AKÇAY 28.78 MW HYDROELECTRIC POWER PLANT PROJECT

Document Prepared by GTE

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Prepared By	GTE
Contact	MAIDAN - Mustafa Kemal Mah. 2118. Cad. No: 4 C Blok 42 06510 Cankaya - Ankara – TURKEY +90 312 514 63 63 kemal@gte.com.tr www.gte.com.tr

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Akcay Hes Elektrik Üretim A.Ş. installed Akçay HEPP with 28.78 MW runoffriver hydropower electricity plant (HEPP) at the end point of Bozdoğan – Akçay Left Coast Main Irrigation Channel in Aydin, Turkey. The expected life time of the project is minimum 40 years which corresponds to the duration of the licence obtained from EMRA. Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources which otherwise would have been generated by the fossil fuel fired power plant.

Prior to the implementation of the project, Kemer regulator and irrigation channels had been built by DSİ (State Hydraulic Works of Turkey) downstream of Kemer dam within the scope of Bozdoğan – Akçay project. Headpond, penstock, power house and tail-water channel have been added on the existing irrigation channel for Akçay HEPP as stated in the feasibility report of the project.

The plant uses the water left from the channel to generate electricity, before conveying water to the Akcay river bed. Therefore, the project activity of Akcay HEPP does not include any reservoir area or diversion weir. The project not only produces electricity from water, but also plays a role of conveying water to the river bed as a part of the irrigation channel.

Implementation of the project consists of construction of the following main items: Penstock with length of 380.00 m.; Power house with Francis type turbines. In the power house, three vertical shaft Francis turbines is installed, two 11.60 and one 5.58 MW (total capacity 28.78 MW). The first-hand turbines which are used in the project are supplied from Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China. The efficiency of the turbines is 93% and there are three generators attached to the facility. The net electricity production (delivered to the grid after losses and consumption in the plant) from the plant is estimated to be 76.170 GWh per annum. Estimated CO2 reduction is 35,091 tonnes annually while it is calculated as 350,909 tonnes for the whole crediting period.

The project milestones are provided in the table below:

Table 1. Project implementation milestones

Milestone	Date/ Explanation
Generation License (Final Amendment Date)	24/11/2003
Loan Agreement (Investment Decision Date)	09/2008
Construction Start	05/2008
VCS Registration Date	19/11/2013
Commissioning of the Project (Project Start Date)	14/08/2009

First Monitoring Period	14/08/2009-30/04/2013
Second Monitoring Period	01/05/2013-13/08/2019
Second Crediting Period	14/08/2019 – 13/08/2029

Table 2. Technical Properties of Akcay HEPP

LOCATION	AKCAY CREEK, WITHIN THE BOUNDARIES OF AYDIN PROVINCE
TOTAL INSTALLED CAPACITY	28.78 MW
NUMBER OF UNITS	3
TURBINE CAPACITY	11.60 MW (one) / 5.58 MW (two)
TURBINE TYPE	FRANCIS TYPE – VERTICAL
TURBINE MAKE	Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China.
LENGTH OF PENSTOCK	380.00 M
AVERAGE ANNUAL POWER GENERATION	76.170 GWh

1.2 Sectoral Scope and Project Type

This is a voluntary project, but it follows the CDM rules. The approved baseline and monitoring methodology for large-scale project activities ACM0002-Version.20.0: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applied.

Proposed project activity is categorized in the sectoral scope 1 "Energy Industry – Renewable -/Non-renewable Sources" according to the UNFCCC definition[1].

1.3 Project Eligibility

Akçay HEPP project is eligible under the scope of VCS since the project meets the following requirements:

[1] http://cdm.unfccc.int/DOE/scopes.html

- Akçay HEPP project is a grid connected renewable power generation project that applies a methodology (ACM0002) eligible under VCS program.
- The implementation of project activities do not cause the violation of any applicable law.

1.4 Project Design

Project is not a part of grouped project.

Eligibility Criteria

N/A, since the project is not a part of grouped project.

1.5 Project Proponent

Organization name	**AKÇAY HES ELEKTRIK URETIM A.S.**
Contact person	Seçkin Demiryapan
Title	-
Address	Şehit Nevres Bulvarı, No:10, Kat:7 Deren Plaza Montrö / İZMİR TURKEY
Telephone	+90 232 463 98 11
Email	seckin.demiryapan@endaenerji.com.tr

1.6 Other Entities Involved in the Project

Project Consultant

Organization name	**GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S.**
Contact person	M.Kemal Demirkol
Title	Director
Address	MAIDAN - Mustafa Kemal Mah. 2118. Cad. No: 4 C Blok 42 06510 Cankaya - Ankara – TURKEY
Telephone	+90 312 514 63 63

Email	kemal@gtecarbon.com

1.7 Ownership

As per the license issued by Energy Market Regulatory Authority (EMRA), all legal rights of the project is given to AKÇAY HES ELEKTRIK URETIM A.S.

1.8 Project Start Date

Project start date is 14/08/2009 (The commissioning date of the project).

1.9 Project Crediting Period

Project's second crediting period includes the dates of 14/08/2019 – 13/08/2029 (both dates included). The crediting period is 10 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

According to the VCS Standard v4.1, project categorizations are as follows:

- Projects: Less than or equal to 300,000 tonnes of CO_2 per year
- Large projects: Greater than 300,000 tonnes of CO2 per year.

Therefore, the project is classified under "project" category.

Project Scale	
Project	x
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
14/08/2019 – 31/12/2019	13,459
2020	35,091
2021	35,091
2022	35,091
2023	35,091

2024	35,091
2025	35,091
2026	35,091
2027	35,091
2028	35,091
01/01/2029 – 03/08/2029	21,631
Total estimated ERs	350,909
Total number of crediting years	10 years
Average annual ERs	35,092

1.11 Description of the Project Activity

Akcay HEPP project entails the construction and operation of a 28.78 MW hydroelectric power plant, the construction of connection canals, and penstock. The project consists of hydro power plant with two turbines of 11.60 and one 5.58 MW. The first-hand turbines which will be used in the project will be supplied from Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China. The turbines will be Francis type with vertical axis. The net electricity production (delivered to the grid after losses and consumption in the plant) from the plant is estimated to be 76.170 GWh per annum. The quantity of electricity required for operation of the plant is at a negligible level.

The project was designed by Yol – Su Müh. ve Müş. Ltd. Şti. which is experienced in energy structures, roadways and bridge construction. There are many projects the company finished such as Dim Dam, Kilavuzlu Dam, Süleymanlı HEPP and Sırma HEPP and over 50 various projects on which company has still been working.[2]

The technology used in the plant is a state-of-the-art technology with extensive automatization. The equipment to be provided is brand new according to the electromechanical equipment agreement. The equipment were produced at the end of 2008. There is no new technology which is expected to replace the plant's technology in the short run. The project does not need extensive initial training and maintenance efforts in order to work as presumed during the project planning period. Necessary trainings to the plant staff has been delivered by the supplier in line with the agreement between the project owner and the supplier.

[2] http://www.yolsu.com.tr/index.php?p=tsrlr

The economic life of an HEPP in Turkey is assumed as 50 years[3]. However, it is recommended to renew the equipment in every 20 years.[4]

The existing electricity grid in Turkey is an interconnected single entity which to a larger extend fed by fossil fuel fired power plants. Akcay 28.78 MW Runoff-River HEPP Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources which otherwise would have been generated by the fossil fuel fired power plant.

The subject project will not cause any GHG emissions during the operation. The quantity of emissions created for the construction of the project is negligible according to ACM0002 / Version 20.

1.12 Project Location

The project is located in the Aegean Region of Turkey, within the province of Aydin. The project is on the Akcay creek. The altitude at the location is 65.00 m. Headpond coordinates are 615 038 E, 4 182 935 N while plant building coordinates are 615 459 E, 4 183 125 N.[5]

[3] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.25)

[4] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26

[5] Akçay Final Feasibility Report, page 2/116

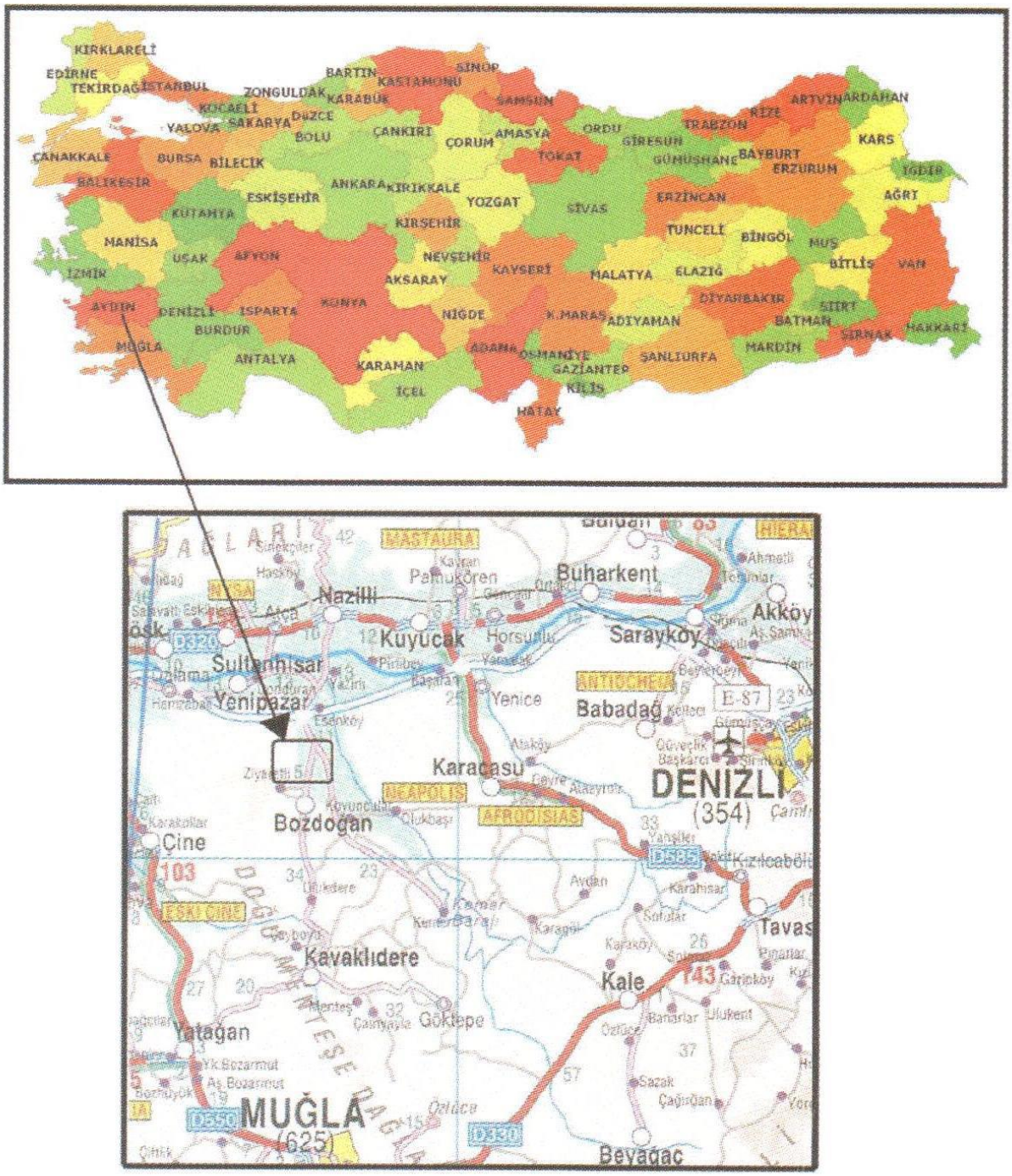

Figure 1. Location of the project on the map

1.13 Conditions Prior to Project Initiation

Prior to project initiation, the project area did not host livestock production activity. The project area hosted some agricultural production activity in some land. Such land has been expropriated with full consent from the villagers because the agricultural land under project affected area did not pose a commercial value to the farmers as those fields happened to be used for low value added crops such as cereals for household use and livestock feeding. The farmers were content with selling those fields for a good value and use the funds to improve their land they used for olive groves or for new machinery to for better olive oil processing. The project site had been vacant as the project is a new power unit and it did not replace an old plant.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

It is important to note that there are no local laws and regulations in Turkey because it is not a federal state. The Akcay HEPP is in compliance with relevant national laws and regulations related to the project. The general scheme of the regulations this kind of facilities in line with, are defined by The Renewable Energy Law and Environmental Law. [6],[7] Such laws also include land use regulations, forest use permissions and environmental risk management regulations. The company has had the Pre-Assessment Report, Energy Production Licence and water use agreement until now. In addition to these, company will have to have TEİAŞ Connection Agreement, System Usage Agreement and then Substantial Completion Agreement in the coming months.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project doesn't claim Green or White certificates or equivalents that may result in double counting as a result of carbon dioxide emission reduction purposes.

1.15.2 Projects Rejected by Other GHG Programs

The project doesn't claim Green or White certificates or equivalents that may result in double counting as a result of carbon dioxide emission reduction purposes.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project doesn't claim Green or White certificates or equivalents that may result in double counting as a result of carbon dioxide emission reduction purposes.

1.16.2 Other Forms of Environmental Credit

[6] http://www.epdk.gov.tr/mevzuat/diger/diger.htm

[7] http://www.cevreorman.gov.tr/yasa/k/2872.doc

The project doesn't claim Green or White certificates or equivalents that may result in double counting as a result of carbon dioxide emission reduction purposes.

1.17 Additional Information Relevant to the Project

Leakage Management

N/A. There is no leakage risk within the project activity.

Commercially Sensitive Information

N/A. There is not any commercially sensitive information regarding the project, all information has been included in the public version of the project description.

Sustainable Development

The project helps following sustainable development goals:

1 – Affordable and Clean Energy (SDG 7): The project promotes clean and sustainable energy production and use. The total net electricity production of the project is estimated to be 76,170 MWh/year.

2 – Decent Work and Economic Growth (SDG 8): The project generated employment for all. The employee has required technical training and certifications.

3 – Climate Action (SDG 13): The project contributes to SDG 13 with an amount of 35,091tonnes of CO2e, which represent direct and quantifiable impact on climate security.

Further Information

N/A. There is no further information that has a bearing on the eligibility of the project.

2 SAFEGUARDS

2.1 No Net Harm

N/A. The project has no negative environmental and socio-economic impacts.

2.2 Local Stakeholder Consultation

Although the domestic laws and regulations do not require any stakeholders' participation, both in the project planning and construction phase, the project owner managed to conduct various unofficial and unstructured stakeholder participation meetings. The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from

AKÇAY and relevant contact information was announced in the relevant meetings for ongoing communication.

The project owner used different channels to invite comments by stakeholders. Most of the meetings were held through the Mukhtar (village governors) and Council of Elderly (İhtiyar Heyeti; the village council) of Osmaniye village, and the officials of Municipality of Nazilli. The project owner visited various households in the project area to comprehend their needs and to identify how the project could assist in meeting the social and economic needs of the community. Due to the fact that the region is the least developed and most problematic region in terms of geographical conditions, during the construction period, the company helped the residents in the region to mitigate the effects of tough living conditions.

Below is the list of stakeholder comments and the details of those comments were taken into account.

- The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.

Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, Aydın.

- The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project.

The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs.

2.3 Environmental Impact

The domestic law and regulation does not require any environmental impact assessment. According to applicable law, the project owner is required to conduct a pre-assessment where they need to prove that the project site is not particularly sensitive to any environmental and social impact. Such pre-assessment has been conducted and the project has been qualified not to have any further environmental and social assessment.

The project design identifies and addresses all social and environmental issues. The project pursues a pre-assessment report approved by the Ministry of Environment where all environmental and social concerns were identified through non-formal meetings and hearings with local stakeholders. The pre-assessment report asserted that all issues were taken into consideration in the project design.

2.4 Public Comments

Although the domestic laws and regulations do not require any stakeholders' participation, both in the project planning and construction phase, the project owner managed to conduct various unofficial and unstructured stakeholder participation meetings. The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from AKÇAY and relevant contact information was announced in the relevant meetings for ongoing communication.

The project owner used different channels to invite comments by stakeholders. Most of the meetings were held through the Mukhtar (village governors) and Council of Elderly (İhtiyar Heyeti; the village council) of Osmaniye village, and the officials of Municipality of Nazilli. The project owner visited various households in the project area to comprehend their needs and to identify how the project could assist in meeting the social and economic needs of the community. Due to the fact that the region is the least developed and most problematic region in terms of geographical conditions, during the construction period, the company helped the residents in the region to mitigate the effects of tough living conditions, as listed above.

Below is the list of stakeholder comments and the details of those comments were taken into account. Yet, there is no comments received affecting the design and implementation of the project.

The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.

Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, Aydın.

The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project.

The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs.

During the project implementation, people around the region prefers face-to-face communication. Project manager is accessible by locals all the time. There is no problem encountered about the project/way of communication so far.

2.5 AFOLU-Specific Safeguards

N/A, since the project is not an AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The UNFCCC approved baseline and monitoring methodology ACM0002, version 20.0 was applied for the project activity. Following tools have been used:

- Tool for the demonstration and assessment of additionality, Version 07.0.0
- Tool to calculate the emission factor for an electricity system, Version 07.0
- Tool to determine the remaining lifetime of equipment, Version 01
- Tool 11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 3.0.1
    - The tool offers 2 steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.
    - Although there is no change in national/sectoral policies affecting project implementation (Step 1.1), investement and technology (Step 1.3), the current situations such as margin calculations (Step 1.2) and parameters not monitored (Step 1.4) have been changed. Therefore, Step 2 has been applied.

3.2 Applicability of Methodology

Project meets the applicability criteria defined by the selected methodology which is ACM0002, ver 20.0:

- The project activity is a greenfield, grid connected renewable electricity generation project.
- The project activity is the installation of hydro power plant.
- The project does not involve capacity addition, a retrofit of (an) existing plant(s) or a replacement of (an) existing plant(s).
- Project activity does not involve switching from fossil fuels to renewable energy sources at the site of project activity.
- The project does not involve combined heat and power generation activity.
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

Since there exists no delineation of project electricity system or connected electricity systems by DNA, following criteria has been used to determine the existence of significant transmission constraints:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

Since the project output is fed to the Turkish electricity grid which does not involve any distinct electricity systems that applies different price, first criteria defined above is not applicable. Also, since the transmission line between the proposed projects and nearest substation is built within the scope of the project and there exist no information on grid capacity utilization, second criteria is also inapplicable. Based on assessment above, it is difficult to conclude with a significant transmission constraint or grid boundary. Since there is no dispatch grid system in Turkey, the project boundary is considered as the National Electricity Grid of Turkey according to applied tool. The geographical and physical boundaries of the Turkish grid and location of the power plants are well identified as given diagram below.

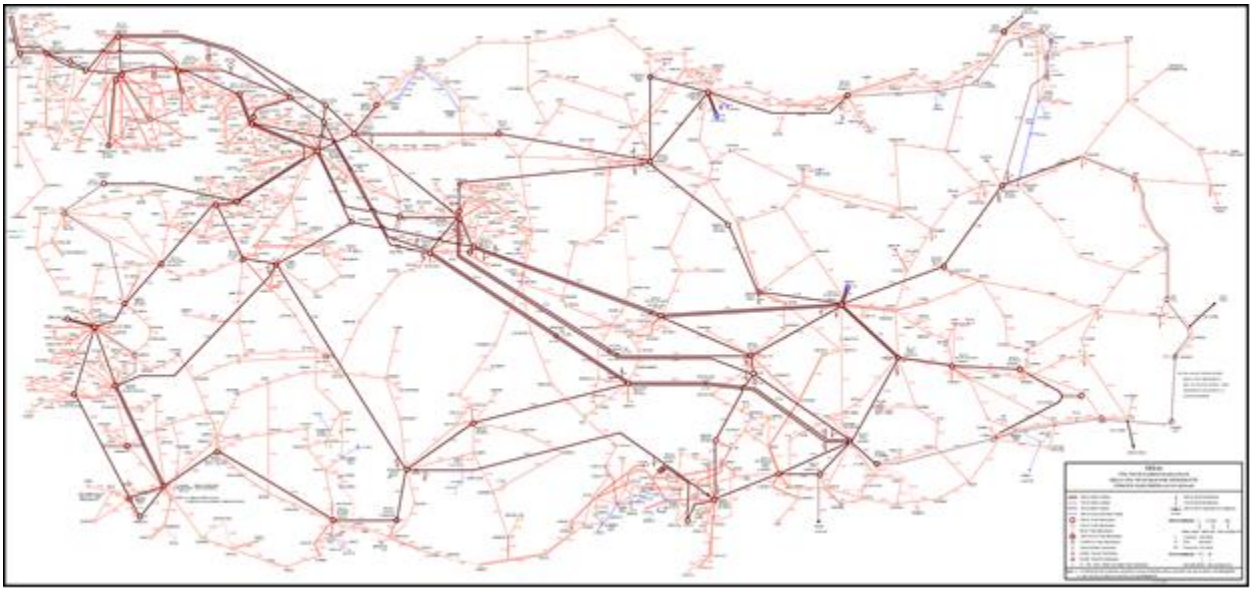

Figure 2. Turkish electricity grid

As per ACM0002 methodology Section 2.2.9, the applicability conditions included in the tools used shall also be discussed.[8]

- Tool 01 Tool for the demonstration and assessment of additionality: The project uses relevant tool together with ACM0002 methodology. No new methodology is used. Since the tool is included in ACM0002, its application is mandatory.
- Tool 07 Tool to calculate the emission factor for an electricity system: This tool is used for the calculation of OM, BM and CM and applicable since the project activity includes grid power plants and supplies electricity to the grid and the project is not a CDM project but a voluntary project following CDM rules.
- Tool 01 Tool to determine the remaining lifetime of equipment: This tool is used to determine the remaining lifetime of baseline or project equipment.
- Tool 11 Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period: This tool is used to determine the validity of the current baseline and in the case of invalid baseline for the next crediting period, the tool provides an approach to update the baseline as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism.

3.3 Project Boundary

The project boundary is considered as the National Electricity Grid of Turkey according to applied tool. The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the power plant is connected to.

8 https://cdm.unfccc.int/filestorage/A/G/0/AG07ZJQ3EXD42LT5YV9HR16M8KINPO/EB105_repan03_ACM0002.pdf?t=TkZ8cWE1d3Z5fDAMlwrWrTEaq81H7qJaF6td

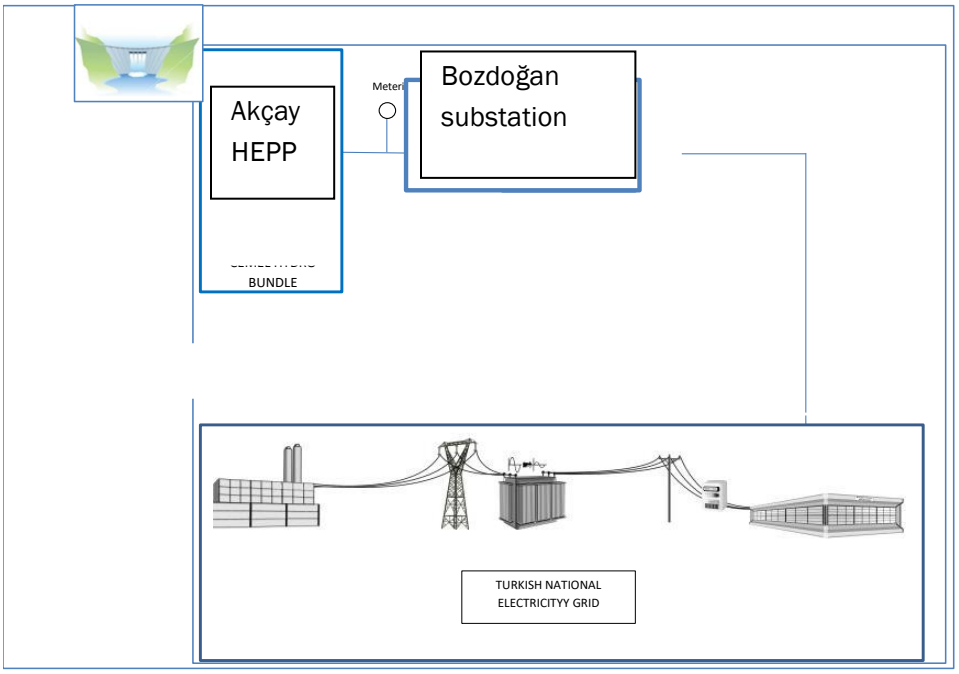

Figure 3. Project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Generation mix of electricity grid in Turkey	CO_2	Yes	Major emission source
		CH_4	No	Minor emission source. Excluded for simplification
		N_2O	No	Minor emission source. Excluded for simplification
Project	Construction and operation of HEPP	CO_2	No	Zero emission electricity generation from renewable resources. Emissions from diesel generator are excluded for simplification as it is a minor emission source.
		CH_4	No	Zero emission electricity generation from renewable resources.
		N_2O	No	Zero emission electricity generation from renewable resources.
	Emission of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	Yes	Main emission source

Source	Gas	Included?	Justification/Explanation
	N_2O	No	Minor emission source

3.4 Baseline Scenario

According to the Tool 11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 3.0.1, there are some requirements:

- The tool offers 2 steps. The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.

- Although there is no change in national/sectoral policies affecting project implementation (Step 1.1), investment and technology (Step 1.3), the current situations such as margin calculations (Step 1.2) and parameters not monitored (Step 1.4) have been changed. Therefore, Step 2 has been applied.

Accordingly, a new combined margin has been used for the second crediting period. Ministry of Energy and Natural Resources document named as Turkey's National Electricity Network Emission Factor Factsheet was used for OM and BM values. OM is calculated as 0.6993 tCO_2/MWh whereas BM is 0.3812 tCO_2/MWh for Turkey. Therefore, CM is calculated as 0.4607 whereas 0.25 and 0.75 weightage factor given to OM and BM, respectively. According to the methodology, baseline scenario was identified as "the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources".

Turkish electricity generation is mainly composed of thermal power plants and the share of renewable resources. Since Turkey is an advanced developing country, there is an increasing demand for electricity which is fully expected to continue in the foreseeable future.

The trend in Turkey to date and given historically slow development of alternative energy resources is to build an increasing number of thermal power plants in the future to satisfy the annual growth in energy consumption demand. Turkey as an advanced developing nation has looked at dealing with energy security by developing and constructing high capacity coal and natural gas power plants. The development of thermal power plants has been also encouraged by the large natural resource availability in Turkey, especially the abundance of economically accessible lignite.

In the absence of the project activity, the same amount of electricity is required to be supplied via either the current power plants or by increasing the number of thermal power plants thus increasing GHG emissions.

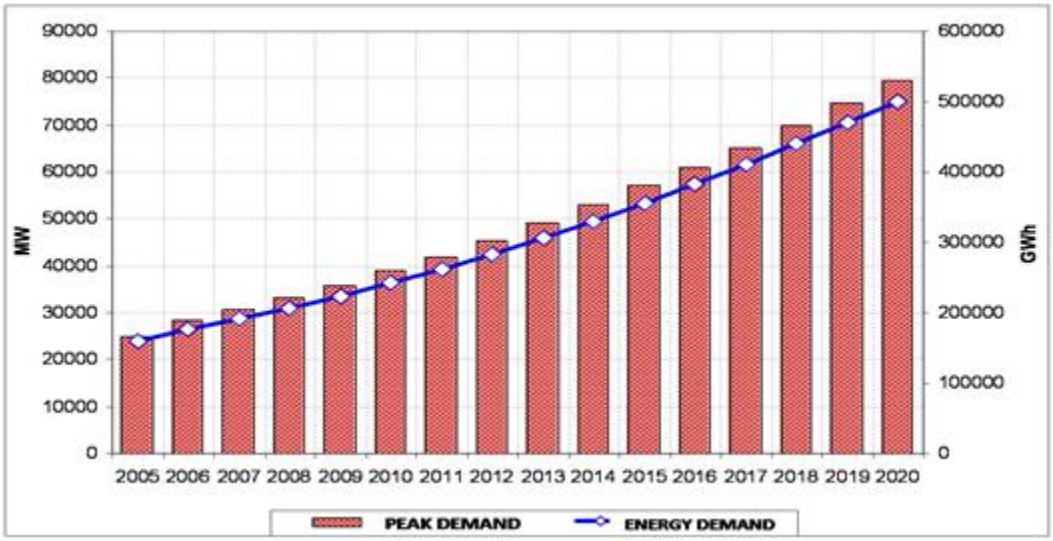

Figure 4. Peak Load and consumption projection for Turkish electricity system between 2005-2020[9]

According to the Ministry of Energy and Natural Resources statistics[10], share of WPPs together with geothermal power plants could hardly reach 6.6% in 2019 whereas share of Coal and natural gas are 37.3% and 29.8%, respectively. When we look at the annual development of Turkey's gross generation in recent years we see that grid is dominated by thermal power plants and which is boosted by increasing energy demand in parallel to increase population and per capita income. Hence, baseline of Turkey's electricity grid will continue to be dominated by fossil fuel power plants which is seen as the quickest solution in short term to meet the demand and enable energy security in supply side.

9 http://www.teias.gov.tr/apkuretimplani/veriler.htm

[10] https://www.enerji.gov.tr/tr-TR/Sayfalar/Elektrik

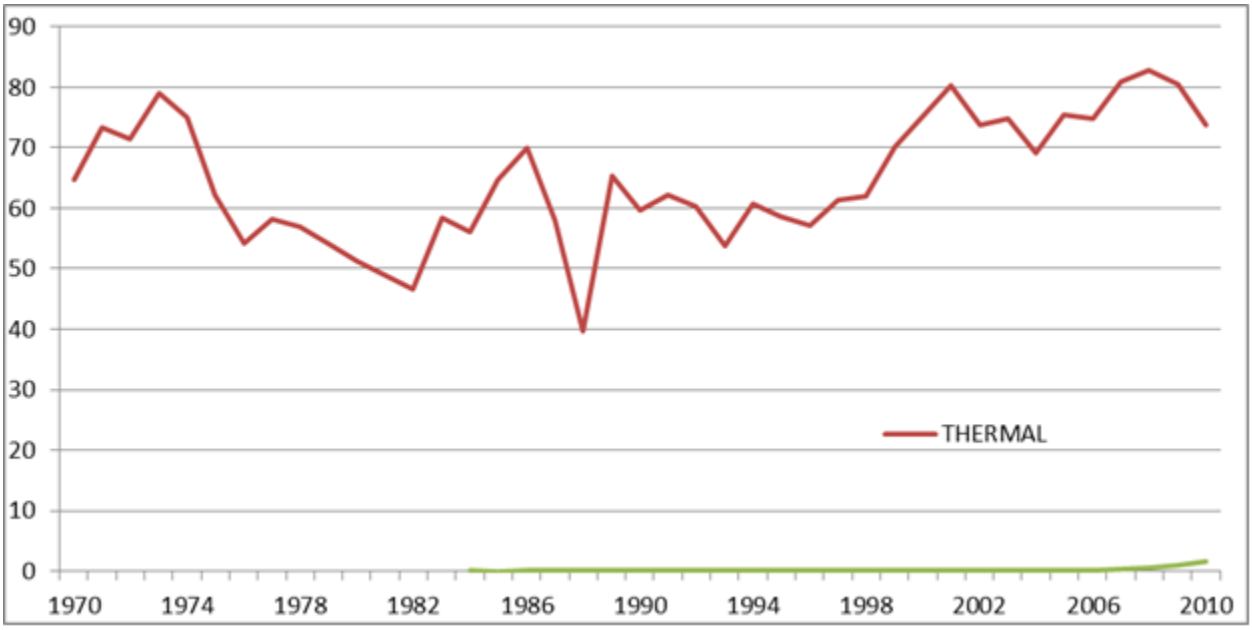

Figure 5. Annual Development of Turkey's Gross Generation Capacity

3.5 Additionality

This step is not applied since the additionality was demonstrated during first crediting period using CDM tool applicable at time of project submission.

The project is not being implemented to comply with any law or other regulatory framework. It is a voluntary project.

3.6 Methodology Deviations

The most current version of ACM0002 has been used which is ver 20.0. There is not any methodological deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emission is calculated according to the formula:

BEy = EGy x EFy

Where:

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

EFy = Emission factor calculated according to selected methodology According to the Ministry of Energy and Natural Resources document named as Turkey's National Electricity Network Emission Factor Factsheet, OM is calculated as 0.6993 tCO_2/MWh whereas BM is 0.3812 tCO_2/MWh)[11] Therefore, CM is calculated as 0.4607 whereas 0.25 and 0.75 weightage factor given to OM and BM, respectively.

BEy = 76,170 MWh × 0.4607 tCO_2e/MWh = 35,091 tCO_2e

4.2 Project Emissions

The proposed project activity involves the generation of electricity by hydroelectric power plant therefore project activity does not result in greenhouse gas emissions.

PEy = PE FF,y + PEGP,y + PEHP,y

Where:

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

PE FF,y = Project emissions from fossil fuel consumption in year y (t CO_2/yr)

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

PEHP,y = Project emissions from water reservoirs of hydro power plants in year y (t CO_2e/yr)

Since this project uses hydroelectric power PEGP,y is "0" (t CO_2/yr)

The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. According to the applied methodology ACM0002_(v20.0) " for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected (paragraph 38). Therefore;

PE FF,y = 0 (t CO_2/yr)

Beside of the diesel generator, other potential project emission for this proposed project is PEHP,y

PEHP,y = Project emissions from water reservoirs (t CO_2e/yr)

PEHP,y = EFRES * TEGy /1000

[11] https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf

Where;

EFRES = Default emission factor for emissions from reservoirs of hydro power plants (kg CO_2e/MWh)

TEGy = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

However, if the power density of the project activity is greater than 10 W/m2 than PEHP,y =0

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

PD = (CapPJ – CapBJ) / (APJ - ABL)

Where:

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

CapPJ = Installed capacity of the hydro power plant after the implementation of the project activity (W)

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

APJ = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

ABL = Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

PD = (28,780,000 W – 0) / (0 -0) =∞

Therefore, power density is assumed to be 0 as suggested by the methodology.

PEy = PE FF,y + PEGP,y + PEHP,y

PEy = 0 + 0 + 0 = 0 (t CO_2/yr)

4.3 Leakage

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

LEy = 0

As a result, Total Emission Reduction is:

ERy = BEy

4.4 Net GHG Emission Reductions and Removals

ERy = BEy – PEy – Ley

LEy = 0

PEy =0

ERy = BEy

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
14/08/2019 – 31/12/2019	13,459	0	0	13,459
2020	35,091	0	0	35,091
2021	35,091	0	0	35,091
2022	35,091	0	0	35,091
2023	35,091	0	0	35,091
2024	35,091	0	0	35,091
2025	35,091	0	0	35,091
2026	35,091	0	0	35,091
2027	35,091	0	0	35,091
2028	35,091	0	0	35,091
01/01/2029 – 13/08/2029	21,631	0	0	21,631
Total	350,909	0	0	350,909

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	**EFgrid,CMy**
Data unit	tCO_2/MWh
Description	Baseline emission factor: the combined emission factor of the project grid system
Source of data	Turkey Ministry of Energy and Natural Resources https://enerjiapi.etkb.gov.tr/Media/Dizin/ETKB/Duyurular/0c6b62ea-bf2f-4fea-b9b3-28bc6f48ddf2_Bilgi_Formu_-_Web_Sitesi.pdf
Value applied	0.4607
Justification of choice of data or description of measurement methods and procedures applied	”Tool to calculate the emission factor for an electricity system”
Purpose of Data	Baseline emission calculation
Comments	EFgrid,CMy value (0.4607 tCO2/MWh) is valid for the duration of the crediting period.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility, y}$
Data unit	MWh/y
Description	Quantity of electricity generated and supplied by the project power plant to the consumers/electricity consuming facility i in year y
Source of data	EPIAS records and Meter reading records-OSF forms
Description of measurement methods and procedures to be applied	EPIAS records and meter reading records provides the exact electricity generation of the facility and the imports from the grid. According to meter reading protocols, the internal consumption of the facility was subtracted from the gross generation. EPIAS data are used for the quantity of net

<table>
<tr><td></td><td>electricity delivered to the grid, and it has been cross checked with the meter reading records (OSF forms) provided to the company by TEIAS.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuous measurement / Monthly recording</td></tr>
<tr><td>Value applied</td><td>76,170 MWh/y</td></tr>
<tr><td>Monitoring equipment</td><td>
<table>
<tr><td></td><td colspan="2">Feeder 1</td><td colspan="2">Feeder 2</td></tr>
<tr><td></td><td>Main</td><td>Spare</td><td>Main</td><td>Spare</td></tr>
<tr><td>Brand</td><td>EMH</td><td>ITRON</td><td>EMH</td><td>ITRON</td></tr>
<tr><td>Type</td><td>LZQJ-XC</td><td>SL761X071</td><td>LZQJ-XC</td><td>SL761X071</td></tr>
<tr><td>Class</td><td>C – 2S</td><td>0.5 -2S</td><td>C -2S</td><td>0.5 -2S</td></tr>
<tr><td>Serial No</td><td>9276783</td><td>84051667</td><td>9276784</td><td>84051668</td></tr>
</table>
</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Cross check measurements results with records for sold electricity. Calibration of the meters are valid for 10 years based on related regulation. In addition to the meters which is used for billing purposes, records taken by meters using at project site is used for comparison.

The meters should also comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit.

Maintenance and calibration of the metering devices are made by TEIAS. If there is a noticeable difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment is done before waiting for the periodical maintenance.

In cases where electricity meters are regulated (e.g. the electricity is supplied to the electric grid), the electricity meter is subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.</td></tr>
<tr><td>Purpose of data</td><td>To calculate the quantity of net electricity delivered to the grid</td></tr>
</table>

Calculation method	EGFacility,y=EGexport,y-EGimport,y (Annual electricity generation of the plant is calculated as the sum of the monthly generations obtained from EPIAS records. After deducting the amount of imported electricity from the generated electricity, the net electricity supplied to the grid is evaluated.)
Comments	-

Data / Parameter	**CapPJ**
Data unit	W
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	Supplier information on the equipment
Frequency of monitoring/recording	Once at each monitoring period
Value applied	28,780,000 W
Monitoring equipment	N/A, since no monitoring equipment is needed to determine the installed capacity.
QA/QC procedures to be applied	Supplier information on the related equipment and the existence of the equipment will be checked. Also this information can be checked from EPDK.
Purpose of data	To check the project's installed capacity
Calculation method	N/A, no calculation method was used since installed capacity is a given supplier information.
Comments	No change on the installed capacity with respect to the generation license.

5.3 Monitoring Plan

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. There are three sets of data to be monitored during the project activity.

The first one is the amount of electricity fed into the grid. There is already an electricity meter installation and these records provided the data for the monthly invoicing to TEIAS which form the basis for EPIAS data. EPIAS data is developed remotely by TEIAS and shows the monthly electricity generation of the company.

The second data to be monitored is the installed capacity of the project activity. The data is monitored from the digital displays on the equipment which show the installed capacity at the time, together with the electricity generation of the facility. The installed capacity can be monitored from turbine labels and also the generation license.

The third data to be monitored is the reservoir area for HEPP projects in general. However, because the subject project use the water left from the irrigation channel and it has no reservoir area, this data is not applicable for the project.

The project is operated by Akçay HES Elektrik Üretim A.Ş. which ensures the overall site management in accordance with Turkish Laws and technology providers' guidelines.

VER Team Members are expected to include the following staff of the HEPP:

Plant Engineer: Responsible for the control of the electricity supplied to the grid and imported from the grid with TEIAS. The electricity measurements are made by TEIAS remotely. The plant engineer checks these electricity measurement records and reports to the Operations Manager of the plant.

Accounting Manager: Responsible for keeping data about power sales, invoicing and purchasing.

Operations Manager: the VER coordinator, responsible for developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures.

GTE: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

In order to demonstrate the emission reduction, only required data is the net electricity delivered to the grid by the project activity. TEIAS has started to extract generation data from the facilities remotely through the EPIAS (previously PMUM system) which forms the basis for the billing.

During the monitoring period EPIAS readings and meter reading records (OSF forms) were used as the source of calculation of electricity generation and emission reductions. Meter reading protocols were compared for cross-check. Generation data collected during crediting period was submitted to GTE who is responsible for calculating the emission reduction subject to verification. Generation data were used to prepare monitoring report which was used to determine the vintage from the

project activity. This reports was submitted to the duly authorized and appointed Designated Operational Entity 'DOE' before verification period.

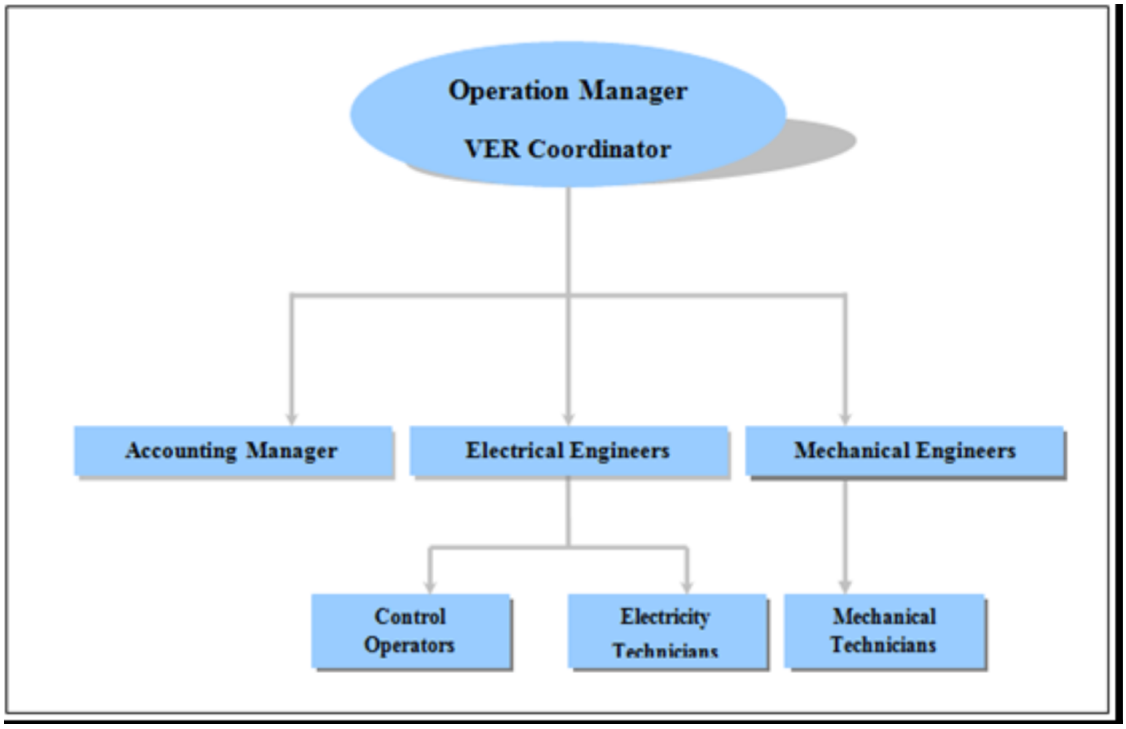

Figure 6. Site organizational chart

Each period, the monitoring report is submitted to DOE for the verification. The report covers the monitoring of grid-connected power generation, check report; report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc. All data collected as part of monitoring is archived electronically and kept at least for 2 years after the end of the last crediting period. The company establishes a dedicated maintenance system to ensure the data availability for the required period.

In line with the EMRA requirements, the company purchased and installed one unit electricity meter, but since the February 2013, company installed an addition unit meter and all measurements are realized by the two unit meters for the Akçay Hydroelectric Power Plant. The serial numbers of main meters are 376480 and 471186. The accuracy class of the product production is 0.5s. The serial number of first main meter's back-up is 376486 and the serial number of second main meter's back-up is 471187. According to the test reports of meters, the meters were tested by TEIAS on 11/05/2014.

On 20/05/2020, the meters have been changed again due to the commissioning of Bozdoğan Transformation Center. Detailed info about the meters are given in the table below.

Table 3. Meters Properties

	Feeder 1		Feeder 2	
	Main	Spare	Main	Spare
Brand	EMH	ITRON	EMH	ITRON
Type	LZQJ-XC	SL761X071	LZQJ-XC	SL761X071
Class	C- 2S	0.5 – 2S	C – 2S	0.5 – 2S
Serial No	9276783	84051667	9276784	84051668

Calibration of the metering devices has been made by TEIAS and sealed before the commissioning of the power plant. The meters were calibrated by TEIAS. The installed meters are in line with the regulations.

For internal auditing, TEIAS is in charge. Project owner is not responsible for any audit related to electricity meters, etc. In case of any problem with them, teams from TEIAS handle the issue.