capacity of the project is 49.2 MWe with two turbines each having installed capacity of 24.6 MWe as was indicated in the generation license dated as 06/12/2004. The estimated annual electricity production and the annual emission reduction values are 157,500 MWh and 83,983 tonnes CO_2e, respectively. Project has started on 10/01/2014, which is the date of provisional acceptance. Net electricity production by the PA for this monitoring period (01/01/2022 – 09/01/2024) is calculated as 249,321.49 MWh. Therefore, the emission reduction of the Project Activity is calculated as 132,934 tonnes CO_2e for this monitoring period.

According to the methodology[1], 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, which is clearly defined in accordance with the applied methodology[2], includes the project power plant and all power plants connected physically to the electricity system that the project is connected to.

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

[1] https://cdm.unfccc.int/UserManagement/FileStorage/0X6IERWMG92J7V3B8OTKFSL1QZH5PA

[2] https://cdm.unfccc.int/UserManagement/FileStorage/0X6IERWMG92J7V3B8OTKFSL1QZH5PA

Table 1. Milestones of DERELİ HYDROELECTRIC POWER PLANT

Milestone	Date
The Electricity Production License is granted for the project activity	06/12/2004
Provisional Acceptance (Project Start Date)	10/01/2014
Water usage agreement signed with DSI[3]	05/11/2004
EIA Exemptions certification issued	27/04/2006
Amendment to the Water Usage Agreement Signed	04/11/2013
Grid Connection	07/12/2010
TEIAS agreement	03/09/2013
TEIAS agreement after amendment	24/06/2019
First Crediting Period	10/01/2014 – 09/01/2024
Third Monitoring Period (current)	01/01/2022 – 09/01/2024

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 8113 m. From there the water arrives to the valve chamber and is fed to a penstock of 630 m where it is pressurized and arrives to the power plant that is built at a level of 495 m. The potential energy of water at approximate gross head level of 263 m is utilized and the electricity is produced by the power plant. The project start period is 10/01/2014 and the project has been operational since that day including the monitoring period of 01-January-2022 to 09-January-2024. How the project activity operates is as shown below in Figure 1.

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

Project boundary is shown in the figure below.

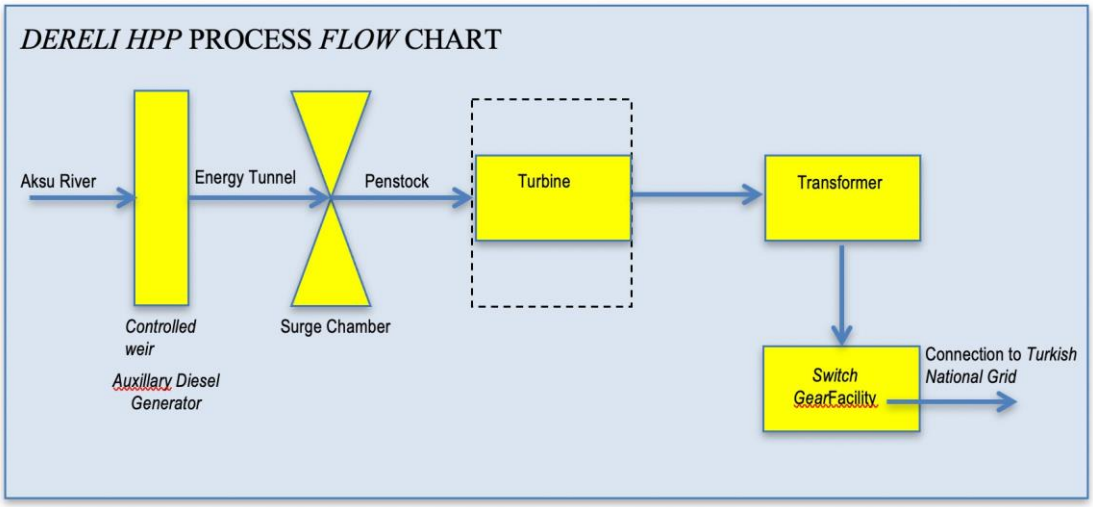


Figure 1. Project boundary

1.2 Audit History

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification	10-January-2014 – 09-January-2024 (crediting period)	VCS	RINA S.p.A (RINA)	10
Verification	10-January-2014 – 30-September-2020 (1st monitoring period)	VCS	Carbon Check	~7
Verification	01-October-2020 – 31-December-2021 (2nd monitoring period)	VCS	Carbon Check	~2 (20 months)
Verification	01-January-2022 – 09-January-2024	VCS	Re-carbon	~2

	(3rd monitoring period)			
Total	-	-	-	~11

1.3 Sectoral Scope and Project Type

Sectoral scope[4]	1
Project activity type	Energy Industries (Renewable/Non-Renewable Sources)

1.4 Project Proponent

Organization name	Aydem Yenilenebilir Enerji A.Ş.3
Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
Address	Gazi Mustafa Kemal Bulvarı 15 Mayıs Mah. 832 Sok. No:2 75.Yıl Esnaf Sarayı K:2 Denizli-Türkiye
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 – TÜRKİYE

[4] *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*

Telephone	+90 312 514 63 63
Email	kemal.demirkol@gte.com.tr

1.6 Project Start Date

Project start date	10-January-2014
Justification	The date of provisional acceptance protocol

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)
Start and end date of first or fixed crediting period	10-January-2014 to 09-January-2024

1.8 Project Location

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

The nearest settlement to the Project Activity is Dereli Town which is 9 km away.

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

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

Figure 2. Project Location

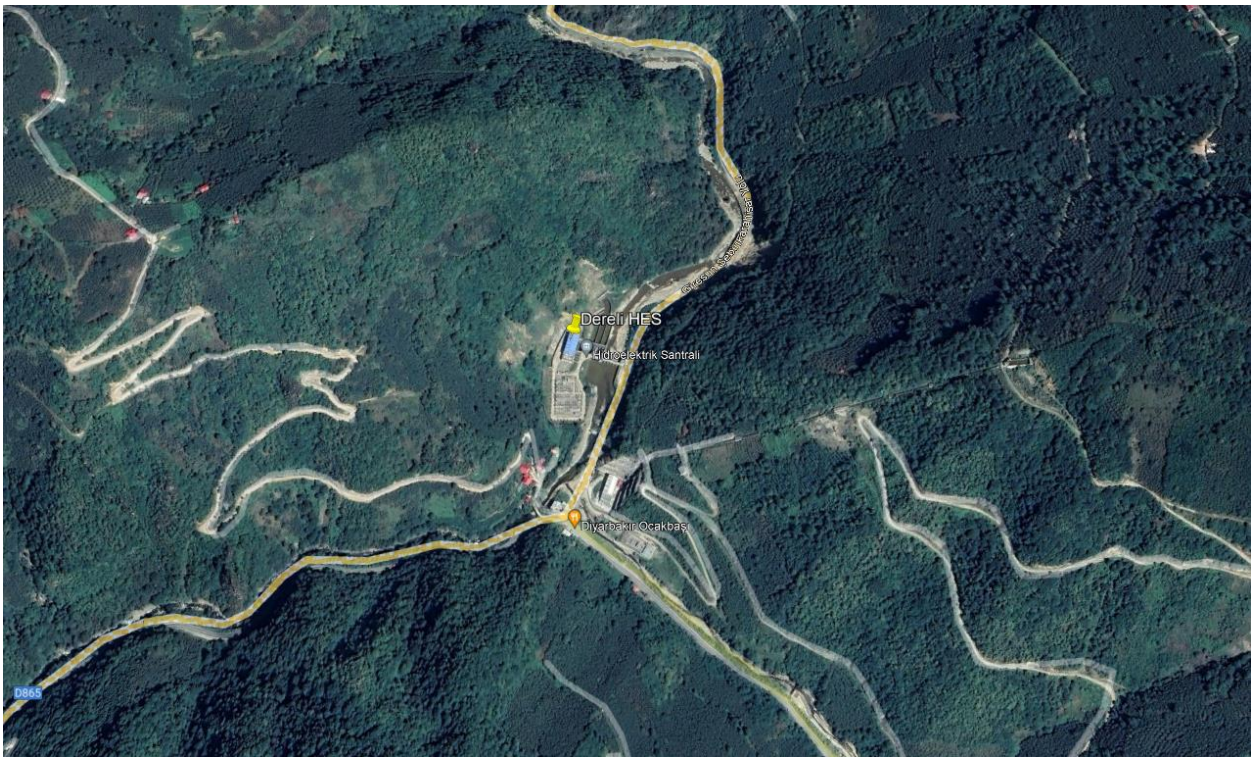


Figure 3. The screenhost of the satellite image of project location

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0002	Large-scale Consolidated Methodology; Grid-connected electricity generation from renewable sources	16.0
Tool	TOOL01	Tool for the demonstration and assessment of additionality	07.0
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	04.0

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 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, 249,321.49 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 for 19 people. All personnel working at the power plant are receiving regular trainings about occupational health and safety.
- 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 132,934 tCO_2 into the atmosphere in this monitoring period.

Table 3. Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	13.3	Tones of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 132,034 tCO_2 into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 692,866.00 tCO_2 into the atmosphere over project lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	During the monitoring period 19 employees were recruited.	The project company recruited 19 employees over the project lifetime.
3)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project generated 249,321.49 MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 1,299,375 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. The project site is not a private land.
Stakeholder diversity and changes over time	No changes over time about the stakeholder diversity.
Expected changes in well-being	The project does not have any negative impacts.
Location of stakeholders	Near places to the plant, Alancik and Kurtulmuş Village
Location of resources	Kuşluhan Sub district which is a close settlement at the project site

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing 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.**

Date(s) of stakeholder consultation	09-April-2006 at 14:00
Communication of monitored results	There were no negative comments received.
Consultation records	There was a "grievance logbook" in coffeehouses and mukhtar's office within the vicinity of the project (Alancik and Kurtulmuş Village) for a continuous grievance policy that is implemented by the project owner. Every month the PP consults with local stakeholders at the book locations and discuss their grievances as well as positive comments.
Stakeholder input	There were no negative comments received. During the monitoring period there were no complaints about or demands from the project.

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. The grievance, negative or positive, can be provided by local stakeholders related to operation of the project activity. PP will resolve all the grievances during whole crediting period. Project manager is accessible by locals all the time. There is no problem encountered about the project/way of communication so far. There is a grievance box.

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 employers.
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 19 people based on the social security records on January 2024.
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. 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. On the contrary it is a government land that classified as forestry area. The property is leased to the project owner by the government until the end of the generation license.

Disputes over rights to territories and resources	N/A
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

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.

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

Dereli HEPP is built on Aksu River. The tyrolean type weir is located approximately at 778.75 m elevation. Dereli HEPP utilizes approximately (gross) 263 m of potential energy difference to produce electricity. The installed capacity of the project is 49.2 MWe with two turbines each having installed capacity of 24.6 MWe as was indicated in the generation license dated as 06/12/2004.

The Project Activity (PA) utilizes the Aksu River to generate electricity with zero carbon emissions for the Turkish Power Grid with transmission line of 5.53 km. The project was designed as a runoff river reservoir type power plant as per EPDK license states (EÜ/391-1/500).

Properties of the Weir	
Elevation of the river bed	778.6 m
Elevation of the foundation	778.6 m
Type	Controlled Weir
Maximum and Minimum Water Level	781.62 m and 781 m

Transmission Line	
Length	5.53 km
Section	1 x 795 MCM

Properties of the Energy Tunnel	
Shape	Circular, concrete covered, pressurized
Length and Slope	8,109.5 m and 0.0007

Turbines	
Type	Vertical Axis Francis

Unit numbers	2
Unit powers	24.6 MWe each

Generators	
Model	SF24.6-10/3250
Serial Numbers	08 Orient 071 – 08 Orient 072
Rated Power	24600 kW
Supplier	Zhejiang Orient Engineering Co., Ltd

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

Table 4. Old meter details

	Main Meter	Spare Meter
Serial no.	53077779	53077780
Brand-Type	Actaris - SL761B071	Actaris - SL761B071
Calibration frequency	10 years	10 years
Meter Removal Date	19/11/2020	19/11/2020
Class	0.2S	0.2S

Table 5. Current meter details

	Main Meter	Spare Meter
Serial no.	9798713	9798714
Brand-Type	EMH LZQJ-XC	EMH LZQJ-XC
First Index Date	19/11/2020	19/11/2020
Next Calibration date	19/11/2030[5]	19/11/2030[6]
Calibration frequency	10 years	10 years
Test Date	22/06/2020	22/06/2020
Test frequency	2 years	2 years

[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

	Main Meter	Spare Meter
Class	0.2S	0.2S

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 as stated in Türkiye Trade Registry Gazette on 24/12/2019.[7]

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

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

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.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

[7] Türkiye Trade Registry Gazette, No:9982, page 219

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data – Parameter	$FC_{i,y}$
Data unit	Volume Unit (cubic meter)
Description	Amount of fuel i consumed by relevant power plants in Türkiye in years, 2009, 2010, 2011
Source of data	Turkish Electricity Transmission Company (TEIAŞ) Web Site [8]
Value applied	Please see Appendix 3-Figure 5 (Table 1 in the validated PD version 2.01)
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

Data - Parameter	$NCV_{i,y}$
Data unit	GJ-Mass or Volume Unit
Description	Net Calorific Values for fossil fuels in years 2009, 2010 and 2011
Source of data	Turkish Electricity Transmission Company Web Site[9]
Value applied	Please see Appendix 3-Figure 6 (Table 5 in the validated PD version 2.01).
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	Data 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.

[8] https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri

[9] https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri

Data – 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 Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied	Please see Appendix 3-Figure 7 (Table 2 in the validated PD version 2.01)
Justification of choice of data or description of measurement methods and procedures applied	According to the "Tool to calculate the emission factor for an electricity system" version 4[10], 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. There is a main and a back-up source for the electricity generation.
Source of data	Turkish Electricity Transmission Company Web Site
Value applied	Please see Appendix 3-Figure 8 and Figure 9 (Table 3 and Table 4 in the validated PD version 2.01).
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

Data – Parameter	$EG_{m,y}$

[10] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

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[11]. Data is extracted from the relevant annexes of the capacity projection reports for the years 2010, 2011, and 2012[12].
Value applied	Please see Appendix-2-Table 8 in the validated PD version 2.01
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

Data - Parameter	$\eta_{m,y}$
Data unit	-
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	The default values provided at the Annex 1 of the "Tool to calculate emission factor for an electricity system (Version 4.0, 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 measurement methods and procedures applied	According to the "Tool to calculate emission factor for an electricity system", version 4 specifications or data from the utility, the dispatch center or official records are not available then the default values given in Annex 1 of the shall be used. The first two options are not available for the power plants supplying the Turkish grid; therefore, the default values are used.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

[11] https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri

[12] https://www.elektrikport.com/uploads/content/TEIAS%20Uretim%20Kapasite%20Projeksiyonu%202011-2020.pdf

4.2 Data and Parameters Monitored

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	EPIAS data as main source (TEIAS meter readings as back-up data)
Description of measurement methods and procedures to be applied	Data is measured directly from meters (main and backup) and records on TEİAŞ readings protocol papers. 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.
Frequency of monitoring-recording	Annually
Value monitored	249,321.49 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. 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.

Details	**Old Main Meter (removed on 19/11/2020)**	**Old Spare Meter (removed on 19/11/2020)**
Brand	Actaris	Actaris
Serial Number	53077779	53077780
Class	0,2S	0,2S
Test Date	12/07/2013	12/07/2013
Calibration Date	12/07/2013	12/07/2013
Calibration frequency	10 years	10 years

Details	Current Main Meter (placed on 19/11/2020)	Current Spare Meter (placed on 19/11/2020)		
Brand	EMH	EMH		
Serial Number	9798713	9798714		
Class	0,2S	0,2S		
Test Date	22/06/2020	22/06/2020		
Test frequency	2 years	2 years	2 years	2 y
Calibration Date	19/11/2020	19/11/2020		
Calibration frequency	10 years	10 years		

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

QA-QC procedures to be applied	There are two meters that backup each other. Generated electricity is also monitored via the operator by the help of EPİAŞ trading software for internal monitoring.
Purpose of the data	Data to be used for the calculation of Baseline Emissions.
Calculation method	Direct Continuous Measurement
Comments	The collected data is kept by Aydem Yenilenebilir Enerji AS. During the crediting period and until two years after the last issuance of VERs for the "DERELİ Hydroelectricity Power Plant" project activity for that crediting period.

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

QA-QC procedures to be applied	Turbine labels checked with SCADA System reading.
Purpose of the data	To monitor capacity of the project
Calculation method	N-A
Comments	

Data / Parameter:	A_{PJ}
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:	3,865 m^2
Monitoring equipment:	-
QA/QC procedures to be applied:	The value checked and compared to satellite imagery available by Google Earth.
Purpose of the data:	Data to be used for the calculation of Baseline Emissions.
Calculation method:	N/A
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 is measured automatically.

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

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

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

The monitoring is conducted by the Verified Emission Reduction (VER) Monitoring Team. The VER Team Members, and their position and duties for the monitoring is outlined in the following table.

Table 6. Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Dereli HPP Manager	**Day to day operation of the Dereli HPP,** **Compliance of the project activity with the host country rules and regulations** **Coordination of the data collection and recording for the VCS monitoring report.**

Chief Electrical Engineer	Day to day follow up of electrical equipment Recording and monitoring of the electricity generation data
Accounts Manager	Data keeping for power sales Data entry to EPİAŞ system
Chief Mechanical Engineer	Day to day operation of the power plant Keeping records of malfunctions and repairs
Carbon Consultant	Emission reduction calculations Scripting of the periodic monitoring report Follow up of the verification process

The power generation meter readings are performed by using the main metering devices and the auxiliary metering devices for accuracy checks only. Data from metering devices is recorded by TEİAŞ and forms the basis for the electricity production data. In addition to the readings of the main and auxiliary (back-up) metering devices, generation data of the Dereli HPP can be cross checked, via the TEİAŞ – EPİAŞ web site[13] which is accessible by a password available to the electricity generation companies (in the case of project activity the project owner has this capacity). The electricity generation data at the Market Financial Reconciliation Centre (MFRC/EPİAŞ) web page exhibits the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from EPİAŞ web site needs to be multiplied by the transmission loss factor of the grid. This data is the main QA/QC data for the project activity.

TEİAŞ is the responsible body for the meters and ensures the quality and accuracy of the measurements. Calibration of the meters are handled by TEİAŞ; hence no internal audit is performed by the power plant employees. Calibrations are done according to the national regulations by the distribution company. Calibrations are done according to the Measuring Instruments Directive[14]. Calibration of the meters are valid for 10 years based on Regulation on Metering and Metering Devices[15].The generation is zero for the period where the meters are being replaced. Meter replacements are done on the same day. Meters are tested every two years, according to the System Use Agreement between the PP and the distribution company TEİAŞ. Testing is done by TEİAŞ.

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.

[13] https://seffaflik.epias.com.tr/transparency/

[14] 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

[15] 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

Meter	Serial Number	Brand	Calibration Year	Valid Until	Accuracy Class
Main Meter (old)	53077779	ACTARIS	12/07/2013	2020	0.2S (+-%1)
Control Meter (old)	53077780	ACTARIS	12/07/2013	2020	0.2S (+-%1)
Main Meter (current)	9798713	EMH	2020	2030	0.2S
Control Meter (current)	9798902	EMH	2020	2030	0.2S

The single line diagram of the project activity has been given in figure below.

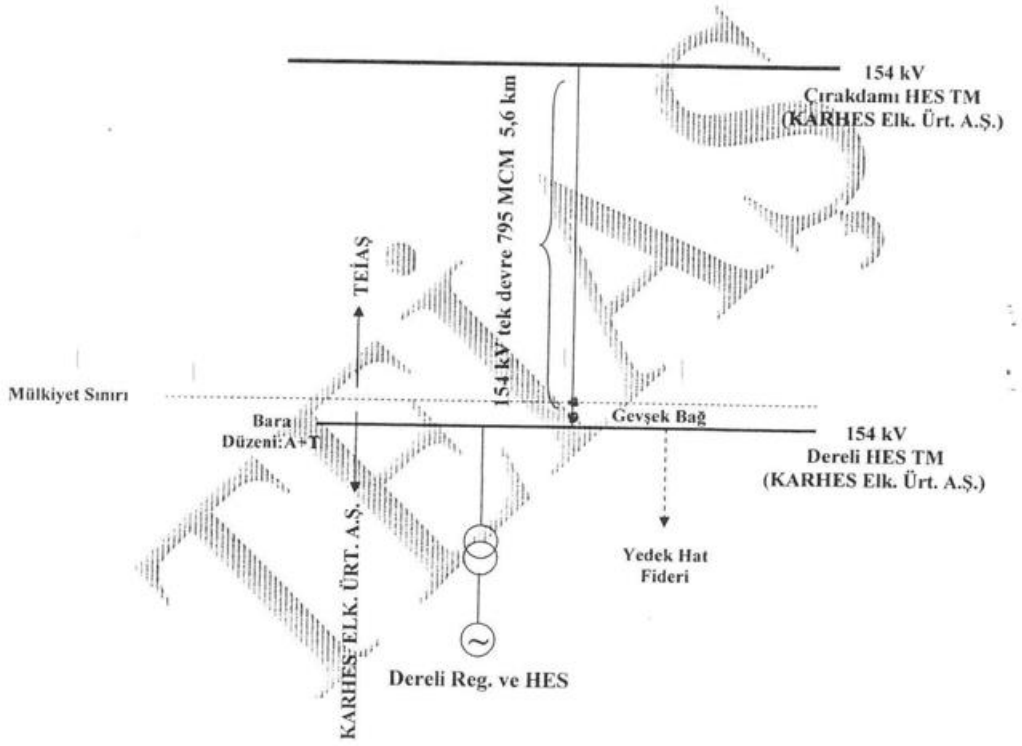


Figure 4. The single line diagram of the project activity

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

$$249{,}321.49\ MWh \times 0.5332\ tCO_2/MWh = 132{,}934\ tCO_2$$

$$BE_y = 132{,}934\ tCO_2$$

5.2 Project Emissions

As per ACM0002 "Grid-connected electricity generation from renewable sources", v16.0,

"For most renewable power generation project activities, PEy = 0. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y = Project emissions in year y (t CO_2e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (t CO_2/yr)

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO_2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (t CO_2e/yr)

- Since this project uses hydroelectric power, $PE_{GP,y}$ is "0" (t CO_2/yr)
- The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. In urgent cases, a diesel powered generator will be operated for the daily consumption of personnel and the building, which is negligible. Project emissions are taken as zero. The same is also stated in para 33 of "ACM0002: Grid-connected electricity generation from renewable sources" ver 16. Hence it is neglected. Therefore; $PE_{FF,y}$ = 0 (t CO_2/yr).

Beside of the diesel generator, other potential project emission for this proposed project is $PE_{HP,y}$.

However, if the power density of the project activity is greater than 10 W/m^2 than $PE_{HP,y}$ = 0.

Therefore, as per ACM0002: Grid-connected electricity generation from renewable sources, v16.0:

The power density of the project activity (PD) is calculated as follows (Equation 1 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} = 49,200,000 We

Cap_{BL} = 0.0 W

A_{PJ} = 3865 (m^2)[16]

A_{BL} = 0.0 (m^2)

Therefore, PD is calculated as;

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

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

[16] Reservoir area, Annex 6 of registered PD

Since the power density of the project activity is greater than 10 W/m², $PE_{HP,y}$ = 0. Therefore;

$$PE_y = 0$$

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;

$$ER_y = BE_y - PE_y - LE_y$$

Where;

ER_y = Emission reductions in year y (tCO_2)

BE_y = Baseline emissions in year y (tCO_2)

PE_y = Project Emissions in year y (tCO_2)

LE_y = Leakage emissions in year y (tCO_2)

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

Table 7. Calculations for net total values

EG_y	Net Generation (MWh) During Monitoring Period	249,321.49
EF_y	Emission Factor (tCO_2-MWh)	0.53323[17]
BE_y	Baseline emissions in year y (tCO_2) During Monitoring Period	132,934
PE_y	Project Emissions (tCO_2)	0

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

LE_y	Leakage Emissions (tCO_2)	0
ER_y	Net Emission Reduction (tCO_2) During Monitoring Period	132,934

Thus, the net emission reduction (in tonnes CO_2) in this monitoring period (01-January-2022 to 09-January-2024) is calculated as given in table below.

Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Reduction VCUs (tCO_2e)	Removal VCUs (tCO_2e)	Total VCUs (tCO_2e)
01-January-2022 to 31-December-2022	59,342	0	0	59,342.00	0	59,342.00
01-January-2023 to 31-December-2023	73,347.00	0	0	73,347.00	0	73,347.00
01-January-2024 to 09-January-2024	245	0	0	245	0	245
Total	**132,934**	**0**	**0**	**132,934**	**0**	**132,934**

Total emission reductions were realized as 132,934 tCO_2 for this monitoring period. When the estimated electricity generation figure of the power plant for each year in the validated VCS PD (157,500 MWh-year) is considered, the total emission reductions should be approximately 142,043.71 tCO_2 for the monitoring period (24 months). Percent difference is calculated as 6.4%, which means the project reduced 6.4% less CO_2 than the estimated amount. Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable. On the other hand, the electricity generation is dependent on water flow estimation, which is a natural phenomenon and cannot be estimated with 100% accuracy.

Vintage period	Ex-ante estimated reductions/	Achieved reductions/ removals (tCO_2e)	Percent difference	Explanation for the difference

	removals (tCO_2e)			
01-January-2022 to 31-December-2022	83,983.73	59,342.00	29.3%	Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable.
01-January-2023 to 31-December-2023	55,989.15	73,347.00	31%	Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable.
01-January-2024 to 09-January-2024	2,070.83	245	88.2%	Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable.
Total	**142,043.71**	**132,934**	6.4%	Since the project is a HEPP, seasonal effects are significant on the monthly generation rates and deviations from the calculated values are acceptable.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

There is no commercially sensitive information about the project.

Section	Information	Justification

APPENDIX 2: PROJECT'S SINGLE LINE DIAGRAM

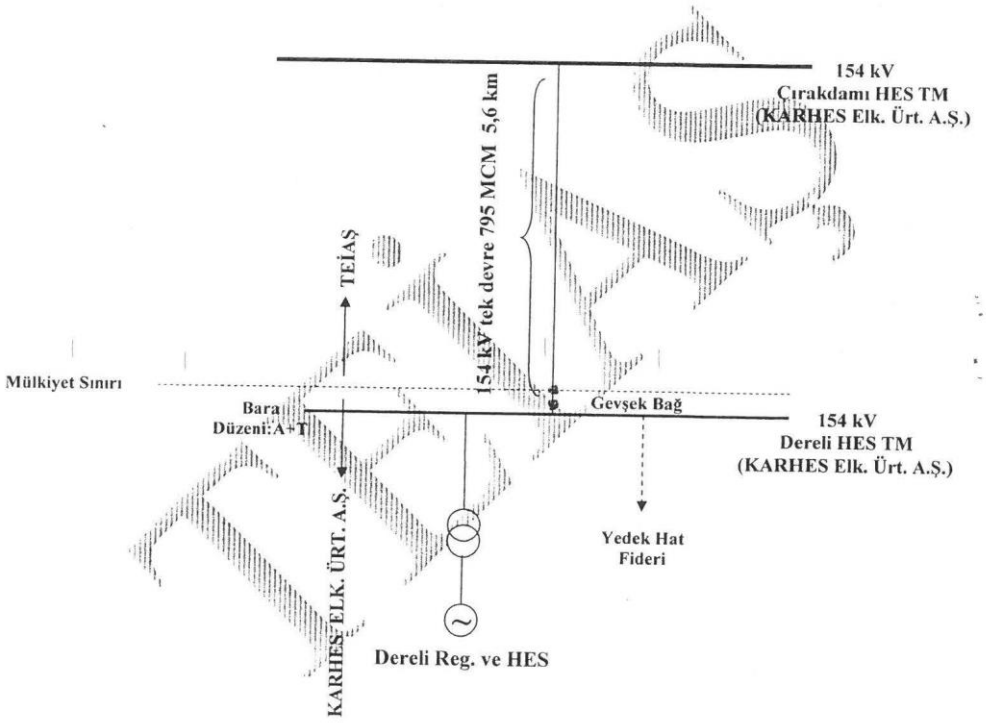
BAĞLANTI ANLAŞMASI

EK-3

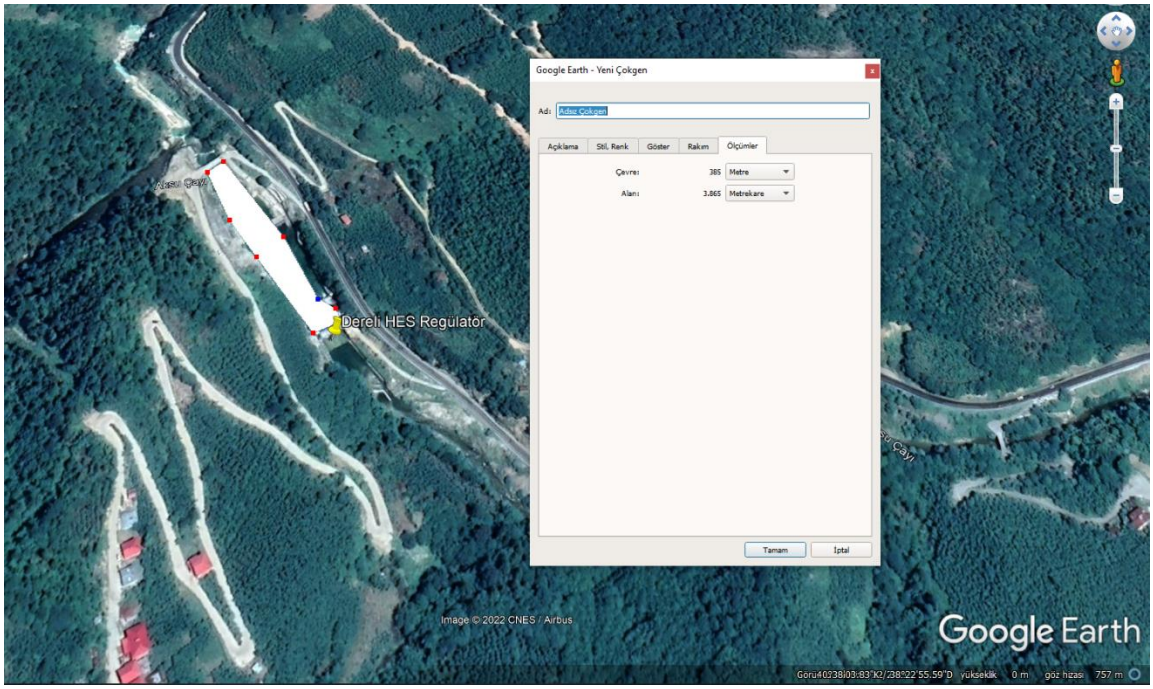
MÜLKİYET SINIRLARI

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

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



APPENDIX 3: PROJECT'S RESERVOIR AREA



APPENDIX 4: RELATED DATA

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKIT MİKTARLARININ ÜRETİCİ KURULUŞLARA DAĞILIMININ YILLAR İTİBARİYLE GELİŞİMİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
ANNUAL DEVELOPMENT OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES
(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)

Birim(Unit):Ton/Gaz(gas) 10^3 m^3

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	Taşkömürü	*Hard Coal*	1,664,859	1,563,792	1,700,458
	Linyit	*Lignite*	57,850,129	50,123,941	54,558,282
	TOPLAM	*TOTAL*	**59,514,988**	**51,687,733**	56,258,740
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	239,410	16,864	27,098
		Yrd. Yakıt *Auxiliary Fuel*	134,007	105,073	118,439
		TOPLAM *TOTAL*	**373,417**	**121,937**	145,537
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	45,364	4	0
		Yrd. Yakıt *Auxiliary Fuel*	72,956	18,901	13,984
		TOPLAM *TOTAL*	**118,320**	**18,905**	13,984
	TOPLAM	*TOTAL*	**491,737**	**140,842**	159,521
	Doğal Gaz	*Natural Gas*	5,091,011	4,493,275	4,173,420
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	Fuel-Oil	*Fuel Oil*	0	0	0
	Motorin	*Diesel Oil*	0	0	0
	TOPLAM	*TOTAL*	**0**	**0**	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	4,956,318	5,855,911	8,873,976
	Linyit	*Lignite*	5,770,389	6,565,451	6,949,028
	TOPLAM	*TOTAL*	**10,726,707**	**12,421,362**	15,823,004
	Fuel-Oil	*Fuel Oil*	1,220,904	769,845	386,071
	Motorin	*Diesel Oil*	62,537	1,449	1,063
	LPG	*LPG*	111	0	0
	Nafta	*Naphta*	8,077	13,140	0
	TOPLAM	*TOTAL*	**1,291,629**	**784,434**	387,134
	Doğal Gaz	*Natural Gas*	15,887,029	17,290,139	18,631,167
TÜRKİYE *TURKEY*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	6,621,177	7,419,703	10,574,434
	Linyit	*Lignite*	63,620,518	56,689,392	61,507,310
	TOPLAM	*TOTAL*	**70,241,695**	**64,109,095**	**72,081,744**
	Fuel-Oil	*Fuel Oil*	1,594,321	891,782	531,608
	Motorin	*Diesel Oil*	180,857	20,354	15,047
	LPG	*LPG*	111	0	0
	Nafta	*Naphta*	8,077	13,140	0
	TOPLAM	*TOTAL*	**1,783,366**	**925,276**	**546,655**
	Doğal Gaz	*Natural Gas*	**20,978,040**	**21,783,414**	**22,804,587**

Figure 5. Consumption of fuel in thermal power plants in Türkiye

NET CALORIFIC VALUES OF FUELS CONSUMED IN THE THERMAL POWER PLANTS

Unit: TJ/KT

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	Taşkömürü	*Hard Coal*	13.71	13.36	13.57
	Linyit	*Lignite*	6.03	6.76	7.01
	TOPLAM	*TOTAL*	**6.25**	**6.96**	7.21
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	40.24	40.30	40.27
		Yrd. Yakıt *Auxiliary Fuel*	40.19	40.19	40.19
		TOPLAM *TOTAL*	**40.22**	**40.21**	40.21
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	0.00	1.00	0.00
		Yrd. Yakıt *Auxiliary Fuel*	43.12	43.12	43.17
		TOPLAM *TOTAL*	**43.12**	**43.12**	43.17
	TOPLAM	*TOTAL*	**40.92**	**40.60**	40.47
	Doğal Gaz	*Natural Gas*	34.82	34.81	34.73
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	Fuel-Oil	*Fuel Oil*	0.00	0.00	0.00
	Motorin	*Diesel Oil*	0.00	0.00	0.00
	TOPLAM	*TOTAL*	**0.00**	**0.00**	**0.00**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	25.07	24.71	24.56
	Linyit	*Lignite*	10.37	9.94	9.55
	TOPLAM	*TOTAL*	**17.16**	**16.90**	**17.97**
	Fuel-Oil	*Fuel Oil*	39.69	40.23	42.10
	Motorin	*Diesel Oil*	40.94	42.66	42.85
	LPG	*LPG*	0.00	1.00	0.00
	Nafta	*Naphta*	43.65	33.50	0.00
	TOPLAM	*TOTAL*	**39.77**	**40.13**	42.10
	Doğal Gaz	*Natural Gas*	37.93	38.05	37.63
TÜRKİYE *TURKEY*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	22.21	22.32	22.79
	Linyit	*Lignite*	6.43	7.13	7.30
	TOPLAM	*TOTAL*	**7.91**	**8.89**	**9.57**
	Fuel-Oil	*Fuel Oil*	39.81	40.23	41.58
	Motorin	*Diesel Oil*	42.37	43.09	43.15
	LPG	*LPG*	46.47	0.00	0.00
	Nafta	*Naphta*	43.65	33.50	0.00
	TOPLAM	*TOTAL*	**40.09**	**40.20**	**41.63**
	Doğal Gaz	*Natural Gas*	37.17	37.38	37.10

Figure 6. Net calorific values of fuels consumed in the thermal power plants

Fuel Type:	EF (tCO2/TJ)
Coal	92.80
Lignite	90.90
Fuel Oil	75.50
Diesel	72.60
LPG	61.60
Naphtha	69.30
Natural Gas	54.30
Bitumen	73.00

Figure 7. IPCC Default CO2 emission factors

http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/statistik2011/yakit46-48/49.xls

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TÜRKEY BY THE ELECTRIC UTILITIES
(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)

Birim(Unit): Tcal

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Taşkömürü	*Hard Coal*	5,452	4,990	5,511
	Linyit	*Lignite*	83,356	80,967	91,352
	TOPLAM	*Total*	**88,809**	**85,957**	**96,863**
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	2,301	162	261
		Yrd. Yakıt *Auxiliary Fuel*	1,286	1,009	1,137
		TOPLAM *TOTAL*	**3,587**	**1,171**	**1,398**
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	467	0	0
		Yrd. Yakıt *Auxiliary Fuel*	751	195	144
		TOPLAM *TOTAL*	**1,219**	**195**	**144**
	TOPLAM	*TOTAL*	**4,806**	**1,366**	**1,542**
	Doğal Gaz	*Natural Gas*	**42,335**	**37,354**	**34,621**
	TOPLAM	*TOTAL*	**135,949**	**124,676**	**133,026**
MOBİL SANTRALLAR *MOBIL POWER PLANTS*	Fuel-Oil	***Fuel Oil***	0	0	0
	Motorin	***Diesel Oil***			
	TOPLAM	***TOTAL***	**0**	**0**	**0**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömürü+İthal kömür	*Hard Coal+Imported Coal*	29,677	34,556	52,056
	Linyit	*Lignite*	14,295	15,584	15,857
	TOPLAM	*Total*	**43,973**	**50,141**	**67,914**
	Fuel-Oil	*Fuel Oil*	11,573	7,398	3,882
	Motorin	*Diesel Oil*	612	15	11
	Lpg	*Lpg*	1	0	0
	Nafta	*Naphta*	84	105	0
	TOPLAM	*TOTAL*	**12,270**	**7,518**	**3,893**
	Doğal Gaz	*Natural Gas*	**143,931**	**157,134**	**167,443**
	TOPLAM	*TOTAL*	**187,904**	**207,275**	**235,357**
TÜRKİYE *TURKEY*	Taşkömürü+İthal kömür	*Hard Coal+Imported Coal*	35,130	39,546	57,567
	Linyit	*Lignite*	97,652	96,551	107,210
	TOPLAM	*Total*	**132,781**	**136,097**	**164,777**
	Fuel-Oil	*Fuel Oil*	15,160	8,569	5,280
	Motorin	*Diesel Oil*	1,830	209	155
	Lpg	*Lpg*	1	0	0
	Nafta	*Naphta*	84	105	0
	TOPLAM	*TOTAL*	**17,076**	**8,884**	**5,435**
	Doğal Gaz	*Natural Gas*	**186,266**	**194,487**	**202,064**
	TOPLAM	*TOTAL*	**336,123**	**339,468**	**372,276**

Figure 8

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES
(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)
1cal = 4,1868 Joule

Birim(Unit): Gjoule

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	Taşkömürü	*Hard Coal*	22,828,163	20,892,383	23,074,208
	Linyit	*Lignite*	348,995,433	338,990,622	382,472,805
	TOPLAM	*Total*	**371,823,595**	**359,883,005**	405,547,013
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	9,632,696	679,656	1,091,289
		Yrd. Yakıt *Auxiliary Fuel*	5,386,180	4,223,229	4,760,433
		TOPLAM *TOTAL*	**15,018,876**	**4,902,885**	5,851,723
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	1,956,278	159	0
		Yrd. Yakıt *Auxiliary Fuel*	3,146,162	815,082	603,737
		TOPLAM *TOTAL*	**5,102,441**	**815,241**	603,737
	TOPLAM	*TOTAL*	**20,121,317**	**5,718,126**	6,455,459
	Doğal Gaz	*Natural Gas*	**177,247,713**	**156,392,061**	144,950,365
	TOPLAM	*TOTAL*	**569,192,626**	**521,993,192**	556,952,838
MOBİL SANTRALLAR *MOBIL POWER PLANTS*	Fuel-Oil	***Fuel Oil***	0	0	0
	Motorin	***Diesel Oil***	0	0	0
	TOPLAM	***TOTAL***	**0**	**0**	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	124,253,075	144,680,890	217,948,438
	Linyit	*Lignite*	59,852,102	65,249,084	66,392,055
	TOPLAM	*Total*	**184,105,177**	**209,929,975**	284,340,493
	Fuel-Oil	*Fuel Oil*	48,452,601	30,974,336	16,254,037
	Motorin	*Diesel Oil*	2,560,350	61,818	45,552
	Lpg	*Lpg*	5,158	0	0
	Nafta	*Naphta*	352,524	440,154	0
	TOPLAM	*TOTAL*	**51,370,633**	**31,476,308**	16,299,589
	Doğal Gaz	*Natural Gas*	**602,609,967**	**657,887,178**	701,051,608
	TOPLAM	*TOTAL*	**786,715,144**	**867,817,153**	985,392,101
TÜRKİYE *TURKEY*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	147,081,237	165,573,274	241,022,646
	Linyit	*Lignite*	408,847,535	404,239,706	448,864,860
	TOPLAM	*Total*	**555,928,772**	**569,812,980**	**689,887,506**
	Fuel-Oil	*Fuel Oil*	63,471,478	35,877,221	22,105,760
	Motorin	*Diesel Oil*	7,662,790	877,059	649,289
	Lpg	*Lpg*	5,158	0	0
	Nafta	*Naphta*	352,524	440,154	0
	TOPLAM	*TOTAL*	**71,491,950**	**37,194,434**	**22,755,049**
	Doğal Gaz	*Natural Gas*	**779,857,681**	**814,279,239**	**846,001,974**
	TOPLAM	*TOTAL*	**1,407,278,403**	**1,421,286,653**	**1,558,644,529**

Figure 9