MONITORING REPORT

KUMKÖY HYDROELECTRIC POWER PLANT, SAMSUN

Document Prepared By Sekans Danışmanlık

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Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Kumköy Hydroelectric Power Plant, Samsun is located on the Yeşilırmak River in the Black Sea region of Turkey. The project is being used only for energy generation purpose and has an Energy Generation License for 49 years obtained from Energy Market Regulatory Authority (EMRA) in 2011.

The Kumköy Hydroelectric Power Plant, Samsun includes a weir and a reservoir that has been constructed by the General Directorate of State Hydraulic Works (DSI). The weir will serve two purposes: one is to provide water for irrigation and the other is energy generation.

The project activity was initially designed by the State Hydraulic Works (DSI), as having an installed capacity of 10 MW, later on the Project Owner improved the design and increased the installed capacity of the project to 17.5 MW.

Two water intake structures have been constructed on the right and left sides of the Kumköy weir. The overall amount of water for irrigation purposes is released through these structures. The hydroelectric powerhouse and the energy facilities are located next to the weir, as the Project Activity is a river type (run-of-river without a water conveyance system composed of a canal or tunnel) hydropower project. Water released from the weir is used for power generation exclusively until the irrigation project infrastructure is created in the Çarşamba Plain. After the implementation of the irrigation project, the Kumköy weir and reservoir will be utilized for both electricity production and irrigation purposes. The irrigation project will have a priority for the water and only the remaining amount of water will be utilized to generate electricity. The construction phase of the project is going on.

The expected annual energy generation is 91,964 MWh and the estimated amount of GHG emission reduction is 49,037 tonnes CO_2e per year in the registered PDD. During its operation during this monitoring period, the actualized net electricity generation is 439,360.25 MWh. By displacing equivalent amount of electricity consumed from the national grid which is mostly comprised of fossil fired power plants, the actual emission reduction has been calculated as 234,277 tonnes CO_2 for this monitoring period.

The project has produced positive environmental benefits as displacing the electricity generated by fossil fuel fired power plants by utilising the renewable resources so as to avoid environmental pollution and GHG emissions,

Please see the vintage based comparison of expected and achieved emission reductions for this monitoring period:

Table 1- Expected vs achieved emission reductions

Vintage	Period	Total Days	Amount achieved during this monitoring period (tCO2e)	Amount estimated ex ante (tCO2e)	Difference (tCO2e)	Difference (%)
2013	01.04.2013-31.12.2013	275	27.701	36.946	- 9.245	-25%
2014	01.01.2014-31.12.2014	365	16.742	49.037	- 32.295	-66%
2015	01.01.2015-31.12.2015	365	52.506	49.037	3.469	7%
2016	01.01.2016-31.12.2016	366	52.754	49.037	3.717	8%
2017	01.01.2017-31.12.2017	365	34.969	49.037	- 14.068	-28,7%
2018	01.01.2018-31.12.2018	365	35.593	49.037	- 13.444	-27,4%
2019	01.01.2019-31.03.2019	90	14,012	12,091	1,921	15.9%
Total			**234,277**	**294,222**	**-59,945**	**-20.4%**

When the difference between the amount achieved during this monitoring period and the amount estimated ex ante is considered, specially lower rainfall than expected in 2014 and 2017 caused lower generation by the Kumköy Hydroelectric Power Plant, Samsun.

Project timeline is presented in Table 2:

Table 2-Project timeline

Date	Milestone	Reference
18-Oct-06	Early consideration of Carbon Finance	Correspondance with Energy and Commodity Services GMbH
12-Dec-06	Water Usage Agreement Signed between Kumköy Enerji Üretim A.Ş. and DSI	Agreement
5-Feb-07	License acquisition fee paid to the government	Payment receipt
30-Jul-07	EIA not Needed Certificate Issued by MoEF Samsun Province Representation	Certificate in Annex 3
28-Sep-07	Local Stakeholder Consultation Meeting announced in Local (Halk) and National (Türkiye) News papers	Newspaper clips
3-Oct-07	Local Stakeholder Consultation Meeting held in Çarşamba	Meeting Minutes
25-Jan-08	Turn-Key EPC Contract Signed	EPC Contract Cover page
6-Feb-08	Loan agreement signed	Signature pages of loan agreement
15-Apr-08	Electromechanical Equipment contract signed	E&M Contract
1-Jun-08	Revised Feasibility Report submitted to DSI for Approval	FSR Cover page
3-Nov-08	DSI Approval for the revised feasibility study report	DSI Approval letter

9-Oct-09	Contract with DSI to use weir construction facilities	DSI Contract
24-Dec-09	TEIAS Connection Agreement Signed	Agreement
11-Feb-11	System Usage Agreement Signed with Grid Operator	Agreement
23-Feb-11	Government officials approved the project to be suitable to be connected to the grid	Ministry of Energy and Natural Resources approval committee report
3-Mar-11	First Date Electricity is supplied to the grid	March 2011 PMUM Screen shot
4-Mar-11	Notice letter for readiness to Substantial Completion sent to Kumköy Enerji Üretim A.Ş. by IC Inşaat (EPC Contractor)	Letter sent to Cenay Elektrik by IC Inşaat
4-Mar-11	Kumköy Enerji Üretim A.Ş. Accepted and issued official Substantial Acceptance Certificate	Substantial Acceptance Certificate
1-Dec-11	Project License renewed and issued by EMRA	Project License
3-Mar-11	Start date of the first monitoring period	1st Periodic Monitoring Report
31-Mar-13	End date of the first monitoring period	1st Periodic Monitoring Report
1-Apr-13	Start date of the second monitoring period	2nd Periodic Monitoring Report
10-July-14	Shareholder structure change (the project activity has been transferred to Entek Elektrik Üretim A.Ş.)	Generation License
31-Mar-19	End date of the second monitoring period	2nd Periodic Monitoring Report

The construction of the weir was started by DSI already in 1997, but construction has taken longer to complete than planned due to DSI budgetary problems. The project's commissioning date is 23.02.2011[1].

The project boundary may be seen through Figure 1.

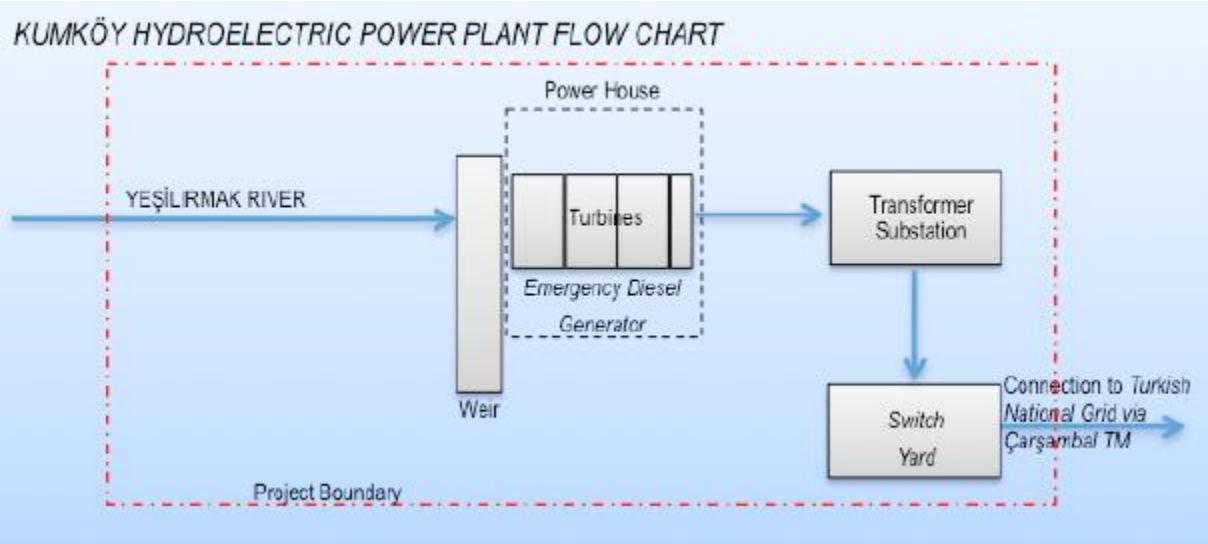

Figure 1. The project boundary of Kumköy Hydroelectric Power Plant, Samsun

[1] The documents are available to the DOE.

The project activity is producing electricity using bulb type turbines. The Project Activity's main technical characteristics obtained from the Project's final feasibility report are provided below:

Table 3 – Main characteristics of the project activity[2]

Component	Property
Thalweg elevation of the weir	18 m
Crest elevation of the weir	32 m
Weir height	14m
Max. operation level	30 m
Min. operation level	28m
Gross head	9.76m
Net-head	9.41m
Turbine type	Bulb
Installed capacity of each turbine	5.75 MW_e
Installed capacity	17.50 MW_e
Number of units	3
Capacity of each unit	70 m^3/s
Max. power capacity of each unit	6.073 MW_m
Total max. turbine capacity	18.22 MW_m

1.2 Sectoral Scope and Project Type

According to UNFCCC sectoral scopes definition for CDM projects, the Project Activity is included in the Sectoral Scope 1, category "Energy industries (renewable - / nonrenewable sources)". The project is a single green field investment and is not part of a project group or bundle.

1.3 Project Proponent

Organization name	Entek Elektrik Üretim A.Ş.
Contact person	Serkan Dündar
Title	Trade Manager
Address	Köseköy Mah. Yeni Demiryolu Cad. No:70 41250 Kartepe/Kocaeli

[2] Kumkoy Feasibility Report, Design Documentation Bulb Type Turbine-Generator Unit and Instruction of Installation,Operation and Maintenance are available to the DOE.

Telephone	+90 216 217 11 90
Email	serkan.dundar@entekelektrik.com.tr

1.4 Other Entities Involved in the Project

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Organization name	Sekans Danışmanlık
Role in the project	Consultant
Contact person	Sıla Duran
Title	Consultant
Address	Konaklar Mah. 34330,4. Levent - Istanbul
Telephone	-
Email	sila@sekansdanismanlik.com

1.5 Project Start Date

The project start date is 03/03/2011.

1.6 Project Crediting Period

The Project's total crediting period is ten years renewable twice: 03/03/2011 – 02/03/2021 (both days are included).

1.7 Project Location

The Project is located on the Yeşilırmak river in Samsun Province at the Black Sea Region northern part of Turkey. The Project Activity is approximately 50 km from the city of Samsun and about 10 km from the town of Çarşamba (Figure 2). The nearest settlements are the villages of Kumköy, Kurtahmetli and Kemer. The project area exists within the coordinates, 41º00'- 41º30' north and 36º30'- 37º00' east[3].

[3] Both Kumkoy Feasibility Report and Project Introduction File are available to the DOE.

Figure 2. The location of the project at the Google Earth satellite image

1.8 Title and Reference of Methodology

The emission reductions of the Project were calculated in accordance with the approved large scale CDM-methodology ACM0002, “Consolidated methodology for grid connected electricity generation from renewable sources”, version 13.0.0

The methodology refers to the “Tool to calculate the emission factor for an electricity system”, version 03.0.0 (EB 70-Annex 22) for baseline calculations. For the demonstration of additionality, “Tool for the demonstration and assessment of additionality”, version 07.0.0 (EB 70-Annex 8) was implemented. Regarding the investment analysis, "Guidelines on the assessment of investment analysis”, version 5 (EB 62-Annex 5) was considered.

1.9 Other Programs

The project has never been included in an emissions trading program or any other binding limits. It has neither received any kind of environmental credits nor been registered under any other GHG programs.

1.10 Sustainable Development

The project produces electricity from renewable energy sources using hydro as the power source and to contribute to Turkey’s growing electricity demand through a sustainable and low carbon

technology. The project displaces the same amount of electricity generated by the grid dominated with fossil fired power plants. The project is expected to generate 91,964 MWh annually. The project contributes to the Sustainable Development Goal, Affordable and Clean Energy.

The annual emission reduction estimated by the project is 49,037 tonnes CO2eq, approximately. While this amount of emissions is mitigated, technology transfer is also realized as benefitting from hydropower.

The project contributes to improve the environmental situation in the region and in the country as avoiding fossil fuel-based electricity will enhance the air quality and help to reduce the negative effects on the climate. Through renewable technologies and hydro-based electricity sustainable and climate friendly development is promoted. The project contributes to the Sustainable Development Goal, Climate Action.

During construction and operational period, the project has created employment opportunities for the local community. The project contributes the economic development of the region by providing sustainable energy resources. The project provides workers with a safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments. Thus, the project contributes to the Sustainable Development Goal, Decent Work and Economic Growth.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The construction of the weir was started by DSI already in 1997, but construction has taken longer to complete than planned due to DSI budgetary problems. The project became operational on 03.03.2011. So far, there have been no events that may impact the GHG emission reductions or removals and monitoring.
The description of the implementation and operational status of the project and the installed technology(ies), technical process and equipment are detailed in Section 1.1.

The shareholder structure was changed on 10.07.2014 and the Project has been transferred to Entek Elektrik Üretim A.Ş. The sole Project Proponent is Entek Elektrik Üretim A.Ş.

Other entity involved in the Project was Ekobil Çevre Hizmetleri Danışmanlık Eğt.Tar. Hayv.Mad. İnş. İth. İhr.Tur. ve Tic. Ltd. Şti. in the project description. However, it's been changed as Sekans Danışmanlık after the first periodic monitoring period.

2.2 Deviations

2.2.1 Methodology Deviations

There are no methodology deviations applied during this monitoring period.

2.2.2 Project Description Deviations

There are no project description deviations applied during this monitoring period.

2.3 Grouped Project

This is not a grouped project.

2.4 Safeguards

2.4.1 No Net Harm

There isn't any negative environmental or socio-economic impact.

2.4.2 Local Stakeholder Consultation

A public meeting with stakeholders regarding the planned project activity was conducted in the meeting hall of Ömer Akyıldız Kıraathanesi Kumköy Köyü, Çarşamba, Samsun province, on 3rd October 2007.

For the participation of officials, phone calls were made to the Samsun Governorship and the Provincial Environment and Forestry Directorship Çarşamba District Governor's Office. For the participation of the local villagers, a fax notification and personal invitations were sent to the Çarşamba municipality and to Kumköy and Orduköy villages inviting their residents. In addition, the event was announced in the regional and national newspapers calling for stakeholders to attend the meeting. The ads were published at the Samsun Halk Gazette (regional), and the Türkiye Gazette (national).

The meeting included a presentation, a dialog session, and a personal questionnaire. Informational brochures (can be provided) summarizing all the information presented were handed to all participants with contact information of a representative for any further questions and clarifications.

The villagers expressed their overall satisfaction with the implementation of such a Project in their region and expressed their hope that after many years of delays, the Kumköy Hydroelectric Power Plant, Samsun would finally be completed.

The local villagers asked about employment possibilities. The Owner promised that when hiring unskilled workers during the construction and operation of the project activity, priority was given to the local villagers. Five employees have been employed from the local region[4].

[4] Social Security System records are available to the DOE.

There was no specific environmental problem that concerned the locals more than others, and environmental issues need to be solved by the government. All people considered clear signs of climate change in the region in recent years.

The contact information of the plant responsible exist at the Mukhtar, the project owner and local community are always in touch. The project owner regularly checks with the Mukhtar if any complaint or a request exists. Any complaint or need from the local community could directly be received by the project owner and appropriate contributions or improvements are made to the local community. The signed letter (dated on 08.07.2019) by Mukhtar, which indicates that contact information of the plant responsible is available to them has been provided to the DOE.

There is no update or any change to the project design after the registration of the project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

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Data / Parameter	$FC_{i,y}$
Data unit	Volume Unit (cubic meter)
Description	Amount of fuel *i* consumed by relevant power plants in Turkey in years, 2009, 2010, 2011.
Source of data	Official publications at the Turkish Electricity Transmission Company (TEIAŞ) Web Site https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Detailed in Annex 2 in the PDD
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 the data	Calculation of baseline emissions
Comments	-

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/Mass or Volume Unit
Description	Net Calorific Values for fossil fuel type i in year, for the years 2009, 2010 and 2011
Source of data	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site

	https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Detailed in Annex 2 in the PDD
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 the data	Calculation of baseline emissions
Comments	-

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 Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied	Detailed in Annex 2 in the PDD
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 03.0.0 , 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 the data	Calculation of baseline emissions
Comments	-

Data / Parameter	EGy
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 https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Value applied	Detailed in Annex 2 in the PDD
Justification of choice of data or	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

description of measurement methods and procedures applied	the Turkish grid.
Purpose of the data	Calculation of baseline emissions
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 (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 2011 and 2012 The reports are now available through the website of EPDK: https://www.epdk.org.tr/Detay/Icerik/3-0-66/elektrikuretim-kapasite-projeksiyonlari
Value applied	Detailed in Annex 2 in the PDD
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 the data	Calculation of baseline emissions
Comments	-

Data / Parameter	$\eta_{m,y}$
Data unit	-
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	Default values provided at the Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 03.0.0)" are used.
Value applied	Please see Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 03.0.0)"
Justification of choice of data or description of	According to the "tool to calculate emission factor for an electricity system if documented manufacturer's 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 tool shall be used. The first two

measurement methods and procedures applied	options are not available for the power plants supplying the Turkish grid, therefor the default values are used.
Purpose of the data	Calculation of baseline emissions
Comments	-

3.2 Data and Parameters Monitored

Data / Parameter	$EG_{PP\text{-}self\ consumption,\ y}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the grid for self-consumption, in year y
Source of data	The primary source is the Meter Reading Forms. The data is crosschecked with EPIAS records. EPİAS is the financial settlement centre of TEIAS (the national grid operator). The Meter Reading Forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAS. TEIAS is performing remote reading of the meters and monthly meter reading forms are the basis for both exported and imported electricity.
Frequency of monitoring/recording	Monthly readings
Value monitored	200.27 MWh for 2013 432.67 MWh for 2014 134.99 MWh for 2015 136.50 MWh for 2016 248.36 MWh for 2017 265.02 MWh for 2018 30.83 MWh for 2019
Monitoring equipment	Both exported and imported electricity are measured continuously by a power meter at the grid interface and recorded monthly.

<table>
<tr><td></td><td>Power meters:

<table><tr><td></td><td>Main Meter</td><td>Spare Meter</td></tr><tr><td>Name</td><td>Ana Sayaç</td><td>Yedek Sayaç</td></tr><tr><td>Description</td><td colspan="2">Bi-directional electricity meter in compliance with TS-620 EN 60044-1 and TS718 IEC60044.2 standards</td></tr><tr><td>Location</td><td colspan="2">TEIAŞ Switch Yard Facility Telecommunications Hall</td></tr><tr><td>Brand</td><td>Actaris SL7000</td><td>Actaris SL7000</td></tr><tr><td>Serial Number</td><td>53042294</td><td>53042295</td></tr></table></td></tr>
<tr><td>QA/QC procedures to be applied</td><td>• A spare meter is used for crosschecking the accuracy and both meters are calibrated if required.
• The Meter Reading Forms are considered as the main source for the net electricity and the values are crosschecked with the EPIAS records.
• TEIAS is responsible for calibration and maintenance of the devices. The periodic calibration or maintenance is under the responsibility of TEIAS and has been fixed as once in 10 years[5]. Since TEİAŞ meters are sealed by TEİAŞ, the project proponent cannot intervene with the devices. The periodic tests are executed on annual basis[6].
• The power meters were tested on 19.02.2014, 12.03.2015, 23.03.2016, 08.05.2017 and 09.05.2018.</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of net electricity supplied to the grid and thus baseline emissions</td></tr>
<tr><td>Calculation method</td><td>Direct continuous measurement

Please check Section 4.1</td></tr>
<tr><td>Comments</td><td>-</td></tr>
</table>

Data / Parameter	$EG_{PP\text{-}gross,\ y}$
Data unit	MWh
Description	Quantity of electricity produced by the power plant, in y

[5] http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.6381&MevzuatIliski=0&sourceXmlSearch

[6] The protocols of the tests are available to the DOE. TEIAS had indicated the serial numbers wrongly for the years 2015, 2016, 2017 and 2018. The revised protocols are available to the DOE.

Source of data	The primary source is the Meter Reading Forms. Net electricity exported is crosschecked with EPIAS records. EPİAS is the financial settlement centre of TEIAS (the national grid operator). The Meter Reading Forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAS. TEIAS is performing remote reading of the meters and monthly meter readings are the basis for monitoring net electricity fed into the grid.
Frequency of monitoring/recording	Monthly readings
Value monitored	51,949.78 MWh for 2013 31,397.82 MWh for 2014 98,468.47 MWh for 2015 98,934.62 MWh for 2016 65,579.96 MWh for 2017 66,750.64 MWh for 2018 26,278.97 MWh for 2019
Monitoring equipment	Power meters as detailed in $EG_{PP\text{-}selfconsumption,\,y}$ parameter
QA/QC procedures to be applied	• A spare meter is used for crosschecking the accuracy and both meters are calibrated if required. • EPİAS records are considered as the main source for the net electricity and the values are crosschecked with the data measured by meters. • TEIAS is responsible for calibration and maintenance of the devices. The periodical calibration or maintenance is under the responsibility of TEIAS and has been fixed as once in 10 years. Since TEİAŞ meters are sealed by TEİAŞ, the project proponent cannot intervene with the devices. The periodic tests are executed on annual basis
Purpose of the data	Calculation of baseline emissions
Calculation method	Direct continuous measurement Please check Section 4.1
Comments	-

Data / Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydropower 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	Observation via the SCADA system of the Project Activity
Frequency of monitoring/recording	Once for each monitoring period
Value monitored	17,500,000
Monitoring equipment	SCADA system of the Project Activity
QA/QC procedures to be applied	Can be confirmed also by the parameter readings on the design plates of each turbine and by summing up the three units.
Purpose of the data	Calculation of project emissions
Calculation method	Please check Annex 1 and Section 4.2
Comments	Since there is no capacity increase, the same installed capacity during the registration is valid. Therefore, no annual electronic spreadsheet has been recorded for the installed capacity. The unit capacity of each turbine is 5750 kW and total installed capacity reaches to 17.25 MW with three turbines. Since the installed capacity is indicated as 17.5 MW in the generation license, this value is considered.

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 full.
Source of data	Indirectly measured based on Depth-Volume-Area correlation curve provided in Appendix 1.
Description of measurement methods and procedures to be applied	The reservoir area corresponding to maximum operational level has been determined via a correlation curve, presented in Appendix 1.
Frequency of monitoring/recording	Once during each monitoring period
Value monitored	597,000

Monitoring equipment	-
QA/QC procedures to be applied	Can be checked and compared to satellite imagery available by Google Earth.
Purpose of the data	Calculation of project emissions
Calculation method	Please check Annex 1 and Section 4.2
Comments	Since there is no capacity increase, the same installed capacity during the registration is valid. Therefore, no annual electronic spreadsheet has been recorded for the area of the reservoir and the reservoir area corresponding to maximum operational level has been taken into consideration.

3.3 Monitoring Plan

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emission reductions during the whole crediting period. The Project proponent is responsible for the implementation of the monitoring plan.

According to the methodology applied, ACM0002 version 13.0.0, the electricity supplied to the national grid by the proposed project and the electricity consumed by the project activity are monitored. The net electricity is the difference of the electricity supplied from electricity consumed by the project and are taken into account for emission reduction calculations.

The Project Proponent is responsible for the overall management of the monitoring procedures including recording, data collection, calculating emission reductions and project emissions.

Please see below the management structure for the plant operation:

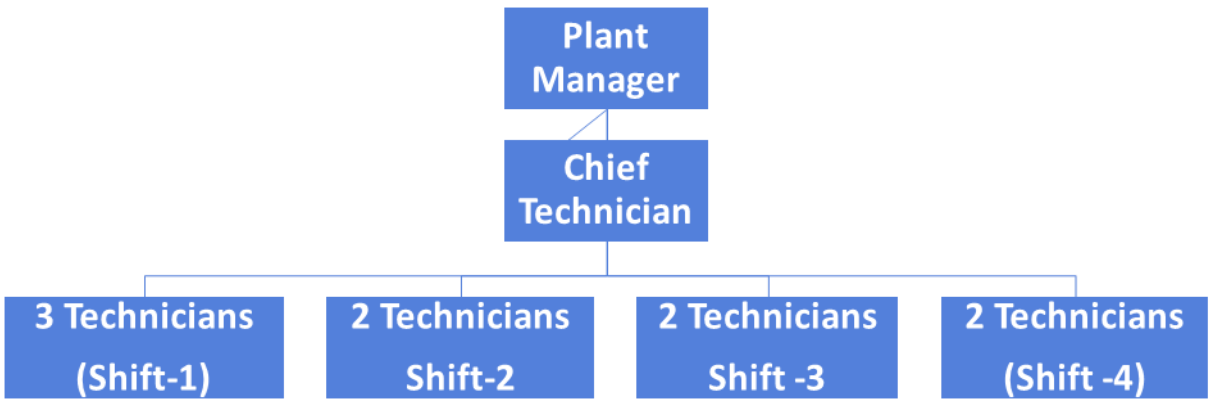


Figure 3. The management structure for the plant operation

The plant manager is responsible for the whole management of the Project Activity and the technicians are responsible for the implementation of the Project Activity. In addition to the technicians, there are seven security guards and one cleaning staff member working for the plant. In total, nineteen employees are working for the Project Activity.

Two power meters are installed at the grid interface of the project. One is the main meter and the other is spare meter of the main meter for cross-checking. Both meters are jointly inspected and sealed in order to be protected from interference by any of the parties. Both the main and secondary meters are owned and installed by the grid operator (TEIAS). The grid operator's is the only one authorized to deal with fixing, calibrating, or changing the meters, which will be done either by the grid operator or by a company authorized by the grid operator. During this monitoring period, there were no records of meter failure. In case of any urgent case TEIAS contacts the Plant Manager.

TEIAS is performing remote reading of the meters and monthly power meter readings are the basis for monitoring net electricity fed into the grid. A measuring protocol is prepared including day, peak and night hour electricity generation by the project owner and approved by governmental officers at the end of each month.

The primary source is the Meter Reading Forms. Net electricity exported is crosschecked with EPIAS records. EPİAS is the financial settlement centre of TEIAS[7]. The Meter Reading Forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available. The website of EPİAS is accessible to Project Proponent with their unique user ID and password. Once accessed, the Project Proponent is able to call electricity generation and consumption reports of their own projects. The same reports are used by the Project Proponent for invoicing TEIAS. The electricity generation data is reported monthly basis.

The installed capacity is measured through the SCADA system. By means of the SCADA system established in the plant all kinds of technical parameters related with turbines and generators including installed capacity is measured and stored in the system on real time basis.

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 coordinates may be measured by GPS around the border of the reservoir area.

Quality Control and Assurance (QC/QA)

Both the main and spare (control) meters are owned and installed by the grid company. Both meters are jointly inspected and sealed in order to be protected from interference by any of the parties.

The grid operator's Metering Officer should be notified of any failure of one of the meters. He is the only one authorized to deal with fixing, calibrating, or changing the meters, which will be done either by the grid operator or by a company authorized by the grid operator. During this monitoring period, there

[7] PMUM has been replaced by EPIAS as of 01/09/2015 in Turkey during the verification period. Retrospective data is accessible via EPIAS.

were no records of meter failure. The data is hourly recorded by the personnel on the plant. TEIAS Load Dispatching Center also executes remote reading during 24-hour period. At the end of the month, the readings are taken to the center to be compared and approved. The data could be remotely accessed by TEIAS.

The capacity of the transmission line connected is 31.5 kV, the accuracy class for main power meter has been defined in the Communiqué for Power Meters as 0.2S class. The spare meter has the same accuracy class of 0.2S. The calibration will be implemented in accordance with the related standard procedures (TS-620 EN 60044-1 and TS718 IEC60044.2) by either TEIAS or the provider company in the name of TEIAS. When the main meter has a breakdown, the readings of the spare meter will be used. Both power meters are Actaris SL7000, 0.2S class. The serial number for main power meter is 53042294 and the spare power meter is 53042295.

All data collected as part of monitoring will be archived electronically by the Project Proponent and be kept at least for 2 years after the end of the last crediting period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The baseline emission BE_y (tCO2e) during the monitoring period results from:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$

Where:

BE_y	Baseline emissions in year y (tCO_2e/y)
$EG_{PJ,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$	Combined margin CO_2 emission factor for grid connected power generation in year y calculated by using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO_2/MWh)

$EF_{grid,CM,y}$ value is fixed as 0.53323 tCO2/MWh for during the crediting period. Table 4 shows the baseline emissions for the verification period:

Table 4- Baseline emissions

Month	(A) Electricity supplied to the grid [MWh]	(B) Electricity consumption from the grid [MWh]	(C) = (A)- (B) EG (ID 8) Net electricity supplied to the grid [MWh]	EF [tCO_2/MWh]	Baseline emission: ER = EG * EF [t CO_2-eq]
Apr-13	7.934,81	17,23	7.917,58	0,53323	4.222
May-13	5.042,65	26,85	5.015,80	0,53323	2.675
Jun-13	4.133,82	29,25	4.104,57	0,53323	2.189
Jul-13	5.875,31	21,66	5.853,65	0,53323	3.121
Aug-13	7.629,59	13,96	7.615,63	0,53323	4.061
Sep-13	5.874,76	19,87	5.854,89	0,53323	3.122
Oct-13	4.460,47	20,31	4.440,16	0,53323	2.368
Nov-13	3.855,18	32,40	3.822,78	0,53323	2.038
Dec-13	7.343,46	18,74	7.324,72	0,53323	3.906
Jan-14	2.449,30	40,17	2.409,13	0,53323	1.285
Feb-14	4.028,05	29,67	3.998,38	0,53323	2.132
Mar-14	2.346,97	39,79	2.307,18	0,53323	1.230
Apr-14	2.071,62	38,46	2.033,16	0,53323	1.084
May-14	536,31	43,46	492,85	0,53323	263
Jun-14	2.313,25	28,23	2.285,02	0,53323	1.218
Jul-14	4.319,61	30,58	4.289,03	0,53323	2.287
Aug-14	4.412,09	32,22	4.379,87	0,53323	2.335
Sep-14	2.751,18	35,87	2.715,31	0,53323	1.448
Oct-14	1.151,02	41,06	1.109,96	0,53323	592
Nov-14	2.654,66	35,39	2.619,27	0,53323	1.397
Dec-14	2.796,43	37,77	2.758,66	0,53323	1.471
Jan-15	7.577,93	17,99	7.559,94	0,53323	4.031
Feb-15	9.440,66	3,22	9.437,44	0,53323	5.032
Mar-15	10.775,08	1,66	10.773,42	0,53323	5.745
Apr-15	10.719,82	0,30	10.719,52	0,53323	5.716
May-15	9.781,90	0,32	9.781,58	0,53323	5.216
Jun-15	8.466,75	4,07	8.462,68	0,53323	4.513
Jul-15	6.913,93	13,11	6.900,82	0,53323	3.680
Aug-15	10.372,01	1,57	10.370,44	0,53323	5.530
Sep-15	9.185,76	4,73	9.181,03	0,53323	4.896
Oct-15	5.631,00	24,00	5.607,00	0,53323	2.990
Nov-15	3.823,15	35,57	3.787,58	0,53323	2.020
Dec-15	5.915,46	28,45	5.887,01	0,53323	3.139
Jan-16	6.610,51	25,00	6.585,51	0,53323	3.512
Feb-16	9.690,54	3,54	9.687,00	0,53323	5.165
Mar-16	9.319,56	8,37	9.311,19	0,53323	4.965
Apr-16	9.084,65	5,72	9.078,93	0,53323	4.841
May-16	9.679,05	5,55	9.673,50	0,53323	5.158

Jun-16	10.655,97	0,08	10.655,89	0,53323	5.682
Jul-16	9.884,15	4,17	9.879,98	0,53323	5.268
Aug-16	6.832,39	17,46	6.814,93	0,53323	3.634
Sep-16	7.439,23	12,28	7.426,95	0,53323	3.960
Oct-16	6.124,31	20,25	6.104,06	0,53323	3.255
Nov-16	5.786,42	17,09	5.769,33	0,53323	3.076
Dec-16	7.964,34	16,99	7.947,35	0,53323	4.238
Jan-17	8.584,45	14,12	8.570,33	0,53323	4.570
Feb-17	6.615,21	16,12	6.599,09	0,53323	3.519
Mar-17	5.358,61	24,12	5.334,49	0,53323	2.845
Apr-17	3.406,13	21,97	3.384,16	0,53323	1.805
May-17	3.194,91	23,66	3.171,25	0,53323	1.691
Jun-17	4.898,35	11,04	4.887,31	0,53323	2.606
Jul-17	5.349,46	23,10	5.326,36	0,53323	2.840
Aug-17	5.792,79	19,71	5.773,08	0,53323	3.078
Sep-17	6.046,50	21,04	6.025,46	0,53323	3.213
Oct-17	4.764,56	27,63	4.736,93	0,53323	2.526
Nov-17	2.948,33	33,05	2.915,28	0,53323	1.555
Dec-17	8.869,02	12,80	8.856,22	0,53323	4.722
Jan-18	9.093,89	11,25	9.082,64	0,53323	4.843
Feb-18	6.612,72	18,32	6.594,40	0,53323	3.516
Mar-18	6.012,42	26,17	5.986,25	0,53323	3.192
Apr-18	5.460,25	23,06	5.437,19	0,53323	2.899
May-18	4.283,01	24,48	4.258,53	0,53323	2.271
Jun-18	2.627,77	25,57	2.602,20	0,53323	1.388
Jul-18	8.140,15	8,84	8.131,31	0,53323	4.336
Aug-18	6.255,67	15,70	6.239,97	0,53323	3.327
Sep-18	6.046,50	21,04	6.025,46	0,53323	3.213
Oct-18	3.567,88	30,63	3.537,25	0,53323	1.886
Nov-18	2.948,33	33,05	2.915,28	0,53323	1.555
Dec-18	5.967,07	26,91	5.940,16	0,53323	3.167
Jan-19	10.528,59	3,32	10.525,27	0,53323	5.612
Feb-19	9.380,88	1,54	9.379,34	0,53323	5.001
Mar-19	6.400,33	25,97	6.374,36	0,53323	3.399
2013 Vintage (01.04.2013-31.12.2013)	52.150,05	200,27	51.949,78	0,53323	27.701
2014 Vintage (01.01.2014-31.12.2014)	31.830,49	432,67	31.397,82	0,53323	16.742

2015 Vintage (01.01.2015-31.12.2015)	98.603,45	134,99	98.468,46	0,53323	52.506
2016 Vintage (01.01.2016-31.12.2016)	99.071,12	136,50	98.934,62	0,53323	52.754
2017 Vintage (01.01.2017-31.12.2017)	65.828,32	248,36	65.579,96	0,53323	34.969
2018 Vintage (01.01.2018-31.12.2018)	67.015,66	265,02	66.750,64	0,53323	35.593
2019 Vintage (01.01.2019-31.03.2019)	26,309.80	30.83	26,278.97	0,53323	14,012
Total	440,808.89	1,448.64	439,360.25	0.53323	234,277

4.2 Project Emissions

There is no project emission resulting from the reservoir area of the Project Activity as the power density of the project is greater than 10W/m2. The aerial extent of the reservoir is calculated based on the Volume Area curve presented in Appendix-1, during this verification period, the maximum water level was 30 m.

Water levels are recorded by the scada system and the meter gauge located at the weir and tail water canals. The maximum recorded water level of 30m value gives an aerial extend of 597,000 m^2. The Project Activity's power density was calculated as below:

=17,500,000 W/597,000 m^2
=29.31 W/m^2

Therefore, PE= 0

4.3 Leakage

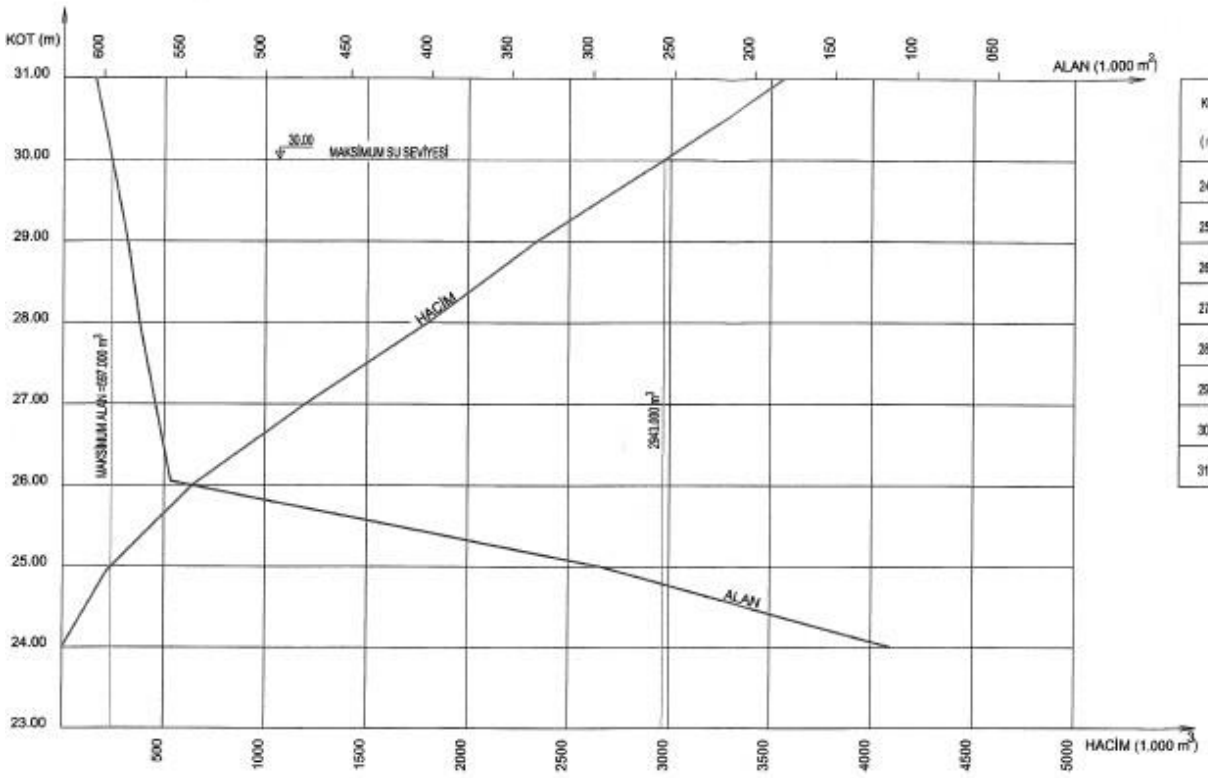
No leakage is to be accounted by the Project Activity. This is in line with the registered PDD and applicable methodology ACM0002 version 13.0.0. Therefore, the leakage from the Project Activity is zero.

4.4 Net GHG Emission Reductions and Removals

Table 5 – Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2013 Vintage (01.04.2013-31.12.2013)	27,701	0	0	27,701
2014 Vintage (01.01.2014-31.12.2014)	16,742	0	0	16,742
2015 Vintage (01.01.2015-31.12.2015)	52,506	0	0	52,506
2016 Vintage (01.01.2016-31.12.2016)	52,754	0	0	52,754
2017 Vintage (01.01.2017-31.12.2017)	34,969	0	0	34,969
2018 Vintage (01.01.2018-31.12.2018)	35,593	0	0	35,593
2019 Vintage (01.01.2019-31.03.2019)	14,012	0	0	14,012
Total	234,277	0	0	234,277

APPENDIX 1: VOLUME VS AREA CURVE



KOT (m)	ALAN 1000 m²	HACİM 1000 m³	ΣV 1000 m²
24.00	113		0.00
		203.50	
25.00	294		203.50
		427.00	
26.00	560		630.50
		564.50	
27.00	569		1195.00
		573.50	
28.00	578		1768.50
		582.50	
29.00	587		2351.00
		592.50	
30.00	597		2943.00
		601.50	
31.00	606		3544.50