CEYHAN 61.7 MW HYDROPOWER PROJECT

Document Prepared by Sekans Enerji Ltd Şti.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Ceyhan 61.7 MW Hydropower Project (hereafter referred to as “the project”) developed by Enova Enerji Üretim A.Ş., (hereafter referred to as “the project owner”) includes Oşkan and Berkman diversion weirs and HEPPs which are run-of-river hydro electrical power plants with a total installed capacity of 63.468MWm/61.704 MWe. . The project is a single green field investment.The Oşkan and Berkman diversion weirs of Ceyhan Project are located on Ceyhan River, in the city of Osmaniye, in South Anatolian Region, Turkey

The project includes two diversion weirs and HEPPs. Oşkan Diversion weir and HEPP, upstream, has an installed capacity of 23.889 MWe and generates 100.248 GWh electricity per year. Berkman HEPP, downstream, has an installed capacity of 37.815 MWe and generates 139,698 MWh electricity per year. The project includes 6 turbines, with an estimated power supply to the grid of 239,946 MWh per annum. [1]

Oşkan HEPP has 3 Pit Kaplan type turbines each with an installed capacity of 8.198MWm/7.963 MWe. Berkman HEPP is also equipped with 3 Pit Kaplan type turbines each with an installed capacity of 12,958 MWm /12.605 MWe.

The project will produce positive environmental and economic benefits through the following aspects:

- Displacing the electricity generated by fossil fuel fired power plants by utilising the renewable resources to avoid environmental pollution and GHG emissions,
- Contributing the economic development of the region by providing sustainable energy resources,
- Increasing the income and local standard of living by providing job opportunities for the local people,
- Reducing the blackout because of low voltage by lowering required capacity of the transformer.

[1] Please see the registered PD. Electricity generation projection has been made for every 5 years according to historical flow data of the river and future flows of upstream dams. Thus, this figure reflects the average generation projection between the years 2010-2030.

Oşkan HEPP started operation as of 03/06/2010 and Berkman HEPP's first turbine started operation as of 20/08/2010. Thus, the project start date is 03/06/2010[2].

The installed capacity of the project is 63.468MWm/61.704 MWe, which yields an output of 239,946 MWh per year to the Turkish National Grid in long-term average. Thus, the project will lead to estimated annual emission reduction of approximately 118,275 tons of CO2e.

1.2 Sectoral Scope and Project Type

According to UNFCCC sectoral scopes definition for CDM projects, the Project Activity is included in the Sectoral Scope 1, category "Energy industries (renewable - / nonrenewable sources)".

1.3 Project Eligibility

Requirements document as below.

- The project applies methodology ACM0002. Version 20.0, which is an approved methodology under VCS.
- The project type is hydro and an eligible project type as per the 1.1. Eligible Project Types & Scope under Renewable Energy Activity Requirements.

  (a) Project shall generate and deliver energy services (e.g., mechanical work/electricity/heat) from non-fossil and renewable energy sources.

  (b) Project shall comprise of renewable energy generation units, such as photovoltaic, tidal/wave, wind, hydro, geothermal, waste to energy and renewable biomass.
- The project activity results in displacement of electricity from thermal power stations while contributing to sustainable development of Turkey. Hence, the project contributes to the VCS and Mission.
- Hydro is an approved project type.

[2] Ministry Acceptance Protocol

1.4 Project Design

The project is a single green field investment and is not part of a project group or bundle.

Eligibility Criteria

- Type of project: Hydro
- Location of project: The project is located in Osmaniye province, Turkey. Therefore, the project is eligible.
- Project Area, Boundary and Scale: The registered project activity is 63.468MWm/61.704 MWe as large scale.

1.5 Project Proponent

Organization name	Enova Enerji Üretim A.Ş
Contact person	Koray Keskin
Title	Trade Manager
Address	Turkey
Telephone	+90 312 428 11 25
Email	koray.keskin@enovaenerji.com.tr

1.6 Other Entities Involved in the Project

Organization name	Sekans Enerji Ltd Şti.
Role in the project	Consultant
Contact person	Sıla Duran
Title	Consultant
Address	EMNIYET EVLERI MAH. ESKI BÜYÜKDERE CAD. NO: 1 /1 IÇ KAPI NO: 1B04 KAGITHANE/ ISTANBUL
Telephone	+90 532 438 30 29
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1.7 Ownership

Enova Enerji Üretim A.Ş[3]

1.8 Project Start Date

The project start date is 03/06/2010[4].

1.9 Project Period

The Project's crediting period is ten years renewable twice and the first crediting period is 03 June 2010 to 02 June 2020.Start date of the second crediting period: 03/06/2020

End date of the second crediting period: 02/06/2030

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	x

Year	Estimated GHG emission reductions or removals (tCO_2e)
03.06.2020 - 31.12.2020	68,696
2021	118,275
2022	118,275
2023	118,275
2024	118,275
2025	118,275
2026	118,275
2027	118,275
2028	118,275

[3] The Generation License

[4] The Ministry Acceptance Protocols are available to the DOE.

2029	118,275
01.01.2030 - 02.06.2030	49,578
Total estimated ERs	1,182,749
Total number of crediting years	10
Average annual ERs	118,275

1.11 Description of the Project Activity

The project is a run-of-river hydroelectric power plant with a total installed capacity of 63.468 MWm/ 61.704 MWe.. The project, being a run-of-river type Hydro-Power project, would generate power by utilizing the water diverted from the flow of Ceyhan River. The diversion weirs of the project are located on Ceyhan River to make use of the 25m. head between Aslantaş Dam and Cevdetiye Irrigation System at the downstream. This head is projected to be utilized by Oşkan HEPP, upstream, and Berkman HEPP, downstream.

Oşkan HEPP of the project is planned to be built with 23.889 MWe total installed capacity and equipped with 3 Pit Kaplan Type turbine-generator units (each turbine with 8.198MWm/7.963 MWe capacity). Depending on the water flow of the upstream projects, 100.248 GWh[5] electricity is produced annually in Oşkan HEPP.

Berkman HEPP, which is planned to be built with 37.815 MWe total installed power and equipped with 3 Pit Kaplan Type turbine-generator units (each turbine with 12,958 MWm /12.605 MWe.capacity). Depending on the water flow of the upstream projects, 139.698 GWh[6] electricity is produced annually in Berkman HEPP.

Electro mechanic equipments of the project have 20 year lifetime.

The technical data of the Oşkan HEPP and the Berkman HEPP are as follows;

Table 1 - Oşkan Diversion Weir and HEPP

Parameter	Specifications
Drainage Basin	14.775 km^2

[5] Please see the registered PD: Electricity generation projection has been made for every 5 years according to historical flow data of the river and future flows of upstream dams. Thus this figure reflects the average generation projection between the years 2010-2030.

[6] Please see the registered PD: Electricity generation projection has been made for every 5 years according to historical flow data of the river and future flows of upstream dams. Thus this figure reflects the average generation projection between the years 2010-2030.

Reservoir Water Level	83.00 m
Diversion Weir Type	Homogenous Filling
Crest Elevation	85.50 m
Crest Length	167.50 m
Height From Thalweg	14.50 m
Upstream Cofferdam Crest Elevation	77.50 m
Downstream Cofferdam Crest Elevation	76.50 m
Type of Weir	Radial Penstock
Approach Channel Elevation	73.00 m
Sill Elevation	74.50 m
Design Flow	1600 m^3/s
Penstock Dimensions	10.00 m x 9.19 m
Installed Power	23.889 MWe (7.963 MWe * 3)
Powerhouse Dimensions	54.50 x 67.00
Tailwater Level	72.50 m
Gross Head	10.50 m
Project Flow	267 m^3/s

Table 2- Berkman Diversion Weir and HEPP

Parameter	Specifications
Drainage Basin	14.842 km2
Reservoir Water Level	72.50 m
Diversion Weir Type	Homogenous Filling
Crest Elevation	75.00 m
Crest Length	231.00 m
Height From Thalweg	13.50 m
Upstream Cofferdam Crest Elevation	67.500 m
Downstream Cofferdam Crest Elevation	66.00 m
Type of Weir	Radial Penstock
Approach Channel Elevation	62.50 m
Sill Elevation	64.00 m
Design Flow	1600 m^3/s
Penstock Dimensions	10.00 m x 9.19 m
Installed Power	37.815 MWe (12.605MWe * 3)
Powerhouse Dimensions	53.00 m x 69.00 m
Tailwater Level	58.00 m
Gross Head	14.50 m
Project Flow	267 m^3/s
Number of Unit	3
Unit Type	Pit Kaplan

The net electricity production (delivered to the grid after losses and consumption in the plant) from the plant is estimated to be 239,946 MWhper annum. The amount of electricity

generated by the project is not influenced by factors outside the project boundary such as other power plants or demand for electricity.

The baseline scenario is 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. The Baseline Scenario is detailed in section 3.4. In the project scenario, the project generates electricity from hydro power and result in emission reductions in parallel with its electricity generation values. Since Turkey's grid mainly consists of thermal power plants, this would have resulted in GHG emissions. Briefly, in the absence of the project activity, the electrical energy would have been delivered to the grid through a mix of existing power generation resources, as described in more detail in section 3.4.

In addition to displacing the electricity generated by fossil fuel fired power plants by utilising the renewable resources to avoid environmental pollution and GHG emissions, the project activity has increased the income and local standard of living by providing job opportunities for the local people and contributed the economic development of the region by providing sustainable energy resources.

1.12 Project Location

The project is located on Ceyhan River which is in the borders of Osmaniye city in South Anatolian region of Turkey. The coordinates of the Oşkan HPP are 37.224463 North, 36.252444 East. The coordinates of the Berkman HPP are 37.168667 North and 36.233742 East.

Figure 1. Location of the Project Activity

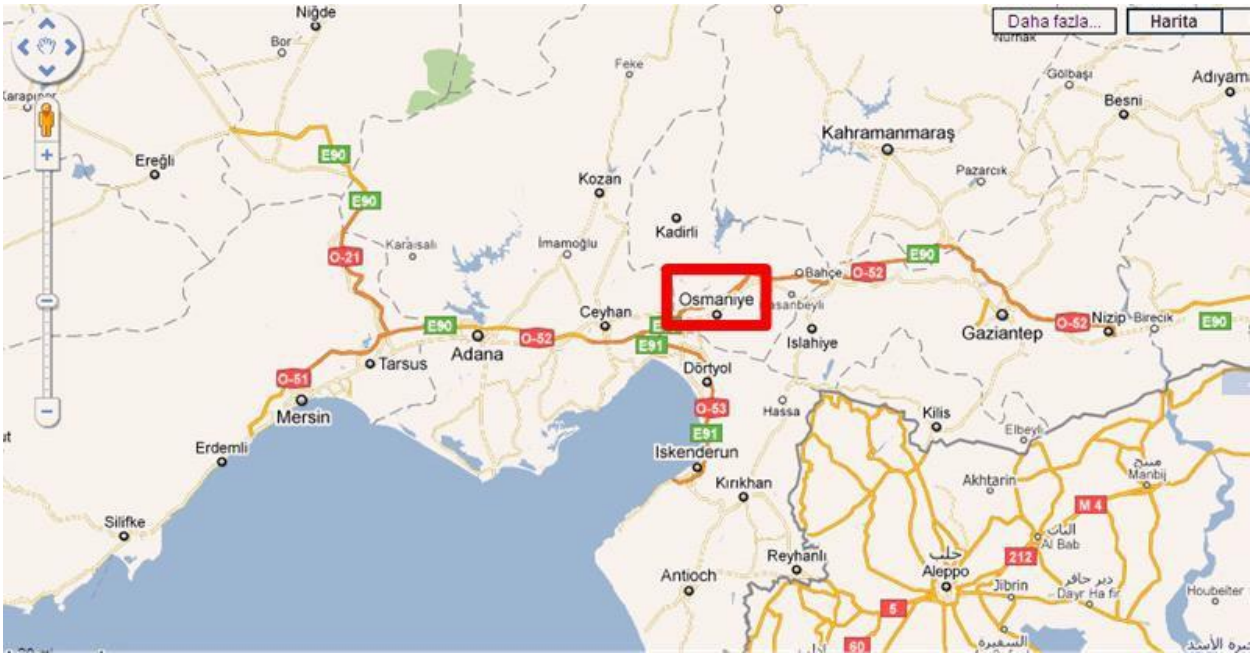

Figure 2. Project location on Turkey Map

1.13 Conditions Prior to Project Initiation

Please see Section 3.4.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Table 3 - Relevant laws and regulations

Relevant Laws	Number/ Enactment Date	Aim and Scope
Environmental Law *Environmental Impact Assessment Regulation	Nr. 2872 / 17/07/2008	The approval is requested for power plants from Ministry of Environment and Forest as Electricity Licence Regulation requests project to be in line with the environmental law.
Electricity Market Law *ElectricityLicence Regulation *Electricity Market Balancing andConciliation Regulation	Nr. 4628 / 03/03/2001	Regulating procedures of electricity generation, transmission, distribution, wholesale, retail for legal entities. Two regulations issued under the law; one for generation licence and the other for market price balancing and conciliation.

Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy	Nr. 5346 / 18/05/2005	Aims to extend the utilization of renewable energy for electricity generation and identifies method and principles for power generation from renewable resources in an economical and conservative manner as well as certification of the electricity generated from renewable resources.
Energy Efficiency Law	Nr. 5627 / 02/05/2007	Identifies method and principles for industry, power plants, residential buildings and transport to imply necessary measures for energy efficiency during electricity generation, transmission, distribution and consumption.
Regulation on procedures and principles of signing the agreement of utilization of water resources for the purpose of electricity production in the electricity market	National Gazette number 25150, 06/06/2003	Identifies procedures and principles of signing the agreement of utilization of water resources for the purpose of electricity production in the electricity market
Regulation on Environmental Impact Assessment	National Gazette number 26939, 17/07/2008	Identifies rules and principles for Environmental Impact Assessment of power plants

1.15 Participation under Other GHG Programs

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

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

1.15.2 Projects Rejected by Other GHG Programs

The project was not rejected by any other GHG program before.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

N/A

1.16.2 Other Forms of Environmental Credit

There is not another form of environmental credit generated by the project.

1.17 Additional Information Relevant to the Project

Leakage Management

N/A

Commercially Sensitive Information

N/A

Sustainable Development

The project produces electricity from renewable energy sources using hydro as the power source and to contribute to Turkey's growing electricity demand through a sustainable and low carbon technology. The project displaces the same amount of electricity generated by the grid dominated with fossil fired power plants. The project is expected to generate 239,946 MWh annually.

The annual emission reduction estimated by the project is 118,275tonnes CO2, approximately. While this number of emissions is mitigated, technology transfer is also realized as benefitting from hydropower.

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

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

Further Information

N/A

2 SAFEGUARDS

2.1 No Net Harm

Within the scope of the project, all precautions have been taken for the environment during the design phase and the project is implemented in line with the environmental law and related regulations.

The purpose of the project activity is to generate power in an efficient, clean, reliable and sustainable way with maximum respect on social and environmental aspects and to reduce emissions by partially substituting the electricity supply of fossil fuel fired power plants in Turkey. The consequences of the Project Activity with regards to economic, social and environmental impacts have been assessed during EIA process.

The project activity is not on forest land. There are agricultural lands around the project area; however, since the project is constructed on water and, no reservoir, no negative impacts are expected on agricultural land.

There is not any negative environmental or socio-economic impact

2.2 Local Stakeholder Consultation

The meeting was announced in local media and national (Bir Gün) newspapers and through Village Head of Karagedik. Also, national and local policy makers, local NGOs and the local people were invited. Residents in the village were informed about the event through the village heads of Karagedik, Karatepe and Nohuttepe. In this meeting authorized people from EN-ÇEV on behalf of the project owner Enova Enerji Üretim A.Ş. introduced project to the local people in terms of the size of the project, expected length of the construction period and to give details about how this project impacted their lives.

The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from Enova Enerji Üretim A.Ş. and relevant contact information was announced in the relevant meetings for ongoing communication.

The local workers have been given priority during the hiring for plant operation.

The Project has resulted in the creation of new jobs in the project region and improvement in local roads, contributing to living standards in the region. The project owner helped local people and the institutions in many ways.

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

The contact information of the plant responsible exist at the Mukhtars of Karagedik village, the project owner and local community are always in touch. The project owner regularly checks with the Mukhtar if any complaint or a request exists. Any complaint or need from the

local community could directly be received by the project owner and appropriate contributions or improvements are made to the local community. No complaint has been received during the monitoring period.

The project is operational and there is no update to the project design.

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

The online site visit for the renewal crediting period with DOE was made on 10/09/2021.The local people were interviewed and the general outcome of the interviews was positive verbally.

2.3 Environmental Impact

The specific benefits of the project are:

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

Preliminary EIA studies for the Oşkan and Berkman HEPP were prepared and submitted to the Osmaniye Provincial Directorate of Environment and Forestry (PDoEF) previously. Upon examining the Preliminary EIA study reports, the Osmaniye PDoEF issued "EIA Not Required" certificates for Oşkan and Berkman HEPP in 21st August 2003 pursuant to the then applicable national EIA Regulation.

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

During construction and operational period, the project has created employment opportunities for the local community. The project contributes the economic development of the region by providing sustainable energy resources. The project provides workers with a

safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments. Thus, the project contributes to the Sustainable Development Goal, Decent Work and Economic Growth.

The domestic law and regulation do 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.

2.4 Public Comments

The stakeholder meeting was held on 10th April 2009 in Karagedik Village in accordance with the World Bank Operational Manual requirements. The meeting was announced in local media and national (Bir Gün) newspapers and through Village Head of Karagedik. Also, national and local policy makers, local NGOs and the local people were invited. List and contact information of the NGOs have been determined using the database of "Civil Society Development Center"108. Residents in the village were informed about the event through the village heads of Karagedik, Karatepe and Nohuttepe.

The stakeholders were then invited to ask questions regarding the presentation and/or the project itself. The meeting was recorded via handy cam and an official written record was signed by the village heads in the project region regarding the first crediting period. The environmental and social aspects were discussed by the stakeholders and clarifications were sought. The overall response to the project was positive. The project team ensured that all relevant national legislations will be respected and compiled during the project activities.

The meeting was finalized with no adverse reactions, comments and/or further clarifications sought. The answers provided by the project team were accepted as satisfactory. All stakeholders agreed that no significant negative effects will result because of the project activity as far as they could assess according to their knowledge. No major concerns were raised during the entire consultation process requiring any changes in the project's implementation.

2.5 AFOLU-Specific Safeguards

The project is a non-AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Project type: Type I – Renewable Energy Projects

Category: D – Electricity Generation for a System

Methodology: ACM0002: Grid-connected electricity generation from renewable sources, Version 20.0

Sectoral Scope: 01 Energy industries (renewable - / non-renewable sources)

ACM0002 refers to:

- Tool to calculate the emission factor for an electricity system, Version 07.0,
- Tool "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
- "Tool to determine the remaining lifetime of equipment", -Version 01

3.2 Applicability of Methodology

The methodology ACM0002: Grid-connected electricity generation from renewable sources is applicable to grid-connected renewable power generation project activities that a) install a Greenfield power plant; b) involve a capacity addition to (an) existing plant(s); c) involve a retrofit of (an) existing operating plants/units; d) involve a rehabilitation of (an) existing plant(s)/unit(s); or e) involve a replacement of (an) existing plant(s)/unit(s).

The project activity installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield), ACM0002: Grid-connected electricity generation from renewable sources is applicable. The applicability criteria are listed and justified below:

The choice of methodology ACM0002 Version 20.0 is justified as the proposed project activity meets relevant applicability criteria:

Table 4- Applicability of ACM0002

Applicability Criteria	**Justification**
This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s)	The project is installation of a new hydro power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology. (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) The project activity is implemented in an existing	There is no project emission resulting from the reservoir area of the Project Activity as the power density of the project is greater than 10W/m2. .

reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2 ; (c) (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2	
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project is greenfield hydropower plant and does not have non-renewable components
Combined heat and power (co-generation) systems are not eligible under this category.	The project is hydropower plant.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically Distinct from the existing units.	The project does not involve the capacity addition.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW	The project does not involve retrofit, rehabilitation or replacement.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid, then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	The project is hydropower plant.

In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The project is hydropower plant.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Generation mixes of electricity grid in Turkey	CO_2	Yes	Main source. The dominant emissions from power plants are in the form of CO2, therefore CO2 emissions from fossil fuel fired power plants connected to the grid will be accounted for in baseline calculations.
		CH_4	No	-
		N_2O	No	-
Project	Construction and operation of HPP	CO_2	No	Not applicable

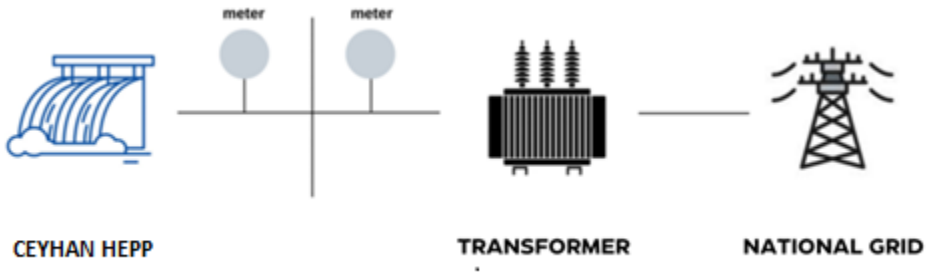

Figure 3. Project Boundary

3.4 Baseline Scenario

According to ACM0002 (Version 20), if the project activity is the installation of a new grid-connected renewable power plant, the baseline scenario is 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. In line with the tool, "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", the development of the Turkish energy mix and thus the baseline scenario have been re-analyzed as it may been seen below.

Step 1: Assess the validity of the current baseline for the next crediting period

The current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period.

The following applicable mandatory laws and regulations have been identified.

- Electricity Market Law[7]

  The project operated under the generation license which was given by the market operator (EMRA) and all licensees have to be act in line with this law.

- Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy

  The project utilizes hydro power and all renewable energy generators have to act in line with this law.

- Environmental Law[8] and Regulation on Environmental Impact Assessment (EIA)[9]

  The environmental indicators have been monitored and reported to the regulatory authorities in accordance with the EIA Regulation during 1st crediting period. The legal permissions and licenses have already been taken.

- Regulation on procedures and principles of signing the agreement of utilisation of water resources for the purpose of electricity production in the electricity market[10]

[7] https://www.mevzuat.gov.tr/mevzuatmetin/1.5.6446.pdf

[8] https://www.mevzuat.gov.tr/mevzuatmetin/1.5.2872.pdf

[9] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=39647&MevzuatTur=7&MevzuatTertip=5

[10] https://www.resmigazete.gov.tr/eskiler/2015/02/20150221-7.htm

All hyro power generators have to sign and act in line this regulation. Otherwise, no activity is allowed.

Step 1.2: Assess the impact of circumstances

As it may be seen in Figure 4, the development of Turkey's installed capacity by primary energy resources between the years, 2009-2019, the electricity generation has mainly been done by fossil fuel fired power plants in Turkey. Total Installed electricity generation capacity in Turkey has reached 91,267 megawatts (MW) as of 2019. As having a share of 31.23%, wind power projects have an installed capacity of 28,503 MW.

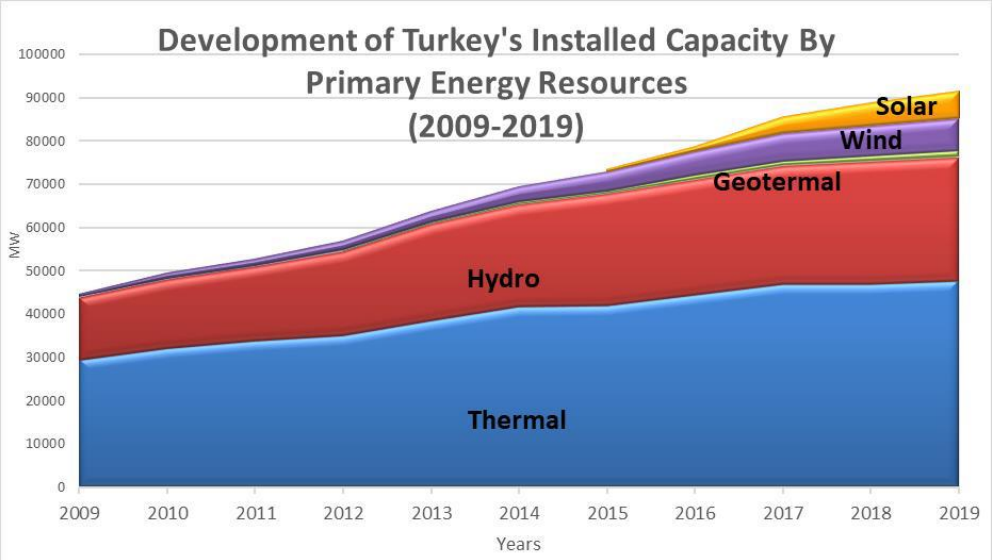

Figure 4. The development of Turkey's installed capacity by primary energy resources, 2009-2019

In reference to 5-year capacity projection11, it is clear that fossil fuels will remain the main sources for electricity generation through until 2024. Fossil fuels will continue to dominate the market. Hydro will account for 15% of the mix whereas all non-hydro renewable combined (geothermal/ biomass/ solar/ wind) will only account for 11% of all electricity generation capacity. This projection is consistent with continuing fossil fuel dependent characteristics of Turkish electricity sector.

[11] https://webapi.teias.gov.tr/file/abeac87d-3abc-4532-9cf4-d6f3a9d34c17?download

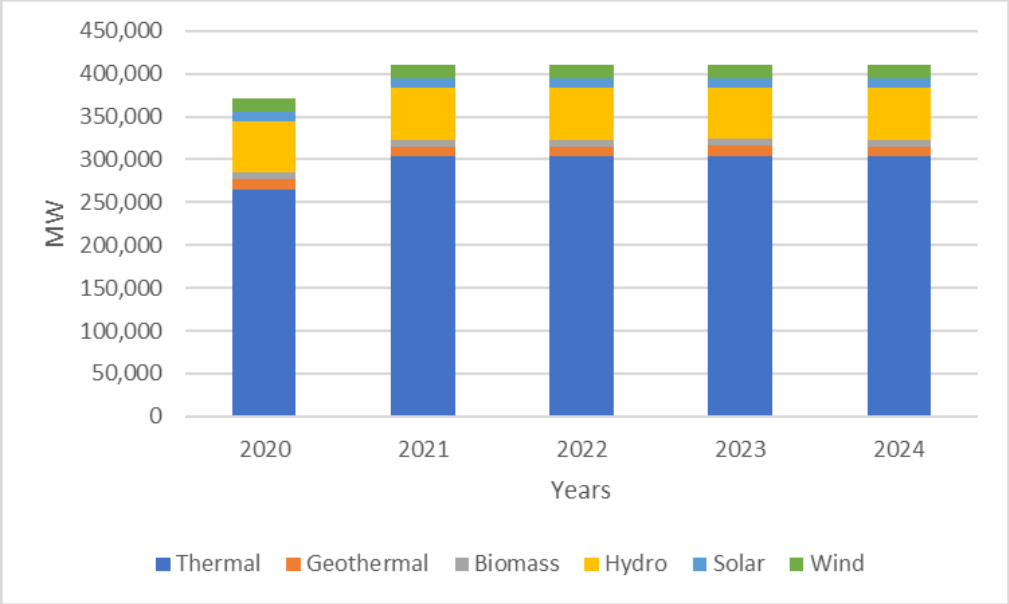

Figure 5. 5-year capacity projection

The current baseline has been updated with the latest data and projections available by the official bodies. It's clear that the baseline scenario is still valid for the second crediting period in accordance with the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

This sub-step is not applicable since the baseline scenario identified at the validation of the project activity was not the continuation of use of the current equipment(s) without any investment.

Step 1.4: Assessment of the validity of the data and parameters

Sections 4 and 5 have been updated.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The current baseline emissions for the subsequent crediting period have been updated.

Step 2.2: Update the data and parameters

Sections 4 and 5 have been updated.

The current baseline has been updated with the latest data and projections available by the official bodies. It's clear that the baseline scenario is still valid for the second crediting period.

3.5 Additionality

Demonstration and Assessment of Additionality Version 0.5.2 was applied to the project. The additionality has been evaluated in first validation and that the information is repeated in this PD and no new additionality assessment is done.

The IRR of the project was compared against an investment benchmark. The main parameters used for evaluation of the investment are as follows:

Table 5-Financial parameters used in investment analysis

Installed Capacity	61.704 MWe
Grid Connected Output	239.946 GW/h
Total Investment	103,101,436 €
Loan	67,372,969 €
Income Tax	20%

Table 6 includes the results of the financial analysis for the Project, at the time that the decision to go ahead was made, both with and without VER financing. The IRR of the Project without VER financing was lower than the applicable benchmark rate of return. This therefore indicates that in comparison to alternative investments, the Project was financially unattractive in the absence of VER financing.

Table 6- Summary of Project investment analysis without and with VER financing.

	Without VER	With VER
Equity IRR (%)	6.52	7.91

Comparison of IRR for the proposed project to the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the project IRR, are lower than the benchmark, the proposed project is not considered financially attractive.

Table 6 highlights the project IRR with and without carbon revenues. Without the additional income to the project developer resulting from VER sales, the Equity IRR is 6.52%, which is lower than the financial benchmark. Thus, the proposed project is not financially attractive.

Taking VER revenues into consideration, the Equity IRR increases to 7.91%. While the IRR with VERs remains lower than the financial benchmark of 11.55, the Project Developer will also benefit from the following intangible benefits that VERs provide:

- Development of international partnerships through turbine provider, which positively affect investors' confidence
- Enhanced corporate green image of the project developer through its contribution to a clean source of electricity and the diversification of electricity sources in Turkey, which broadens stakeholder confidence

Finally, the project is not mandated by any enforced law, statute or other regulatory framework, and that the energy generated by project activity is not used to meet governmental targets, laws, or legal mandates. The project operates within free market conditions. The project activity is in compliance with the applicable laws and regulation and it could receive regulatory income (feed-in - tariff).

Sensitivity analysis

According to "Tool for the demonstration and assessment of additionality" Version 05.2 only variables (including initial investment cost) that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For the proposed project, five parameters have been identified:

- Investment Cost
- Operating Cost
- Electricity Sale Revenue
- Construction Cost
- Electromechanical Cost

For a range of ±10% fluctuations in parameters above, the below has been obtained:

%Fluctuation

	-10	**-5**	**-2.5**	**0**	**2.5**	**5**	**10**
Investment cost	7.35	6.95	6.74	6.52	6.30	6.07	5.59

Operation and Maintenance cost	6.68	6.60	6.56	6.52	6.48	6.44	6.37
El. Sale Revenue	4.30	5.44	5.98	6.52	7.05	7.56	8.57
Construction cost	6.90	6.72	6.62	6.52	6.42	6.32	6.12
El. mechanical cost	6.86	6.69	6.61	6.52	6.44	6.35	6.17

The common practice analysis was done first validation and that the information is not repeated in this PD and no new common practice analysis has been done.

3.6 Methodology Deviations

There are no methodology deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Since the project is an installation of a new grid-connected renewable power plant, the baseline scenario is formulated in ACM0002, Version 20: "Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the Combined Margin (CM) calculations described below".

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor.

The combined margin (CM) emission factor of Turkish National Transmission System has been published by the Ministry of Energy. The latest values belong to the 2019 statistics[12].

Calculation of the Operating Margin Emission Factor

[12] https://enerji.gov.tr/duyuru-detay?id=82

It's been published as 0.7258 tCO2/MWh by the Ministry of Energy.

Calculation of the Build Margin Emission Factor
It's been published as 0.4153 tCO2/MWh by the Ministry of Energy.

Calculating of the Combined Margin Emission Factor
It's been published as 0.4929tCO2/MWh by the Ministry of Energy.

All other projects than wind and solar power generation project activities wOM = 0.5 and wBM = 0.5 for the first crediting period, and wOM = 0.25 and wBM = 0.75 for the second and third crediting period.
Therefore wOM = 0.25 and wBM = 0.75 have been considered for the second crediting period.

$$EF_{grid,\ CM,\ y} = EF_{grid,\ OM,y} \times w_{OM} + EF_{grid,\ BM,y} \times w_{BM}$$

Where:

$EF_{grid,\ BM,y}$	Build margin CO2 emission factor in year y (t CO2/MWh)
$EF_{grid,\ OM,y}$	Operating margin CO2 emission factor in year y (t CO2/MWh)
w_{OM}	Weighting of operating margin emissions factor (per cent)
w_{BM}	Weighting of build margin emissions factor (per cent)

The resulting EFgrid,CM,y 0.4929 tCO2 /MWh.

Accordingly, the baseline emissions BEy are calculated as following:

$$BEy = EGy \times EFgrid,\ CM,\ y$$

Where:

BE_y : Baseline emissions (tCO2e)

EG_y : Annual electricity supplied by the project to the grid (MWh)

$EF_{grid,\ CM,\ y}$: Baseline emission factor (tCO2e/MWh)

y : Refers to a given year

Also, as suggested in ACM0002 / Version 20, the leakage emissions are not considered and assumed as "0".

4.2 Project Emissions

Since the Project Activity is a run-of-river hydropower project, there are no expected project emissions related to the electricity generation.

As the Project Activity has a submerged area of Oşkan HEPP and Berkman HEPP, the power density was calculated to be conservative. There is no project emission resulting from the reservoir area of the Project Activity as the power density of the project is greater than 10W/m2. Accordingly, The Project Activity's power density was calculated as below:

For Oşkan HPP

=23,889,000 W / 1,621,425.95 m2[13]

=14.733 W/m2

For Berkman HPP

=37,815,000 W / 1,648,560.79 m2[14]

=22.938 W/m2

Therefore, PE= 0

4.3 Leakage

Leakage emission (LEy) is considered as "0" as suggested in ACM0002, Version 20.

4.4 Net GHG Emission Reductions and Removals

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)

[13] Please see the registered PD for the calculation. Calculation is also available in the ER Calculations file.

[14] Please see the registered PD for the calculation. Calculation is also available in the ER Calculations file.

03.06.2020 - 31.12.2020	68,696	0	0	68,696
2021	118,275	0	0	118,275
2022	118,275	0	0	118,275
2023	118,275	0	0	118,275
2024	118,599	0	0	118,599
2025	118,275	0	0	118,275
2026	118,275	0	0	118,275
2027	118,275	0	0	118,275
2028	118,599	0	0	118,599
2029	118,275	0	0	118,275
01.01.2030 - 02.06.2030	49,578	0	0	49,578
Total	1,183,397	0	0	1,183,397

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EFgrid,CMy
Data unit	tCO2/MWh

Description	Emission factor of the Turkish grid determined ex-ante. It's been published by the Ministry of Energy for 2018.
Source of data	Ministry of Energy. Please see: https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443
Value applied	0.4929
Justification of choice of data or description of measurement methods and procedures applied	Emission factor of the Turkish grid published by the Ministry of Energy for 2019
Purpose of Data	Calculation of the baseline emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	EPIAS records
Description of measurement methods and procedures to be applied	Two sets of meters measuring continuously then calculate the net electricity generation supplied by the project to grid.
Frequency of monitoring/recording	Measuring continuously/ recording monthly
Value applied	The annual electricity fed to the grid is estimated as 239,946/MWh
Monitoring equipment	Power meters: **Oşkan HPP**

Unit 1	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	EMH	EMH
Serial Number	8923872	8923873
Latest Test Date of the Meters	14.10.2019	14.10.2019
Accuracy Class	0.5 S	0.5 S

Unit 2	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	EMH	EMH
Serial Number	8923874	8923875
Latest Test Date of the Meters	14.10.2019	14.10.2019
Accuracy Class	0.5 S	0.5 S

Unit 3	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç
Brand	EMH	EMH
Serial Number	8923876	84260477
Latest Test Date of the Meters	14.10.2019	14.10.2019
Accuracy Class	0.5 S	0.5 S

Berkman HPP

	Main Meter	Spare Meter
Name	Ana Sayaç	Yedek Sayaç

Brand	EMH	EMH
Serial Number	8923878	8923879
Latest Test Date of the Meters	14.10.2019	14.10.2019
Accuracy Class	0.5 S	0.5 S

Latest twometer test dates are 30/10/2018 and 14/10/2019.

QA/QC procedures to be applied

The amount of electricity generated by the project and fed into the grid is recorded by 4 Main electronic meters and 4 substitute meters. Monthly readings of these meters will be calculated by personnel from TEIAS and a representative from the plant and an invoice will be submitted to the EnovaEnergy. This invoice is also the sales receipt of the electricity fed into the grid between TEIAS and the project developer.

Electricity that is generated at Berkman HEPP will be transmitted to Oşkan HEPP and the amount of electricity generated by Berkman HEPP is calculated and monitored by a meter (also by a substitute meter) which is located at Oşkan HEPP.

The electricity that is generated by Oşkan HEPP will be calculated and monitored by 3 meters (each meter also has a substitute meter).

Each meter has also a substitute meter which also performs recording simultaneously. Both meters are sealed and under the control of TEIAS The substitute meter is also checked together with the primary meter every month for billing by TEIAS staff. The substitute meter also serves to detect calibration faults between two meters. In case of such a discrepancy TEIAS is responsible for calibration and maintenance.

The electricity of both plants is connected to Berke-Kadirli Energy Transmission Line.

At the end of each month TEİAS will perform the reading of each meter and the project owner will be billed only one receipt.

The metering devices are under the control of TEIAS and since they are sealed and no one other than TEIAS can intervene with these meters. Calibration and maintenance are also under responsibility of TEIAS.

	EPIAS records are considered as the main source for the net electricity and the values are crosschecked with the OSF records.
Purpose of data	Calculation of emission reductions
Calculation method	$EG_{Facility,y} = EG_{export,y} - EG_{import,y}$
Comments	-

Data / Parameter	**Number of temporary and permanent employees**
Data unit	Number of Employees
Description	Number of the Permanent employees
Source of data	SGK records
Description of measurement methods and procedures to be applied	SGK records
Frequency of monitoring/recording	Annually during verification
Value monitored	31 permanent employees
Monitoring equipment	SGK records
QA/QC procedures to be applied	N/A
Purpose of data	Monitoring of project contribution to SDG 8 Decent Work and Economic Growth
Calculation method	N/A
Comments	-

Data / Parameter	**Livelihood of the poor**
Data unit	Numbers of the employees from the project region

Description	Numbers of the employees from the project region
Source of data	SGK records
Description of measurement methods and procedures to be applied	SGK records
Frequency of monitoring/recording	Annually during verification
Value monitored	31 permanent employees and 0 temporary employees (16 local employees)
Monitoring equipment	SGK records
QA/QC procedures to be applied	N/A
Purpose of data	Monitoring of project contribution to SDG 8 Decent Work and Economic Growth
Calculation method	N/A
Comments	-

5.3 Monitoring Plan

The Project Owner will be responsible for the overall management of the monitoring procedures including recording, data collection and store. The consultant will calculate emission reductions based on these monitored data and prepare monitoring report.

According to the methodology applied, the electricity supplied to the national grid by the project and the electricity consumed by the project activity shall be monitored. The net electricity is the difference of the electricity supplied and consumed by the project and shall be taken into account for emission reduction calculations.

The Monitoring Plan (MP) used for determining the emission reduction by the project is based on the approved methodology ACM0002 verison 20.0.. Since the project activity involves electricity generation from renewable sources and there is no significant leakage source or environmental impacts, MP includes monitoring electricity generation by the project activity and key sustainable development indicators.

The amount of electricity generated by the project and fed into the grid is recorded by 4 main electronic meters and 4 substitute meters. Electricity that is generated at Berkman HEPP is transmitted to Oşkan HEPP and the amount of electricity generated by Berkman HEPP is calculated and monitored by a meter (also by a substitute meter) which is located at Oşkan HEPP.

The electricity that is generated by Oşkan HEPP is calculated and monitored by 3 meters (each meter has also has a substitute meter).

Each meter has also a substitute meter which also performs recording simultaneously. The substitute meter also serves to detect calibration faults between two meters. Both meters are sealed and they are under the control of TEİAŞ. TEİAŞ is performing remote reading of the meters and monthly power meter readings are the basis for monitoring net electricity fed into the grid. EPİAŞ records are used as the source of net generated electricity value and meter reading forms or OSF forms issued by TEİAŞ are used for the crosscheck. In case of a discrepancy TEİAŞ is responsible for calibration and maintenance. Calibration and maintenance are also under responsibility of TEIAS

The electricity of both plants is connected to Berke-Kadirli 154 kV Energy Transmission Line.

The website of EPİAŞ (https://cas.epias.com.tr/cas/login) is accessible to Project owner with their unique user ID and password. Once accessed, the Project owner is able to call electricity generation and consumption reports of their own projects. The same reports are used by the Project owner for invoicing TEİAŞ. The electricity generation data is reported monthly basis.

All data collected (especially, EPIAS records and OSF Forms) as part of monitoring will be archived electronically by the project owner and be kept at least for 2 years after the end of the last crediting period.

Please see the single line diagram of the project activity as below:

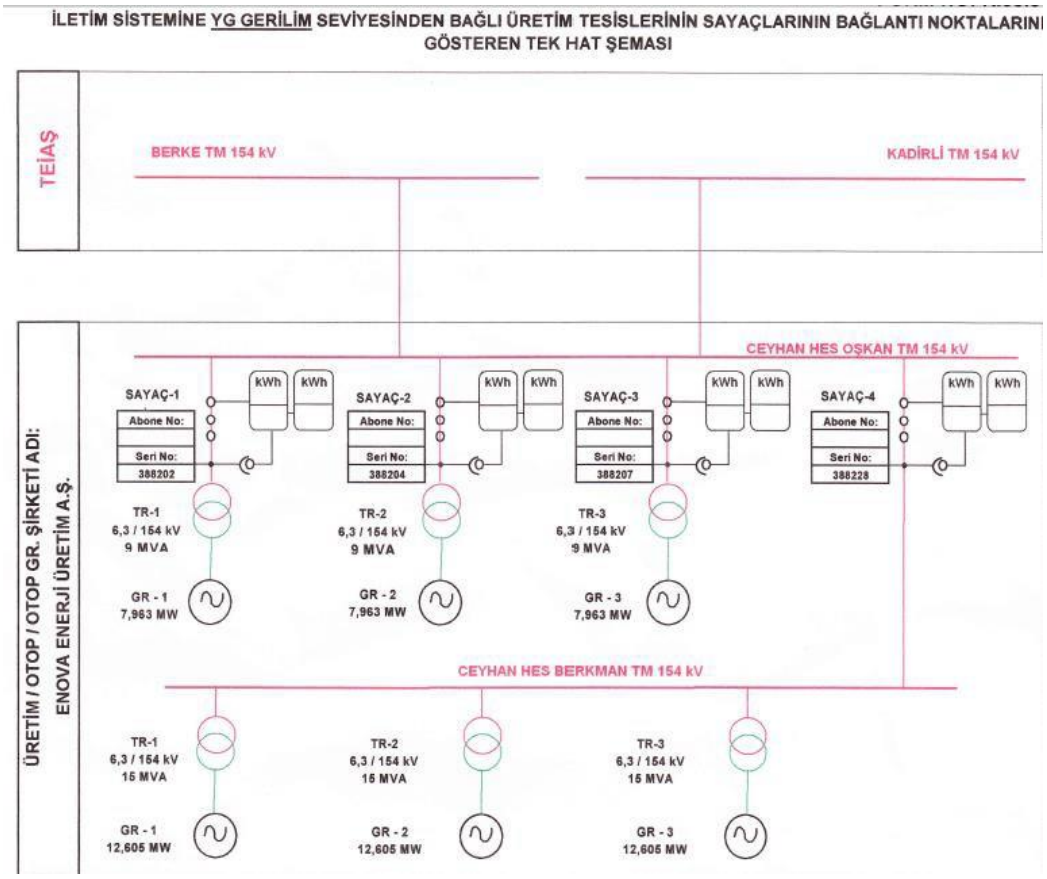

Figure 5. Single line diagram

The Project Proponent is responsible for the overall management of the monitoring procedures including recording, data collection, calculating emission reductions and project emissions. Please see below the management structure for the plant operation:

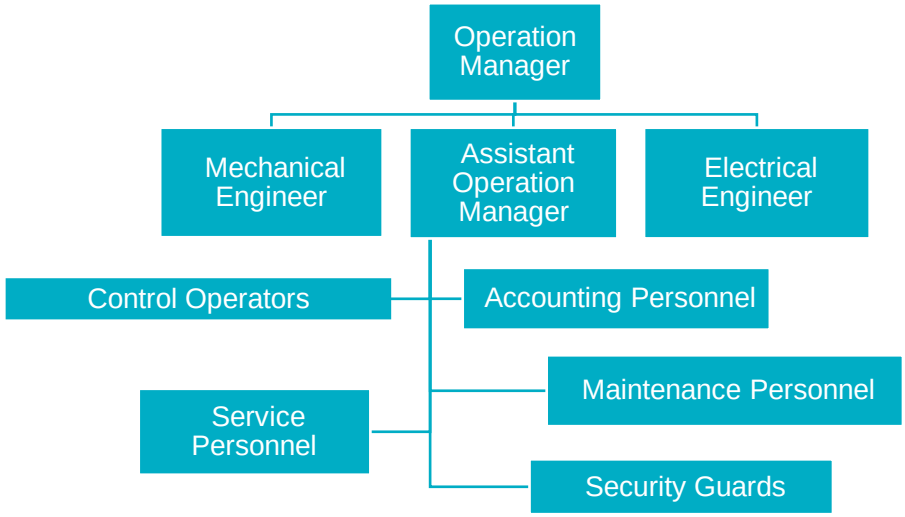

Figure 6. The management structure for the plant operation

The Operation Manager is responsible for the whole management of the Project Activity and assistant operation manager, the mechanical engineer, electrical engineer and control operators are responsible for the implementation of the Project Activity. In total, thirty-one employees are working for the Project Activity.