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	1.1
Report ID	UzuncayırVCSMR-2
Date of Issue	01.09.2022
Project ID	VCS762
Monitoring Period	02/12/2019 to 31/12/2021
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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 km^2reservoir. 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 first 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 first crediting period started on December 2nd, 2009, which has lasted 10 years until December 1st, 2019. This MR falls on the second crediting period. 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 98,484 tCO_2.

During this monitoring period (02/12/2019 to 31/12/2021) the project has produced a net total of 426,504.26 MWh electricity and a net amount of 171,708 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.

1.3 Project Proponent

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

Organization name	Ekobil Environmental Services and Consulting Ltd[1]
Role in the Project	Preparation of the Project Description Document
Contact person	Dr. Aslı Sezer Özçelik
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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: 02/12/2019 to 01/12/2029 (both days inclusive). The crediting period is renewable twice.

[1] 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."

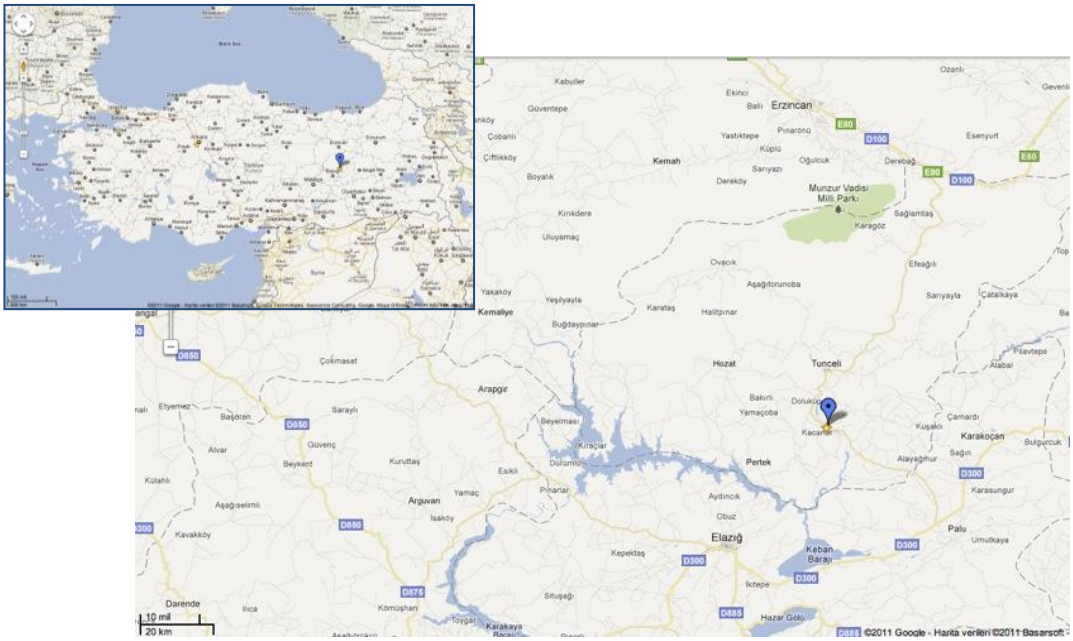
1.7 Project Location

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 km^2 reservoir. The project is located in the Eastern Anatolia Region of Turkey, within the province of Tunceli. The project is on the Munzur River. The altitude is 845 m at powerhouse location.

The project is located between the latitudes 39° 06”-39° 58”and longitudes 39° 28”-39° 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 “Large-scale consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 20.0

Related Tools:

‘’Tool for the demonstration and assessment of additionality” (Version 05.2.1)

‘’Tool to calculate the emission factor for an electricity system” (Version 06.0)

"Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1)

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 Contributions

The project aims to generate electricity by using hydroelectric power to supply the increasing national electricity demand in a cleaner and sustainable manner. It reduces the air pollution caused by the grid connected power plants which are mostly fossil fuel fired.

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 426,504.26 MWh electricity and a net amount of 171,708 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 reach 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.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	increase substantially the share of renewable energy in the global energy mix	Renewable energy exported to the Turkish grid from the hydroelectric power plant.	No further changes this monitoring period. The activity of Uzunçayır HPP increases the share of renewable energy for the Turkish energy grid as compared to the baseline scenario. The project has generated 426,504.26 MWh of net energy during the monitoring period.	The project has generated 2,915,581 MWh of energy from renewable sources since its implementation= 533,571 MWh (1st MP of 1st CP) +1,955,506 MWh (2nd MP of 1st CP) + 426,504 MWh (1st MP of 2nd CP).
2)	8.5	Achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Employment opportunities as well as specific job-related and health and safety education provided to employees	Employment opportunities for local people and equal pay for work of equal value. During this first monitoring period, half of the 50 employees are locals, working at service as well as engineering capacities.	The local workers are given priority during the hiring for plant operation. The project created permanent and temporary employment in the region both in the construction and operation stages.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	GHG emissions reduced due to the Project	The project has produced total amount of 171,708 tCO2e of emission reduction during the monitoring period.	The project has contributed to 1,338,694 tCO2 of emission reduction since its initiation in Dec 2nd, 2019= 250,443 tCO2 (1st MP of 1st CP) + 916,543 tCo2 (2nd MP of 1st CP) + 171,708 tCO2 (1st MP of 2nd CP).

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 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.

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 2: 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 calibration of the meters are checked remotely by TEIAŞ 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 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 a supplement 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	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[2]
Value applied	0.7258
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,OM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources on 06/10/2021 using Version 06.0 of TOOL 7:"Tool to calculate the emission factor for an electricity system",
Purpose of Data	Data used for the calculation of $EF_{grid,CM,y}$
Comments	-

[2] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Building margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[3]
Value applied	0.4153
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,BM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources using Version 06.0 of TOOL 7:"Tool to calculate the emission factor for an electricity system".
Purpose of Data	Data used for the calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin Emission Factor of Turkey
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021
Value applied	0.4929
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,CM,y}$ was calculated using the published databy Turkish Ministry of Energy and Natural Resources. Calculated data of $EF_{grid,OM,y}$ and $EF_{grid,OM,y}$ were used.
Purpose of Data	Calculation of baseline emission (BE_y).
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PP-net,\ y}$
Data unit	MWh
Description	Quantity of the net electricity supplied to the grid by the power plant in year y.

[3] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

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 TEIAŞ. 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	426,504.26 MWh (during the monitoring period)
Monitoring equipment	Calibrated between 2019-2029 (Applicable for the MP) 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 are 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	$EG_{PP\text{-}export,y}$
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the grid in year y.
Source of data	The Primary source of data is the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are made by electricity meters that belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data is used to calculate the net electricity supplied to the grid.

Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols.
Value monitored	427,915,24 (during the monitoring period)
Monitoring equipment	Calibrated between 2019-2029 (Applicable for the MP) 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 are 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 net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	*N/A*

Data / Parameter	CapPJ
Data unit	MW
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 is checked regularly.

Purpose of the data	Data is used to calculate baseline emission.
Calculation method	N/A
Comments	*N/A*

Data / Parameter	$EG_{PP\text{-}import,y}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the grid, in year y.
Source of data	The Primary source of data is the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity imported from the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. 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	1,410.98 MWh (during the monitoring period)
Monitoring equipment	Calibrated between 2019-2029 (Applicable for the MP) 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 a*re* 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 net electricity supplied to the grid.
Calculation method	Direct continuous measurement
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 is 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. 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 are done on a daily basis during the monitoring period.
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 5.1 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 20 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.

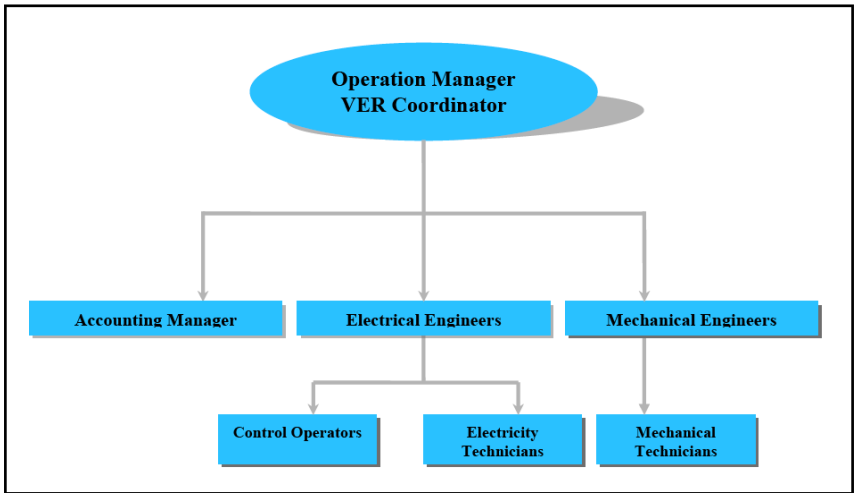
b) Communicating and coordinating the monitoring tasks of all business units.

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.

Figure 2: Site Organizational Chart



Please refer to *Figure 2* where the site organizational chart is presented.

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 is 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 years[4]. All the meters installed within the project are inline with EMRA requirements. Measuring equipments and details are given in the table below (Table 3: TEİAS conducts the calibration and maintenance of the meters and thus, ensures the accuracy and quality of the measurements.

Table 3: 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.	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 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

[4] *http://www.mevzuat.adalet.gov.tr/html/21179.html*

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. During each monitoring period, the PMUM screenshots 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 (BEy) are calculated based on the following formula:

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

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

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

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

And

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

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

The Combined margin CO_2 emissions factor in year y (tCO_2/MWh), $EF_{grid,CM,y}$, is fixed ex-ante for the duration of the crediting period, and is 0.4929 tCO_{2e}/MWh.

The following table is the Baseline emissions of the project calculated for the monitoring period.

Table 4: Baseline emissions of the project calculated for the monitoring period (National Grid Emission Factor EF_{CM} is 0.4929 tCO2/MWh).

		A-Gross Electricity Production	**B-Self Electricity Consumption**	**C-Net electricity production C=A-B**	**Baseline Emissions = $EG_{PP-net.y}$ * EF_{CM}**
	Symbol	$EG_{PP-gross.\ y}$	$EG_{PP-self\ consumption.\ y}$	$EG_{PP-net.\ y}$	BEy
YEAR	**Units**	MWh	MWh	MWh	tCO2e
2019	December (exc. Dec 1st)	10,000.29	95.78	9,904.51	4,881.93
Total in 2019		**10,000.29**	**95.78**	**9,904.51**	**4,881.00**
2020	January	13,111.44	94.01	13,017.43	6,416.29
	February	21,377.09	47.73	21,329.36	10,513.24
	March	38,062.55	8.06	38,054.49	18,757.06
	April	43,697.74	1.19	43,696.55	21,538.03
	May	44,023.46	5.56	44,017.90	21,696.42
	June	13,101.87	43.48	13,058.39	6,436.48
	July	33,632.30	21.76	33,610.54	16,566.64
	August	11,881.25	44.04	11,837.21	5,834.56
	September	7,712.46	59.90	7,652.56	3,771.95
	October	1,950.36	84.47	1,865.89	919.70
	November	7,322.22	74.62	7,247.60	3,572.34
	December	23,214.67	45.16	23,169.51	11,420.25

Total in 2020		**259,087.41**	**529.98**	**258,557.43**	**127,442.00**
2021	January	2,773.53	122.39	2,651.14	1,306.75
	February	16,552.12	60.87	16,491.25	8,128.54
	March	21,517.59	41.03	21,476.56	10,585.80
	April	30,016.84	24.87	29,991.97	14,783.04
	May	22,177.83	36.52	22,141.31	10,913.45
	June	14,191.48	52.82	14,138.66	6,968.95
	July	23,839.59	42.12	23,797.47	11,729.77
	August	9,193.77	54.99	9,138.78	4,504.50
	September	747.85	62.16	685.69	337.98
	October	9,988.07	67.95	9,920.12	4,889.63
	November	7,680.26	85.93	7,594.33	3,743.25
	December	148.62	133.58	15.04	7.41
Total in 2021		**158,827.54**	**785.22**	**158,042.32**	**77,899.00**
Grand Total		**427,915.24**	**1,410.98**	**426,504.26**	**210,222.00**

5.2 Project Emissions

The project has a reservoir area of 13,400,000 m^2. Therefore, the power density of the project calculated to be 6.119 W/m^2.

Table 5 Monthly Project Emissions during the monitoring Period (Emission Reduction Factor for the Reservoir EF_{res} is 90 $kgCO_2e/MWh$)

		Gross Electricity Production	**Project Emissions $(TEG_y*EF_{res})/1000$**
	Symbol	TEGy	PEy
YEAR	**Units**	MWh	tCO_2e

2019	December	10,000.29	900.03
Total in 2019		**10,000.29**	**901 (round up)**
2020	January	13,111.44	1,180.03
	February	21,377.09	1,923.94
	March	38,062.55	3,425.63
	April	43,697.74	3,932.80
	May	44,023.46	3,962.11
	June	13,101.87	1,179.17
	July	33,632.30	3,026.91
	August	11,881.25	1,069.31
	September	7,712.46	694.12
	October	1,950.36	175.53
	November	7,322.22	659.00
	December	23,214.67	2,089.32
Total in 2020		**259,087.41**	**23,318 (round up)**
2021	January	2,773.53	249.62
	February	16,552.12	1,489.69
	March	21,517.59	1,936.58
	April	30,016.84	2,701.52
	May	22,177.83	1,996.00
	June	14,191.48	1,277.23
	July	23,839.59	2,145.56
	August	9,193.77	827.44
	September	747.85	67.31
	October	9,988.07	898.93
	November	7,680.26	691.22
	December	148.62	13.38
Total in 2021		**158,827.54**	**14,295 (round up)**
Grand Total		**427,915.24**	**38,514**

5.3 Leakage

According to the ACM0002, version 20.0 methodology no leakage occurred, 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

Emission reductions are calculated as follows:

ER_y = Emission reductions in year y (tCO_2e/yr)
BE_y = Baseline emissions in year y (tCO_2e/yr) (Please refer section 5.1)
PE_y = Project emissions in year y (tCO_2e/yr) (Please refer section 5.2)
LE_y = Leakage in year y (tCO_2e/yr) (Please refer section 5.3)

Hence,

$ER_y = BE_y - PE_y$

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)
2019 (from 02.12.2019 to 31.12.2019)	4,881	901	0	3,980
2020 (from 01.01.2020 to 31.12.2020)	127,442	23,318	0	104,124
2021 (from 01.01.2021 to 31.12.2021)	77,899	14,295	0	63,604
Total	**210,222**	**38,514**	**0**	**171,708**

Comparison of the ex-ante and ex-post values:

The ex-ante emission reduction estimations were 98,484 tCO2e per year for the crediting period, however the first monitoring period has revealed a total of 171,708 tonnes of CO2e for 25 months. This approximates to 82,419.84 of net tCO2 ER per annum, which is less than ex-ante annual ERs.