



**Verified Carbon
Standard**

GRID CONNECTED ELECTRICITY
GENERATION FROM RENEWABLE SOURCES:
UZUNCAYIR 82.0 MW HYDROELECTRIC
POWER PLANT PROJECT, TURKEY



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Project Title	Grid connected electricity generation from renewable sources: Uzuncayir 82.0 MW Hydroelectric Power Plant Project, Turkey
Version	1.04
Report ID	UzuncayirVCSMR-1
Date of Issue	31-March-2021
Project ID	VCS762
Monitoring Period	01-11-2011 to 01-12-2019 ¹
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¹ The electricity data is considered only till 30/11/2019 which is conservative.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Uzuncayir HEPP is located on Munzur river and it is 18 km away from Tunceli city center. The project will have a dam and a 13.4 km²reservoir. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MWe/28 MWm. Total installed capacity of the project is 82 MWe/84 MWm and the expected electricity generation is 322,000 MWh per annum. The first unit of the project was started to produce electricity on 02/12/2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced with full capacity on 12/04/2010, after the commissioning of the last unit.

The crediting period of the project begins with the commissioning of the plant which is 02/12/2009. The exact commencement date for the plant is the day of first documented supply to the grid with entire capacity. Therefore, the crediting period starts on December 2nd, 2009. Based on the VCS validated PDD, the annual electricity production of the project is estimated to be 322,000 MWh. Accordingly, the expected annual average emission reduction is 151,211 tonnes.

During this 2nd monitoring period (01-11-2011 to 01-12-2019²) the project has produced a net total of 1,955,506 MWh electricity and a total amount of 916,543 tCO₂e of emission reduction.

1.2 Sectoral Scope and Project Type

According to domestic regulations, with an installed capacity of 82.0 MWe the Uzuncayir HEPP is qualified as a large scale project. The project comes under Type I – Renewable Energy Project as per Appendix B of the procedures for CDM project activities. The project is an 82.0 MWe HPP and it uses renewable sources to produce electricity. Since the installed capacity of the planned HPP larger than 15 MW; it is a large scale renewable energy project activity according to the Decision 17/ CP.7 Article 6. The project category is Sectoral Scope 1: Energy industries (renewable-/non-renewable sources). The project type is grid connected electricity generation from renewable sources. The project is a non- grouped, stand-alone project.

² The electricity data is considered only till 30/11/2019 which is conservative.

1.3 Project Proponent

Organization name	Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
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1.4 Other Entities Involved in the Project

Organization name	Ekobil Environmental Services and Consulting Ltd ³
Role in the Project	Preparation of the Project Description Document
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1.5 Project Start Date

Project Start Date is: 2 December 2009.

1.6 Project Crediting Period

The project-crediting period is 10 years: 2/12/2009– 1/12/2019 (both days inclusive). The crediting period is renewable twice.

1.7 Project Location

Uzuncayir HPP is located on Munzur river and it is 18 km away from Tunceli city center. The project has a dam and a 13.4 km² reservoir. The project is located in the Eastern Anatolia

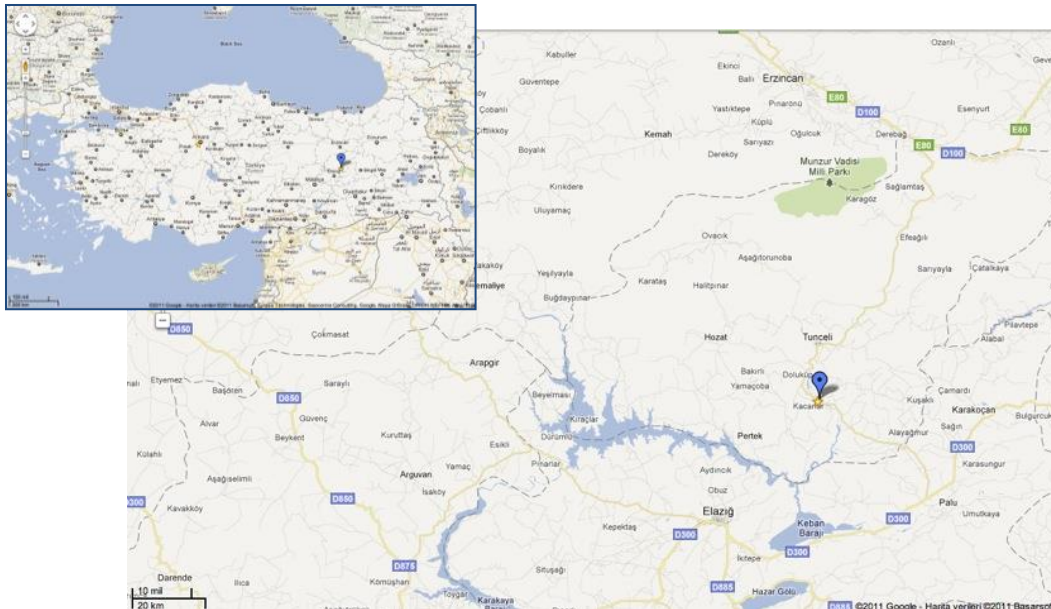
³ Registered to the Ankara Chamber of Trade, with the full name of "Ekobil Çevre Hizmetleri Danışmanlık Eğt.Tar. Hayv. Mad. İnş. İth. İhr.Tur. ve Tic. Ltd. Şti."

Region of Turkey, within the province of Tunceli. The project is on the Munzur River. The altitude is 845 m at power house location.

The project is located between the latitudes $39^{\circ} 06''$ - $39^{\circ} 58''$ and longitudes $39^{\circ} 28''$ - $39^{\circ} 36''$.

The Following is a map showing the project location:

Figure 1: Location Map of the Project



1.8 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilized:

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 11.0.0.

The Approved Methodology refers to the following tools:

- “Tool for the demonstration and assessment of additionality” (Version 05.2.0)
- “Tool to calculate the emission factor for an electricity system”. (Version 02.2.0)

1.9 Participation under other GHG Programs

The project has not participated in any other GHG Programs.

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 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

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.

Uzuncayir HPP consists of 3 units, each having an installed capacity of 27.33 MWe. Total installed capacity of the project is 82.0 MWe and the expected electricity generation is 322,000 MWh per annum. During this monitoring period the project has produced a net total of 1,955,506 MWh electricity and a total amount of 916,543 tCO₂e of emission reduction.

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.

SDG-8 is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.

SDG-13 on urgent action to combat climate change, as the project is replacing the fossil fuel based national grid and it is producing emission reductions.

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

Hydropower presents significant environmental benefits:

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

Hydropower presents significant economic benefits:

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

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

- Tunceli, where the project is located is one of the least developed cities of Turkey with its 86,449 population in 2008 (representing 47% reduction compared to 1975)⁶. There are only 4 businesses which employ more than 10 workers in the city. Although agriculture and animal husbandry are almost only income sources of the city, they are not developed enough. The unemployment rate in the city was 17.2%⁸ (fourth highest in Turkey) in 2008. Although the city is rich in water resources, the production and consumption of fishery products are almost none⁹.
- Construction of Uzuncayir HPP and operation of the plant resulted in extra employment in the local area where unemployment is a big socio-economic problem. The total number of workers to be hired for the construction adds up to 250 where almost 95 percent of those workers are locals. The local workers are given priority during the hiring for plant operation. The project created employment in the region.
- The project will provide a large reservoir area in which fishery products can be grown. This will also increase the fishery products consumption in the region. Local authorities planning to encourage fish farm investments in the reservoir of the project.

2 SAFEGUARDS

2.1 No Net Harm

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

- Reducing greenhouse gas emissions in Turkey compared to the business-as-usual scenario,
- Helping stimulate private sector participation in hydro power industry in Turkey,
- Creating employment during the construction and the operation phase of the plant,
- Helping to reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,
- Helping to diminish Turkey's increasing energy deficit,
- Diversify the electricity generation portfolio and reduce dependency on import of other energy sources."

2.2 Local Stakeholder Consultation

Since Limak did not undertake the construction of the project, the company did not hold an official stakeholder in participation meeting. However, the project managers had been open to face to face communications with local people in order to solve any problem that the project had caused in the construction phase. The ongoing communication is undertaken through stakeholder visits to the site or direct contact via telephone. For this purpose:

- One of the religiously important visit point was moved to a higher location in order to save the location from remaining under the reservoir water.
- The project provided some construction materials to surrounding villages for their infrastructure needs.
- The project constructed some recreational activity centers around the reservoir.

In this monitoring period, no negative comments about the project have been received.

Stakeholders tend to focus on the positive sides of the project such as creation of employment, the touristic activities around the artificial lake, new facilities, sport activities etc.

Stakeholders can directly visit or call the power plant when they have a problem. Since the project started, the project owners have not received any negative comments. A remote meeting

was held with stakeholders on February 25, 2021, at which stakeholders stated that they were satisfied with the project and they could easily contact the project owners whenever they wanted.

2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project start date is 2 December 2009. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions. The following table summarizes the project milestones:

Table 1: Significant dates for the project monitoring period:

Date	Milestone
10.11.2009	Calibration date of meters
02.12.2009	Date of commissioning of the plant /First Unit became operational
28.01.2010	Second unit became operational
12.04.2010	third Unit became operational
31.12.2010	Final Validation Report
31.10.2011	End of the first monitoring period
30.11.2019	End of Calibration validity
01.12.2019	End of the Second Monitoring period

3.2 Deviations

3.2.1 Methodology Deviations

The electricity is invoiced according to the complex MFRC rules and the sold amount is not indicated on the invoice. Therefore it is not possible to use the invoices for QA/QC purpose to compare the electricity generation amount. This amount can be traced, however over the PMUM/MFRC system where the project owner has an access via a specific user ID and Password. The amount of electricity supplied to the grid by the project activity can be observed and cross checked via screenshots of PMUM/MFRC system. The methodology deviation do not negatively impact the conservativeness of the GHG emission reductions or removals quantification. The deviation only relates to procedures for monitoring or measurement.

3.2.2 Project Description Deviations

The following are the minor deviations from the monitoring plan: The electricity is measured by 3 sets of meters; each set is made up of one main meter and one control meter. And each set measures the electricity generated by one of the three turbines of the Uzuncayır HEPP. The position of these meters are indicated in the figure presented in Annex 1 of the validated PD. The calibration of the meters are checked remotely by TEİAŞ by comparing the control meter readings to the main meter readings. Therefore control meter readings are not recorded and

used in the QA/QC procedures. The second monitoring period is longer than initially planned in the Validated PD and it is longer than 12 months. The emission reductions calculation excel sheet, that was presented as figure 4 in the validated PD, is not used for calculations as it was not taking into account the project emissions. The project description deviations do not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario.

3.3 Grouped Projects

N/A Project is not a grouped project activity.

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>i</i> consumed by relevant power plants in Turkey in years, 2007, 2008, 2009
Source of data	Official publications at the Turkish Electricity Transmission Company (TEİAŞ) Web Site https://webapi.teias.gov.tr/file/303fcd3e-6f03-462a-88b3-7a96d9078dad?download
Value applied	Indicated in the validated 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 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 fuel type <i>i</i> in year <i>y</i> , for the years 2007, 2008 and 2009 https://webapi.teias.gov.tr/file/46d3ce93-0127-4536-ac81-27e66e736af6?download
Source of data	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/istatistik2009/46.xls)
Value applied	Indicated in the validated 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.grid.
Purpose of Data	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.
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	Indicated in the validated 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 02.2.1 , 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 www.teias.gov.tr/istatistik2009/37(06-09).xls www.teias.gov.tr/istatistik2009/30(84-09).xls
Value applied	Indicated in the validated 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 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 (www.teias.gov.tr). Statistical Reports are taken for the years 2004 and 2005 and capacity projection reports are used for the years 2007, 2008 and 2009
Value applied	Indicated in the validated 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 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 sector (Version 02.2.1)” are used
Value applied	Please see Annex 1 of the “Tool to calculate emission factor for an electricity sector (Version 02.2.1)”
Justification of choice of data or description of measurement methods and procedures applied	According to the “tool to calculate emission factor for an electricity system if documented manufacturer’s specifications or data from the utility, the dispatch centre or official records are not available then the default values given in annex 1 of the tool shall be used. The first two options are not available for the power plants supplying the Turkish grid, therefore the default values are used.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

Data / Parameter	$NCV_{i,y}$
Data unit	GJ per mass or volume unit (GJ/ton)
Description	Weighted average net calorific value of fuel type i in year y

Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied	-
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Data used for the calculation of EF _{grid,BM,y}
Comments	Applicable as option B of the Methodological tool “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 02) is chosen.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{facility,y}
Data unit	MWh
Description	Quantity of net electricity delivered to the grid
Source of data	Monthly Electricity Meter Reading Records
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. There are 3 main meters that measure the electricity generation by each of the three turbines of the Uzunçayır HEPP.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	1,955,506 MWh (during the monitoring period)
Monitoring equipment	ACTARIS-SL 7000 0.5 S Calibrated between 2009-2019 53035201-Measures generation by turbine I(main) 53035204-Measures generation by turbine I(control) 53035202- Measures generation by turbine II(main) 53035205- Measures generation by turbine II(control) 53035203- Measures generation by turbine III (main) 53035206- Measures generation by turbine III(control) Calibrated between 2019-2029 EMH-LZQJ-XC

	0.5 S 8923709-Measures generation by turbine I(main) 8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control)
QA/QC procedures to be applied	Meter readings will be cross checked with the PMUM/MFRC data obtained from the screen shots of the MFRAC System.
Purpose of the data	Data is used to calculate baseline emission.
Calculation method	Direct continuous measurement
Comments	N/A

Data / Parameter	CapPJ
Data unit	MhW
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Turbine Supplier information on the equipment
Frequency of monitoring/recording	Yearly
Value monitored	82 MW
Monitoring equipment	N/A
QA/QC procedures to be applied	Supplier information on the related equipment and existence of the equipment will be checked
Purpose of the data	Data is used to calculate baseline emission.
Calculation method	N/A
Comments	N/A

Data / Parameter	APJ
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	Project site
Description of measurement methods and procedures to be applied	Pre-calculated area figures in relation to the depth of the reservoir will be used. The graphic that exhibits the correlation between the depth of the reservoir lake and its area is determined based on the correlation between the topographic elevation contour lines and depth of the reservoir. The correlation graph is also presented in annex 6 (p.69) of the validated VCS-PD of Uzunçayır HPP Project. A Hydrostatic Level Measurement device, with a Pressure sensor, measures the water depth at the reservoir. The device installed at the project reservoir is “Deltapilot S DB”. The depth measurements are kept in the logbook as daily lake depth measurement. Later the maximum value obtained during the year is utilized to determine the maximum extent of the reservoir area.
Frequency of monitoring/recording	Yearly
Value monitored	13,400,000 m ²
Monitoring equipment	N/A
QA/QC procedures to be applied	The depth readings will be done on daily basis from
Purpose of the data	Data to be used for the calculation of Project Emissions.
Calculation method	N/A
Comments	N/A

4.3 Monitoring Plan

The following is the description of the monitoring plan as outlined in the validated VCS-PDD. The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed Project within the crediting period is complete, consistent, clear and accurate.

All relevant baseline emission factors are defined ex-ante. Please see the baseline estimations –Section 2.4-(of the validated PDD) for Operating and Build Margin calculations. Hence, the only information to be monitored during the project activity is the amount of electricity fed into the grid.

All the data will be collected and stored by Limak not only during the crediting period but also two years after the last issuance of VERs to Uzuncayir HEPP project for that crediting period.

The emission factors are calculated ex-ante for the period of ten years. The combined margin will be recalculated through ACM0002 / Version 11, any time the crediting period is renewed. The monitoring is performed in-house by the project proponent:

1. Electrical Engineers undertake the specific actions required by the monitoring plan, i.e. they measure the electricity generation, the electricity supplied to the Turkish grid by the power plant, the electricity imports and the amount of fuel consumed, if fuel is consumed.
2. Mechanical Engineers ensure that all the instrumentations and devices to perform the monitoring are working properly.
3. Accounting Manager is in charge of providing the electricity sales receipts to the Operations Manager of the plant.
4. Operations Manager is the VER coordinator. He is in charge of:
 - a) Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
 - b) Communicating and coordinating the monitoring tasks of all business units.
 - c) Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of the data obtained from the electrical engineers and the accounting manager.
 - d) Calculating and report the emission reductions, and
 - e) Organizing in-house seminars to inform and train the company staff to the monitoring procedures.

Please refer to *Figure 3* where the site organizational chart is presented.

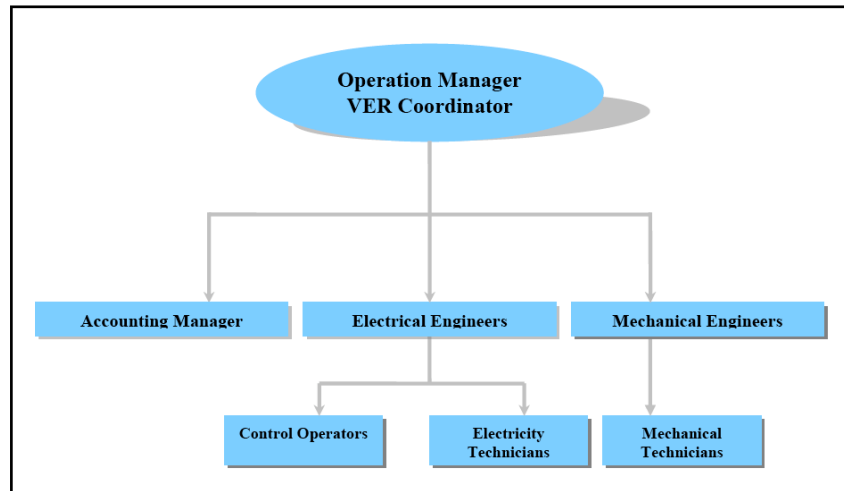


Figure 3: Site Organizational Chart

In order to verify the generated units of emission reductions, the VER coordinator, (Operation Manager) will prepare an annual Report of Vigilance of the Project, in which the following important aspects will be included:

- Year
- Net electricity supplied by the project activity to the grid (in MWh)
- Annual gross electricity generation(in MWh)
- Annual electricity consumption (in MWh)
- Calculation of the emissions reductions: ERs per year (in tCO₂e/yr) produced from the activity of the project

Data is recorded for each crediting period and maintained at least 2 years after its end. The company established a dedicated maintenance system to ensure the data availability for the required period.

Measuring

The Electrical Engineers obtain the readings from the meters, report them in the spreadsheet for measurement control and store the data discharged from the meters electronically.

All the measuring equipment are in line with the EMRA requirements. The recalibration of these equipments done in line with the equipment requirements but re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years⁴. All the meters installed within the project are inline with EMRA requirements.

Measuring equipments and details are given in the table below(Table 2): TEİAS conducts the

⁴ <http://www.mevzuat.adalet.gov.tr/html/21179.html>

calibration and maintenance of the meters and thus, ensures the accuracy and quality of the measurements.

Table 2: Information about the meters

Meter	Main Meters			Backup meters		
Function	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3
Located	At the plant	At the plant	At the plant	At the plant	At the plant	At the plant
Serial No.	53035201	53035202	53035203	53035204	53035205	53035206
Calibration date	10/11/2009	10/11/2009	10/11/2009	10/11/2009	10/11/2009	10/11/2009
Valid Until ⁵	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019
Meter	Main Meters			Backup meters		
Function	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3
Located	At the plant	At the plant	At the plant	At the plant	At the plant	At the plant
Serial No.	8923709	8923711	8923713	8923710	8923712	8923714
Calibration date	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019
Valid Until	30/11/2029	30/11/2029	30/11/2029	30/11/2029	30/11/2029	30/11/2029

Besides, in order to measure the electricity production figure of the plant accurately, there are two sets of meters in the power house. One is the main meter for measuring and the other is the check meter for control. Both of these meters are metering the energy in two directions (consumption and production). If there is a measuring difference between these two meters

⁵ Within the scope of the regulation in Turkey (<https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>), the stamp year is taken as basis year and the year it is stamped(2009) is counted as the first year, regardless of the date and the remaining period is calculated from the year it was stamped(2009+10 years).

and one of the parties (TEIAS or the company) requests for calibration of the meters, in this case, the meters are calibrated without waiting for the periodic calibration date. (TEIAS System Usage Agreement, Art 3, B./2./b))52 . This calibration process is done by another third party under the control of TEIAS. The company is not responsible for calibration of the meters in Turkey according to the local standards.

On the other hand, the emission reductions will be calculated according to the measurements of the main electricity meter, since the electricity production invoices are made out based on this meter. During the each monitoring period, the invoices will be presented to the DOE, together with the calculation details. The Electrical Engineers will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter's reading and calibration and readings recording, adjustment and reporting. If new personnel are hired, they will have to follow up a training program and will be trained in the specific skills required to carry out the Monitoring Plan.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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

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

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

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

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

And

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

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

The Combined margin CO₂ emissions factor in year y (tCO₂ -MWh), EF_{grid,CM,y}, is fixed ex-ante for the duration of the crediting period, and is 0.55955 tCO_{2e} -MWh.

The following table is the Baseline emissions of the project calculated for the monitoring period.
 Table 3: Baseline emissions of the project calculated for the monitoring period (National Grid Emission Factor EF_{CM} is 0.55955 tCO₂e-MWh).

YEAR	Symbol Units	A-Gross Electricity Production EG _{PP-gross, y} MWh	B-Self Electricity Consumption EG _{PP-self consumption, y} MWh	C-Net electricity production C=A-B EG _{PP-net, y} MWh	Baseline Emissions = EG _{PP-net, y} * EF _{CM} BE1 tCO ₂ e
2011	November	11,488	93	11,395	6,376.07
	December	6,926	56	6,870	3,844.11
Total in 2011		18,414	149	18,265	10,220
2012	January	15,722	119	15,603	8,730.66
	February	8,769	77	8,692	4,863.61
	March	16,169	113	16,056	8,984.13
	April	32,199	234	31,965	17,886.02
	May	49,608	362	49,246	27,555.60
	June	39,399	266	39,133	21,896.87
	July	22,146	158	21,988	12,303.39
	August	20,960	140	20,820	11,649.83
	September	16,346	83	16,263	9,099.96
	October	9,862	74	9,788	5,476.88
	November	12,222	92	12,130	6,787.34
	December	5,768	46	5,722	3,201.75
Total in 2012		249,170	1,764	247,406	138,436
2013	January	19,413	169	19,244	10,767.98
	February	23,464	198	23,266	13,018.49
	March	29,205	195	29,010	16,232.55
	April	40,977	212	40,765	22,810.06
	May	45,794	283	45,511	25,465.68
	June	37,373	759	36,614	20,487.36
	July	22,170	154	22,016	12,319.05
	August	20,899	104	20,795	11,635.84
	September	16,075	81	15,994	8,949.44
	October	10,246	75	10,171	5,691.18
	November	7,726	62	7,664	4,288.39
	December	8,597	68	8,529	4,772.40
Total in 2013		281,939	2,360	279,579	156,438
2014	January	11,015	70	10,945	6,124.27
	February	8,956	108	8,848	4,950.90
	March	15,551	131	15,420	8,628.26
	April	20,457	156	20,301	11,359.42
	May	12,491	84	12,407	6,942.34
	June	15,221	112	15,109	8,454.24

YEAR	Symbol Units	A-Gross Electricity Production EG _{PP-gross, y} MWh	B-Self Electricity Consumption EG _{PP-self consumption, y} MWh	C-Net electricity production C=A-B EG _{PP-net, y} MWh	Baseline Emissions = EG _{PP-net, y} * EF _{CM} BE1 tCO _{2e}
	July	14,716	99	14,617	8,178.94
	August	18,497	116	18,381	10,285.09
	September	6,359	37	6,322	3,537.48
	October	5,838	42	5,796	3,243.15
	November	3,165	27	3,138	1,755.87
	December	9,759	90	9,669	5,410.29
	Total in 2014	142,025	1,072	140,953	78,870
2015	January	26,161	253	25,908	14,496.82
	February	13,513	4,665	8,848	4,950.90
	March	27,692	226	27,466	15,368.60
	April	41,095	310	40,785	22,821.25
	May	25,769	152	25,617	14,333.99
	June	33,019	249	32,770	18,336.45
	July	19,814	172	19,642	10,990.68
	August	24,717	212	24,505	13,711.77
	September	15,767	142	15,625	8,742.97
	October	3,489	31	3,458	1,934.92
	November	7,053	58	6,995	3,914.05
	December	9,784	91	9,693	5,423.72
	Total in 2015	247,873	6,561	241,312	135,026
2016	January	18,274	175	18,099	10,127.30
	February	24,321	190	24,131	13,502.50
	March	40,644	292	40,352	22,578.96
	April	46,097	274	45,823	25,640.26
	May	31,696	198	31,498	17,624.71
	June	26,270	163	26,107	14,608.17
	July	16,781	101	16,680	9,333.29
	August	16,907	117	16,790	9,394.84
	September	14,887	102	14,785	8,272.95
	October	6,713	51	6,662	3,727.72
	November	11,216	82	11,134	6,230.03
	December	12,467	100	12,367	6,919.95
	Total in 2016	266,273	1,845	264,428	147,960
2017	January	2,887	24	2,863	1,601.99
	February	11,147	80	11,067	6,192.54
	March	14,870	122	14,748	8,252.24
	April	33,822	188	33,634	18,819.90
	May	25,445	154	25,291	14,151.58

YEAR	Symbol Units	A-Gross Electricity Production EG _{PP-gross, y} MWh	B-Self Electricity Consumption EG _{PP-self consumption, y} MWh	C-Net electricity production C=A-B EG _{PP-net, y} MWh	Baseline Emissions = EG _{PP-net, y} * EF _{CM} BE1 tCO _{2e}
	June	24,126	180	23,946	13,398.98
	July	15,855	99	15,756	8,816.27
	August	15,439	98	15,341	8,584.06
	September	14,451	94	14,357	8,033.46
	October	8,286	61	8,225	4,602.30
	November	8,563	65	8,498	4,755.06
	December	4,354	39	4,315	2,414.46
	Total in 2017	179,245	1,204	178,041	99,622
2018	January	9,859	77	9,782	5,473.52
	February	21,897	159	21,738	12,163.50
	March	42,973	246	42,727	23,907.89
	April	28,328	133	28,195	15,776.51
	May	24,645	132	24,476	13,695.55
	June	29,751	169	29,582	16,552.61
	July	13,605	84	13,521	7,565.68
	August	17,421	87	17,334	9,699.24
	September	5,837	25	5,812	3,252.10
	October	10,862	58	10,804	6,045.38
	November	14,627	99	14,528	8,129.14
	December	26,892	182	26,710	14,945.58
	Total in 2018	246,697	1,451	245,209	137,206
2019	January	23,372	176	23,196	12,979.32
	February	22,619	144	22,475	12,575.89
	March	39,703	185	39,518	22,112.30
	April	54,208	325	53,883	30,150.23
	May	58,566	407	58,159	32,542.87
	June	46,326	291	46,035	25,758.88
	July	29,729	142	29,587	16,555.41
	August	27,859	153	27,706	15,502.89
	September	22,029	112	21,917	12,263.66
	October	6,343	43	6,300	3,525.17
	November	11,614	77	11,537	6,455.53
	Total in 2019	342,368	2,055	340,313	190,422
	Grand Total	1,974,004	18,461	1,955,506	1,094,200

5.2 Project Emissions

The project has a reservoir area of 13,400,000 m². therefore the power density of the project calculates to be 6,12 W/m².

Table 4: Monthly Project Emissions during the monitoring Period (Emission Reduction Factor for the Reservoir EF_{res} is 90 kgCO_{2e}/MWh).

YEAR	Symbol Units	A-Gross Electricity Production TEG _y MWh	Project Emissions (TEG _y *EF _{res})/1000 PE tCO _{2e}
2011	November	11,488	1,033.92
	December	6,926	623.34
Total in 2011		18,414	1,657
2012	January	15,722	1,414.98
	February	8,769	789.21
	March	16,169	1,455.21
	April	32,199	2,897.91
	May	49,608	4,464.72
	June	39,399	3,545.91
	July	22,146	1,993.14
	August	20,960	1,886.40
	September	16,346	1,471.14
	October	9,862	887.58
	November	12,222	1,099.98
	December	5,768	519.12
Total in 2012		249,170	22,425
2013	January	19,413	1,747.17
	February	23,464	2,111.76
	March	29,205	2,628.45
	April	40,977	3,687.93
	May	45,794	4,121.46
	June	37,373	3,363.57
	July	22,170	1,995.30
	August	20,899	1,880.91
	September	16,075	1,446.75
	October	10,246	922.14
	November	7,726	695.34
	December	8,597	773.73
Total in 2013		281,939	25,374
2014	January	11,015	991.35
	February	8,956	806.04

YEAR	Symbol Units	A-Gross Electricity Production TEGy MWh	Project Emissions (TEG _y *EF _{res})/1000 PE tCO ₂ e
	March	15,551	1,399.59
	April	20,457	1,841.13
	May	12,491	1,124.19
	June	15,221	1,369.89
	July	14,716	1,324.44
	August	18,497	1,664.73
	September	6,359	572.31
	October	5,838	525.42
	November	3,165	284.85
	December	9,759	878.31
Total in 2014		142,025	12,782
2015	January	26,161	2,354.49
	February	13,513	1,216.17
	March	27,692	2,492.28
	April	41,095	3,698.55
	May	25,769	2,319.21
	June	33,019	2,971.71
	July	19,814	1,783.26
	August	24,717	2,224.53
	September	15,767	1,419.03
	October	3,489	314.01
	November	7,053	634.77
	December	9,784	880.56
Total in 2015		247,873	22,308
2016	January	18,274	1,644.66
	February	24,321	2,188.89
	March	40,644	3,657.96
	April	46,097	4,148.73
	May	31,696	2,852.64
	June	26,270	2,364.30
	July	16,781	1,510.29
	August	16,907	1,521.63
	September	14,887	1,339.83
	October	6,713	604.17
	November	11,216	1,009.44
	December	12,467	1,122.03
Total in 2016		266,273	23,964
2017	January	2,887	259.83
	February	11,147	1,003.23

YEAR	Symbol Units	A-Gross Electricity Production TEGy MWh	Project Emissions (TEG _y *EF _{res})/1000 PE tCO ₂ e
	March	14,870	1,338.30
	April	33,822	3,043.98
	May	25,445	2,290.05
	June	24,126	2,171.34
	July	15,855	1,426.95
	August	15,439	1,389.51
	September	14,451	1,300.59
	October	8,286	745.74
	November	8,563	770.67
	December	4,354	391.86
Total in 2017		179,245	16,132
2018	January	9,859	887.31
	February	21,897	1,970.73
	March	42,973	3,867.57
	April	28,328	2,549.52
	May	24,645	2,218.05
	June	29,751	2,677.59
	July	13,605	1,224.45
	August	17,421	1,567.89
	September	5,837	525.33
	October	10,862	977.58
	November	14,627	1,316.43
	December	26,892	2,420.28
Total in 2018		246,697	22,202
2019	January	23,372	2,103.48
	February	22,619	2,035.71
	March	39,703	3,573.27
	April	54,208	4,878.72
	May	58,566	5,270.94
	June	46,326	4,169.34
	July	29,729	2,675.61
	August	27,859	2,507.31
	September	22,029	1,982.61
	October	6,343	570.87
	November	11,614	1,045.26
Total in 2019		342,368	30,813
Grand Total		1,974,004	177,657

5.3 Leakage

According to the ACM0002, version 11.0.0 methodology no leakage is expected, as the energy generating equipment is brand new state of the art technology, and is not transferred from another activity. Therefore, the leakage from the project activity is zero.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2011	10,220	1,657	0	8,563
2012	138,436	22,425	0	116,011
2013	156,438	25,374	0	131,064
2014	78,870	12,782	0	66,088
2015	135,026	22,308	0	112,718
2016	147,960	23,964	0	123,996
2017	99,622	16,132	0	83,490
2018	137,206	22,202	0	115,004
2019	190,422	30,813	0	159,609
Total	1,094,200	177,657	0	916,543