TOROS HYDROELECTRIC POWER PLANT

Document Prepared by GTE KARBON SÜRDÜRÜLEBİLİR ENERJİ

EĞİTİM DANIŞMANLIK VE TİC. A.Ş.

Project Title	TOROS HYDROELECTRIC POWER PLANT
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Aydem Yenilenebilir Enerji A.Ş. is to construct Toros Regulator and Hydro Power Plant (HPP) on the Çakıt Stream, within the jurisdiction of Belemedik Village, Pozantı District of Adana Province. The purpose of the project is electricity production using the potential energy of Çakıt Stream 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 Çakıt Stream to generate electricity with zero carbon emissions for the Turkish Power Grid. The PA is displacing electricity that would otherwise be generated by the existing grid of the host country. Annual net electricity production by the PA is estimated to be 239,400 MWh Therefore, the Project Activity is expected to lead to an emission reduction of 126,655 tons CO2e annually as per PD Ver2.02. During this monitoring period the project has produced a net total of 108,062 MWh electricity and a total amount of 57,622 tCO2 of emission reduction.

The Environmental impacts of the project are kept to a minimum and all the regulations that are in act in turkeyare obeyed during the construction and operation stages of the Toros HPP project. At the planning stage these impacts have been investigated and are presented to the Ministry of Environment and Forestry (MoEF). The report is examined by MoEF and it was decided that there is no need for an detailed Environmental Impact Assessment study for the Projects. Considering that the project is using the water resource that is also essential for the aquatic life in the area, there is a fish ladder (Fish passageway) at the downstream and upstream directions of the construction to facilitate fish migration. Since the project is designed as a runoff river reservoir type power plant, the minimum water that is necessary for the sustainability of the aquatic life in the river is always be released. The construction of the project has started in 01/05/2008 and the project has started in 17/05/2013.

Table 1. Milestones of TOROS HYDROELECTRIC POWER PLANT

Date	Milestone	Source
01/07/05	Toros Feasibility Issuance for Study Report	Toros SFR
23/03/06	DSI Approval for Study Report	DSI Correspondence
28/11/06	Water usage agreement signed with DSI1	WUA
18/01/07	The Electricity Production License is granted	License
01/05/08	Construction Started	NHS Records
24/09/09	Project Loan Agreement	Loan Agreement

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

Date	Milestone	Source
25/09/09	Contract Signed with the subcontractor	Inarma Contract
23/06/10	EIA Exemptions certification issued	Certificate
30/09/10	Amendment to the Water Usage Agreement Signed	Amendment Declaration Letter
07/12/10	Grid Connection	Agreement
12/01/11	DOE Contracted for Validation	Contract
01/07/05	Toros Feasibility Issuance for Study Report	Toros SFR
23/03/06	DSI Approval for Study Report	DSI correspondence
28/11/06	Water usage agreement signed with DSI2	WUA
18/01/07	The Electricity Production Licence is granted	License
01/05/08	Construction Started	NHS Records
24/09/09	Project Loan Agreement	Loan Agreement
25/09/09	Contract Signed with the subcontractor	Inarma Contract
23/06/10	EIA Exemptions certification issued	Certificate
30/09/10	Amendment to the Water Usage Agreement Signed	Amendment Declaration Letter
07/12/10	Grid Connection	Agreement
12/01/11	DOE Contracted for Validation	Contract
17/05/2013	Commissioning of both units	Commissioning Document

The Toros HPP is going to be made up of one hydro power plant. There will be one regulating body that will be taking up the water from the 700 m elevation level and the tail water level will be

330.00 m. The potential energy of water at approximate gross head level of 370 m will be utilized and the energy will be produced by the Toros Hydroelectric Power Plant. The water will be entering to the regulatory body and the water collecting area over the Çakıt Stream at the 700 m elevation level. Then the water will be settled at the sedimentation pool and will be transferred to a tunnel with a diameter of 3.5 m and a length of 11,860 m. The water that will pass this tunnel will then be transferred to a canal and be transferred to the loading pool via

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

penstock and will be passed to the hydro power plant building where the electricity will be produced. The water will than be left back to the Çakıt stream at the 330 m elevation level. See the following figure (Figure 1) that represent the schematic description of the project principles.

Project boundary is shown in the figure below.

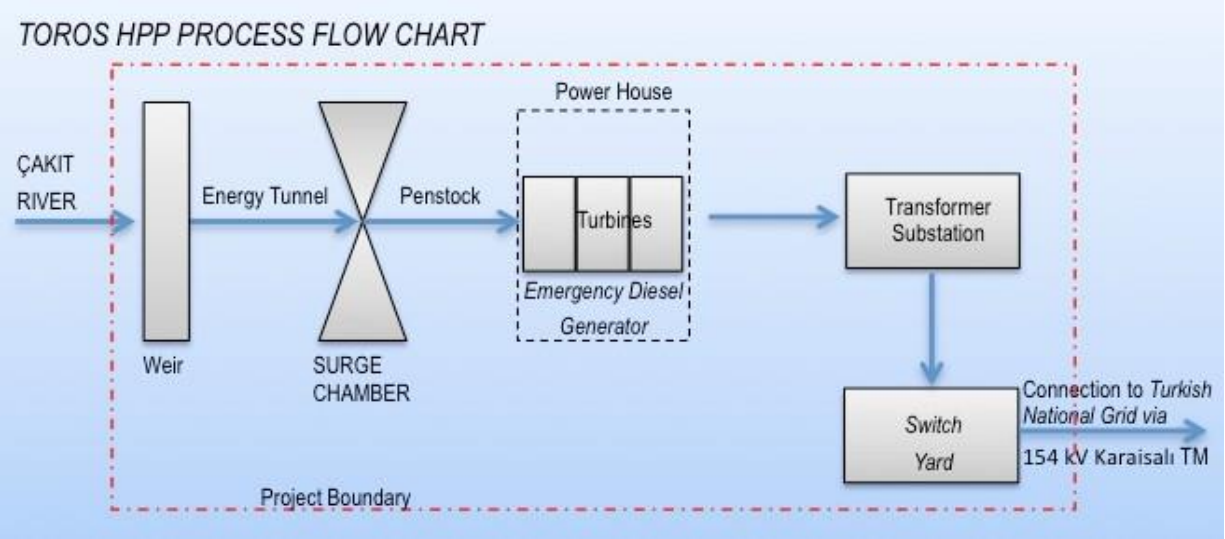

Figure 1. Project boundary

Toros HPP that has 49.00 MW installed capacity is connecting to the Turkish National Power Grid via one of Transformer Substations by 15 km long 154 kV Karaisalı transmission line. As the project is operational, a reliable, continuous, independent from imported fossil fuels, and an uninterrupted high-quality power at 154 kV voltage level is supplied to consumers in Turkey. Thus, launching the project affects positively both Turkey's and region's economy.

The project involves collecting of water, at the 700m level, by the help of a regulator and a water intake body. After that the water is kept at the settling tanks and passes to the diversion tunnel that is carrying the water for 11.86 km^3. After the water leaves the diversion tunnel it enters into the penstock and is transferred to two turbines, each with 24.50 MWe capacity, via a surge Tank. The two turbines are housed within the Hydro Electricity Power Plant Building. The water that hits these two turbines, then leaves the turbines via the tail water canal and a spillway which is located at a level of 330m.

The following are the facilities to be constructed:

- Toros Regulator to be constructed at approximately 700 m elevation level
- Water Intake Body and the Settling Tank
- Derivation Tunnel
- Penstock

- Surge Tank
- Hydro Electricity Power Plant Building
- Tail water canal and spillway
- The switch gear area and the transformer

1.2 Sectoral Scope and Project Type

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

1.3 Project Proponent

Organization name	Aydem Yenilenebilir Enerji A.Ş.
Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
Address	Adalet Mah. Hasan Gönüllü Bulv. No: 151-1 Merkezefendi-Denizli-Turkey
Telephone	+90 258 242 27 76
Email	ozgun.gulkoparan@aydemenerji.com.tr

1.4 Other Entities Involved in the Project

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

1.5 Project Start Date

Project start date is 17/05/2013 which is the commissioning date for both Unit I and Unit II of TOROS HEPP.

1.6 Project Crediting Period

The project crediting period is 10 years: 17/05/2013 to 16/05/2023 (both days included). The crediting period is renewable twice.

1.7 Project Location

The host party is the Republic of Turkey.

The project is located in Adana province, along the Çakıt Stream (Figure 2).

The following are the exact coordinates of the main project structures, as shown in the figures below.

Name of Structure	Latitude	Longitude
Toros Powerhouse	37°16'50.82"N	34°59'59.35"E
Toros Weir Point 1	37°21'38.73"N	34°54'54.15"E
Toros Weir Point 2	37°21'40.01"N	34°54'59.19"E
Toros Surge Pond	37°16'54.80"N	34°59'12.33"E

Figure 2. Project location

1.8 Title and Reference of Methodology

The following UNFCCC methodology and its related tools are utilised: Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for 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) "Tool to calculate the emission factor for an electricity system". (Version 04.0)
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02).
- "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 5.0.0).
- "Tool to determine the remaining lifetime of equipment" (EB 50 Report, Annex 15 version 0.1).

Only the following tools are utilized:

- "Tool for the demonstration and assessment of additionality" (Version 07.0.0) "Tool to calculate the emission factor for an electricity system". (Version 04.0.0)."Tool to determine the remaining lifetime of equipment" (EB 50 Report, Annex 15 version 0.1).

1.9 Participation under other GHG Programs

The project is a voluntary project and the host country, Turkey cannot host CDM or JI projects.

The project has not been registered under any other voluntary GHG program.

1.10 Other Forms of Credit

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

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

1.11 Sustainable Development Contributions

The project helps Turkey to stimulate the commercial application of grid connected renewable energy technologies and markets. It is also a crucial sample of establishing the feasibility of larger grid connected small to medium scale runoff-river HEPPs as a tool to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy

industry development. The project highly supports the sustainable economic development in the region. It has significant contribution in diminishing carbon emissions and protecting the climate compared to the business-as-usual scenario. It created employment during the construction and the operation phase of the plant. Therefore, the project has positive influences on sustainable development and contributes to UN sustainable development goals (SDG) 13, 8 and 7.

- Climate Action (SDG 13): Renewable energy power plants contribute to "Emission Reductions or Removals and/or Adaptation to Climate Change" by reducing CO2 emissions caused by fossil fuel-fired power plants that are displaced due to the project activity. The project has reduced CO2 emissions in an amount of 57,622 tons in the whole monitoring period.
- Decent Work and Economic Growth (SDG 8): The project generates employment and income. The project has created permanent job opportunities.
- Affordable and Clean Energy (SDG 7): Increasing the number and percentage of renewable energy power plants provides substantial increase in the share of renewable energy in the global energy mix and ensure universal access to affordable, reliable, and modern energy services. The project, Toros HPPs has generated net 108,062MWh electricity in the whole monitoring period

Table 2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.3	Tons of greenhouse gas emissions avoided	Implemented activities to increase	By generating electricity from clean sources, project has prevented 57,622 tCO2 into the atmosphere during the monitoring period	By generating electricity from clean sources, project has prevented 766,324 tCO2 into the atmosphere Over Project Lifetime
2)	8.5	Job opportunities created	Implemented activities to increase	During the monitoring period 29 employees were recruited.	-
3)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	The project generated 108,062 MWh electricity from hydropower which is a renewable source during the monitoring period	The project generated 1,437,439.62 MWh electricity from hydropower which is a renewable source over project lifetime

2 SAFEGUARDS

2.1 No Net Harm

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

Air Quality

Necessary precautions, such as watering roads, careful loading and unloading and covering the top of loaded trucks by tarpaulin; are to be taken in order to minimize the dust formed during any excavation.

The dusting problem was more of an issue during the construction phase, but the project activity is not causing any process emissions or fuel burning emissions except the auxiliary diesel generator, that was only operated for testing purposes during the monitoring period.

Water & Wastewater Management

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

Sewage truck records are provided dated 26/12/21, 14/10/21, 21/06/21, 11/02/21, 25/02/21

Waste Oil

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

Collection records are provided dated 10/03/21, 23/09/21, 11/11/21. These records include collection of hazardous wastes generated at the site.

Solid Waste

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

Collection records are provided dated 10/03/21, 23/09/21, 22/11/21

Biodiversity

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

2.2 Local Stakeholder Consultation

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

2.3 AFOLU-Specific Safeguards

This project is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project start date is 17/05/2013. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions.

Table 3. Milestones of TOROS HYDROELECTRIC POWER PLANT

Date	Milestone	Source
12/01/21	Water Use Agreement renewal	Water Use Agreement
24/12/19	Status Change for "Bereket Enerji Üretim Anonim Şirketi" to "Aydem Yenilenebilir Enerji A.Ş"	Official Gazette
20/06/21	Energy Meter Change	First Index Protocol

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330.00 m. The potential energy of water at approximate gross head level of 370 m will be utilized and the energy will be produced by the Toros Hydroelectric Power Plant. The water will be entering to the regulatory body and the water collecting area over the Çakıt Stream at the 700 m elevation level. Then the water will be settled at the sedimentation pool and will be transferred to a tunnel with a diameter of 3.5 m and a length of 11,860 m. The water that will pass this tunnel will then be transferred to a canal and be transferred to the loading pool via

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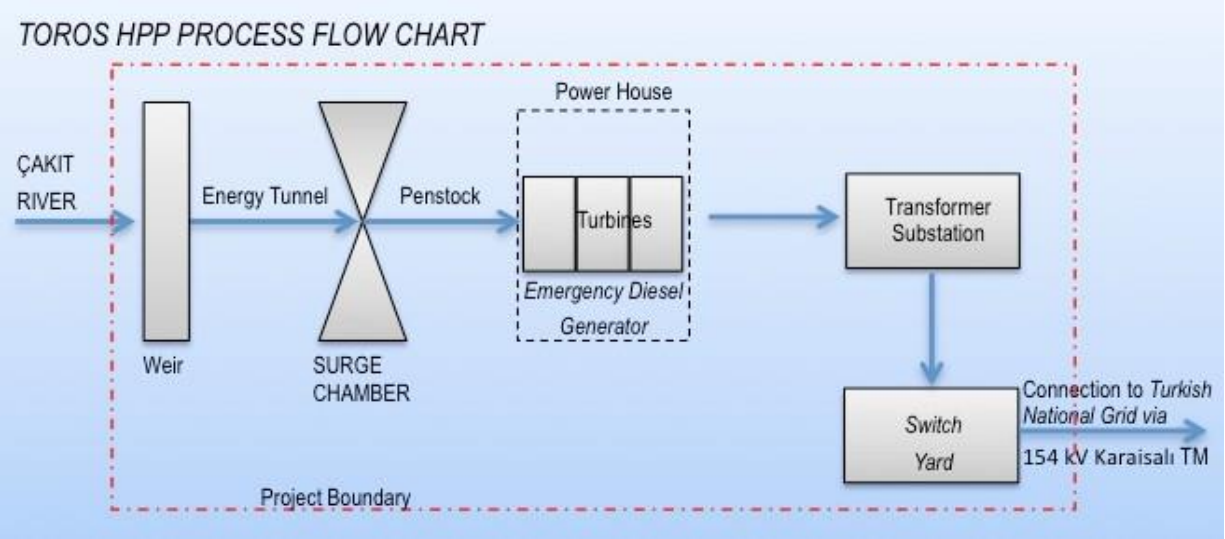

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3.2 Deviations

3.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Version 16.0 and its related tools are applied as they are without any deviation from methodology.

3.2.2 Project Description Deviations

In the registered VCS PD, the PP is "Bereket Enerji Üretim Anonim Şirketi". 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. The project activity is in compliance with the scenario described at the Project Design Document and validated by the validation report dated 11/05/2015.

In registered VCS PD Ver 2.02, the Cap_{pj} (Installed capacity of the hydropower plant were stated as 49,000,000 W). However, in the EPDK license with a registration number of EÜ/1062-2/782 and date of 18/01/2007, the installed capacity was stated as 49.99 MWe (49,990,000 W). Hence, the Cap_{pj} value was corrected in the sections 4.2 and 5.2 of MR version 2.02. This deviation does not cause any change for chosen methodology of ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Ver 16.0 as the installed capacity is under 50 MWe[3].

3.3 Grouped Projects

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

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data – Parameter	$FC_{i,y}$

[3]https://cdm.unfccc.int/filestorage/0/X/6/0X6IERWMG92J7V3B8OTKFSL1QZH5PA/EB81_repan09_ACM0002_ver16.0_clean.pdf?t=YkF8cmQ3N3JsfDAABK8FhIFpDG-Gwnhb1bGX

Data unit	m^3
Description	Amount of fuel i consumed by relevant power plants in Turkey in years, 2009, 2010, 2011
Source of data	Turkish Electricity Transmission Company (TEIAŞ) Web Site https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Please see Appendix 2 (Table 1) in the validated PDD (version 2.02)
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

Data - Parameter	$NCV_{i,y}$
Data unit	GJ-Mass or Volume Unit
Description	Net Calorific Values for fossil fuels in years 2009, 2010 and 2011
Source of data	Turkish Electricity Transmission Company Web Site: https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Please see Appendix-2 –Table 5 in the validated PDD(version 2.02).
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	Data used for the calculation of $EF_{grid,OM,Simple,y}$. As data on the NCV is not published directly on the TEİAŞ website, this data is calculated using the heating values of fuels and the volume or mass of fuels consumed for each year.

Data - Parameter	$EF_{CO2,i,y}$
Data unit	tCO_2-GJ
Description	CO2 emission factor of fossil fuel type i in year y

Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied	Please see Appendix 2-Table 2 in the validated PDD (version 2.02
Justification of choice of data or description of measurement methods and procedures applied	According to the "Tool to calculate the emission factor for an electricity system" version 2, if values provided by the fuel supplier of the power plants in invoices or regional or national average defaults values are not available the IPCC default values at the lower limit of uncertainty must be used.
Purpose of Data	Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$
Comments	-

Data - Parameter	EG_y
Data unit	MWh
Description	Net electricity generated in the project electricity system in other words, net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost - must-run power plants - units, in year y
Source of data	Turkish Electricity Transmission Company Web Site
Value applied	Please see Appendix 2, Table 3 and Table 4 in the validated PDD (version 2.02).
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	-

Data - Parameter	$EG_{m,y}$
Data unit	MWh
Description	Net electricity generated and delivered to the grid by power unit m in year y
Source of data	Turkish Electricity Transmission Company Web Site (https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-iletim-istatistikleri). Data is extracted from the relevant annexes of the

	capacity projection reports for the years 2010[4], 2011[5] and 2012[6].
Value applied	Please see Appendix-2-Table 8 in the validated PDD version 2.02
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

Data - Parameter	$\eta_{m,y}$
Data unit	-
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	The default values provided at the Annex 1 of the "Tool to calculate emission factor for an electricity system (Version 5.0, EB87Annex 9)" are used
Value applied	Please see Annex 1 of the "Tool to calculate emission factor for an electricity system (Version 05.0; EB87Annex 9)" in the validated PDD version 2.02.
Justification of choice of data or description of measurement methods and procedures applied	According to the "tool to calculate emission factor for an electricity specifications or data from the utility, the dispatch center or official records are not available then the default values given in Annex 1 of the shall be used. The first two options are not available for the power plants supplying the Turkish grid; therefore, the default values are used.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

4.2 Data and Parameters Monitored

Data - Parameter	EGy
Data unit	MWh

[4] http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf

[5] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf

[6] http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf

<table>
<tr><td>Description</td><td>Quantity of net electricity generation supplied by the project plant to the grid in MP</td></tr>
<tr><td>Source of data</td><td>Electricity Meters</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Data is measured directly from the electric meter and remotely recorded on TEIAS (grid owner) computerized systems.</td></tr>
<tr><td>Frequency of monitoring-recording</td><td>Annually</td></tr>
<tr><td>Value monitored</td><td>108,062 MWh</td></tr>
<tr><td>Monitoring equipment</td><td>Data is monitored continuously by redundant metering devices. The recording meter is in compliance with the communiqué for Metering Devices to be used in the Electricity Market. By regulation, the accuracy class is 0.2%
Main Electricity Meter: Serial Number: 10172377 Back-up Electricity Meter: Serial Number: 10172378
Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[8]. They have an accuracy class of Class 002 indicating an accuracy range of 0.2%.</td></tr>
<tr><td>QA-QC procedures to be applied</td><td>There are two meters that backup each other. Generated electricity is also monitored via the operator by the help of EPİAŞ trading software for internal monitoring.
The Calibration dates of the meters and their validity is as follows:
<table>
<tr><th></th><th>Main Meter</th><th>Spare Meter</th></tr>
<tr><td>Serial no.</td><td>10172377</td><td>10172378</td></tr>
<tr><td>Brand</td><td>ITRON</td><td>ITRON</td></tr>
<tr><td>Previous calibration date</td><td>2011</td><td>2011</td></tr>
<tr><td>Current Calibration date</td><td>20/06/2021[7]</td><td>20/06/2021</td></tr>
<tr><td>Class</td><td>0.2S</td><td>0.2S</td></tr>
</table></td></tr>
<tr><td>Purpose of the data</td><td>Data to be used for the calculation of Baseline Emissions.</td></tr>
<tr><td>Calculation method</td><td>Direct Continuous Measurement. Main source: The power generation meter readings are performed by using the main metering device and the auxiliary metering device for accuracy checks only. Data from metering devices is recorded by TEİAŞ remote reading computerized systems, that can be retrieved on a monthly basis. This forms the basis for invoicing. In addition to the</td></tr>
</table>

[7] https://www.resmigazete.gov.tr/eskiler/2019/12/20191215-10.htm

	readings of the main metering device, generation data of the Toros HPP can be cross checked, via the TEİAŞ – EPİAŞ web site (https://seffaflik.epias.com.tr/transparency/) which is accessible by a password available to the electricity generation companies. 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.
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 "Toros 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	49,990,000
Monitoring equipment	SCADA System of the Project activity
QA-QC procedures to be applied	Turbine labels checked with SCADA System reading.
Purpose of the data	To monitor capacity of the project
Calculation method	N-A
Comments	

Data / Parameter:	AP_J
Data unit:	m^2

Description:	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is at its maximum fullness.
Measured /Calculated /Default:	Indirectly measured based on the reservoir area map provided in Appendix 2
Source of data:	Surface area determined using the lake surface area map provided in Appendix-2
Description of measurement methods and procedures to be applied:	The reservoir area corresponding to maximum operational level has been determined via the topographic map showing the lake area, presented in Appendix-2.
Frequency of monitoring/recording:	Once during each monitoring period
Value applied:	42,835 m^2
Monitoring equipment:	-
QA/QC procedures to be applied:	Can be checked and compared to satellite imagery available by Google Earth.
Purpose of the data:	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.

he 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 Appendix V.

The electricity produced is sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by one meter placed on the switchgear station where the power plant gets connected to the Turkish national grid. This meter provides official data which is remotely read and recorded by TEİAŞ systems 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 are checked continuously if there is a difference of 0.2 % in the readings of the main and the auxiliary meters, the calibration is repeated.

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 4):

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

Position	Responsibility
Toros HPP Manager	Day to day operation of the Toros 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 device and the auxiliary metering device for accuracy checks only. Data from metering devices is recorded by TEİAŞ remote reading computerized systems, that can be retrieved on a monthly basis. This forms the basis for invoicing. In addition to the readings of the main metering device, generation data of the Toros HPP can be cross checked, via the TEİAŞ – EPİAŞ web site (https://seffaflik.epias.com.tr/transparency/) which is accessible by a password available to the electricity generation companies. 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.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:

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

EF_y = Emission factor calculated according to selected methodology

5.2 Project Emissions

The proposed project activity involves the generation of electricity by hydroelectric power plant therefore project activity does not result in greenhouse gas emissions. Power density of the projects higher than 10 W-m^2 for 49,990 MWe installed capacity and 42,835 m^2 maximum lake area.

The power density of the project activity (PD) is calculated as follows:

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

Where:

PD = Power density of the project activity (W-m^2)

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

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

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

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

For proposed project HEPP,

Cap_{PJ} = 49,990,000 We

Cap_{BL} = 0.0 W

A_{PJ} = 42,835 (m^2)[8]

A_{BL} = 0.0 (m^2)

Therefore, PD is calculated as;

$$PD = \frac{49{,}990{,}000 - 0}{42{,}835 - 0}$$

$$PD = 1167.04\ W - m^2$$

Since the power density (PD) of the project activities is greater than 10 W/m2, Project Emissions (PE) are considered 0

5.3 Leakage

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

$$LE_y = 0$$

5.4 Net GHG Emission Reductions and Removals

Total Emission Reduction has been determined as;

ERy = BEy –PEy - LEy

Where;

ERy = Emission reductions in year y (tCO_2)

BEy = Baseline emissions in year y (tCO_2)

PEy = Project Emissions in year y (tCO_2)

LEy = Leakage emissions in year y (tCO_2)

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

Table 5. Calculations for net total values

EGy	Net Generation (MWh) During Monitoring Period	108,062
EFy	Emission Factor (tCO_2-MWh)	0.53323[9]

[8] Toros HEPP reservoir area, Appendix 2

[9] Fixed ex-ante CM as per registered PD ver 2.02

BEy	Baseline emissions in year y (tCO2) During Monitoring Period	57,622
PEy	Project Emissions (tCO_2)	0
LEy	Leakage Emissions (tCO_2)	0
ERy	Net Emission Reduction (tCO_2) During Monitoring Period	57,622

Thus, the net emission reduction (in tons CO_2) in this monitoring period (01-10-2020 to 31.12.2021) is calculated as given in table below.

Table 6. Summary of Emission Reductions

Year	Baseline Emissions (tCO_2e)	Project Emissions (tCO_2e)	Leakage Emissions (tCO_2e)	Net GHG Emission Reductions or Removals (tCO_2e)
2020 (01/10/2020 – 31/12/2020)	7,481	0	0	7,481
2021 (01/01/2021 – 31/12/2021)	50,141	0	0	50,141
Total	57,622	0	0	57,622

Total emission reductions were realized as 57,622 tCO2 for this monitoring period (Table 4). When the estimated electricity generation figure of the power plant for each year in the validated VCS PD (239,400 MWh-year) is considered, the total emission reductions should be approximately 127,655 tCO2 (Table 5) for the monitoring period (12 months). Percent difference is calculated as -63.9%, which means the project reduced 63.9% less CO2 than the estimated amount. Since the project is a HEPP, seasonal variations in the amount of precipitation and temperature affect the monthly generation rates and may create deviations from the estimated values. According to the values revealed by the General Directorate of Meteorology, Turkey, in Adana province, the maximum temperature and lowest precipitation are reached in July, August and September[10]. This fact reflects on the electricity generation obtained in

[10] https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?m=ADANA

August and September by TOROS HEPP. Moreover, in the Mediterranean region where the power plant is located in, it was recorded that the precipitation decreases between October 2020- September 2021, according to the report named "Evaluation of Areal Precipitation in 2021" published by Directorate General of Meteorology of Turkey. These natural effects cause significant decrease in electricity generation by the plant[11]. On the other hand, the electricity generation is dependent on water flow estimation, which is a natural phenomenon and cannot be estimated with 100% accuracy.

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

	Project Baseline Estimate		Actual Values Achieved in the Monitoring Period	
Year	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO_2e)	Net Electricity Supplied to the Grid (MWh)	Emission Reductions (tCO_2e)
2020	59,850	31,914	14,029	7,481
2021	239,400	127,655	94,033	50,141
Total	**299,250**	**159,569**	**108,062**	**57,622**

[11] https://www.mgm.gov.tr/FILES/arastirma/yagis-degerlendirme/2021AlansalYagisDegerlendirmesi.pdf

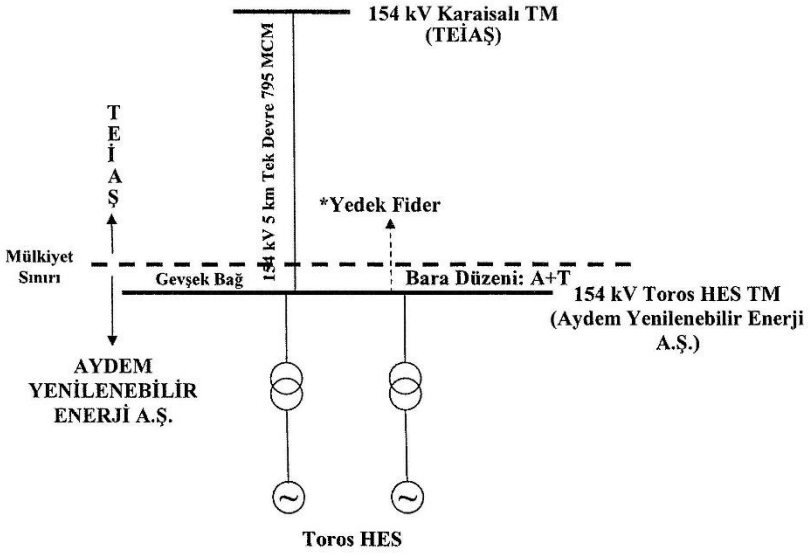
APPENDIX 1: PROJECT'S SINGLE LINE DIAGRAM

BAĞLANTI ANLAŞMASI

EK-3
MÜLKİYET SINIRLARI

a) **Mülkiyet sınırının yazılı ifadesi: :** Üretim Tesisi Şalt Sahasından sonraki nihayet direği ile Üretim Tesisi Şalt Sahası arasındaki gevşek bağlantı hariç, tesis edilecek enerji iletim hatları TEİAŞ'ın mülkiyetindedir.

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



*: Yedek Fider TEİAŞ Mülkiyetindedir.

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APPENDIX 2: PROJECT'S RESERVOIR AREA