KUMKÖY HYDROELECTRIC POWER PLANT, SAMSUN

Document Prepared by *SEEM Danışmanlık Ltd Şti*

Project Title	*Kumköy Hydroelectric Power Plant, Samsun*
Version	*6*
Date of Issue	*31/01/2023*
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Kumköy Hydroelectric Power Plant, Samsun is located on the Yeşilırmak River in the Black Sea region of Turkey. The Project is being used only for energy generation purposes and has an Energy Generation License for 35 years 2 months and 19 days obtained from Energy Market Regulatory Authority (EMRA) in 2011.

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

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

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

For the first crediting period, the expected annual energy generation was 91,964 MWh, and the estimated amount of GHG emission reduction was 49,037 tonnes CO2e per year. For the second crediting period, which is between 03/03/2021 and 02/03/2031, the expected annual energy generation is 91,964 MWh, and the estimated amount of GHG emission reduction is 52,475 tonnes CO2e per year
The Project has produced positive environmental benefits as displacing the electricity generated by fossil fuel-fired power plants by utilizing renewable resources to avoid environmental pollution and GHG emissions.

The project timeline is presented in Table 1.1.

Table 1.1: Project timeline

Date	Milestone

18/10/2006	Early consideration of Carbon Finance
12/12/2006	Water Usage Agreement Signed between Kumköy Enerji Üretim A.Ş. and DSI
5/02/2007	License acquisition fee paid to the government
30/07/2007	EIA not Needed Certificate Issued by MoEF Samsun Province Representation
28/09/2007	Local Stakeholder Consultation Meeting announced in Local (Halk) and National (Türkiye) Newspapers
03/10/2007	Local Stakeholder Consultation Meeting held in Çarşamba
25/01/2008	Turn-Key EPC Contract Signed
06/02/2008	Loan agreement signed
15/04/2008	Electromechanical Equipment contract signed
01/06/2008	Revised Feasibility Report submitted to DSI for Approval
03/11/2008	DSI Approval for the revised feasibility study report
09/10/2009	Contract with DSI to use weir construction facilities
24/12/2009	TEIAS Connection Agreement Signed
11/02/2011	System Usage Agreement Signed with Grid Operator
23/02/2011	Government officials approved the Project to be suitable to be connected to the grid
03/03/2011	First Date Electricity is supplied to the grid
03/03/2011	Start date of the first monitoring period
04/03/2011	Notice letter for readiness to Substantial Completion sent to Kumköy Enerji Üretim A.Ş. by IC Inşaat (EPC Contractor)
04/03/2011	Kumköy Enerji Üretim A.Ş. Accepted and issued official Substantial Acceptance Certificate
01/12/2011	Project License renewed and issued by EMRA
31/03/2013	End date of the first monitoring period
01/04/2013	Start date of the second monitoring period

10/07/2013	Shareholder structure change (the project activity has been transferred to Entek Elektrik Üretimi A.Ş.)
31/03/2019	End date of the second monitoring period
01/04/2019	Start date of the third monitoring period
02/03/2021	End date of the third monitoring period
02/03/2021	End date of the first crediting period
03/03/2021	Start date of the second crediting period

1.2 Sectoral Scope and Project Type

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

1.3 Project Eligibility

"Kumköy Hydroelectric Power Plant Project" is classified in the Renewable Energy Source category as electricity from non-fossil and non-depletable energy sources, in this case from hydropower, is fed into the Turkish electricity grid.

This is not a grouped project activity

1.4 Project Design

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

Table 1.2: Main characteristics of the project activity[1]

Component	Property
Thalweg elevation of the weir	18m
Crest elevation of the weir	32m
Weir height	14m
Max. operation level	30m

[1] The related information was validated at the registration.

Min. operation level	28m
Gross head	9.76m
Net-head	9.41m
Turbine type	Bulb
Installed capacity of each turbine	5.75 MWe
Installed capacity	17.50 MWe
Number of units	3
Capacity of each unit	70 m^3/s
Max. power capacity of each unit	6.073 MWm
Total max. turbine capacity	18.22 MWm

The project boundary may be seen in Figure 1.1.

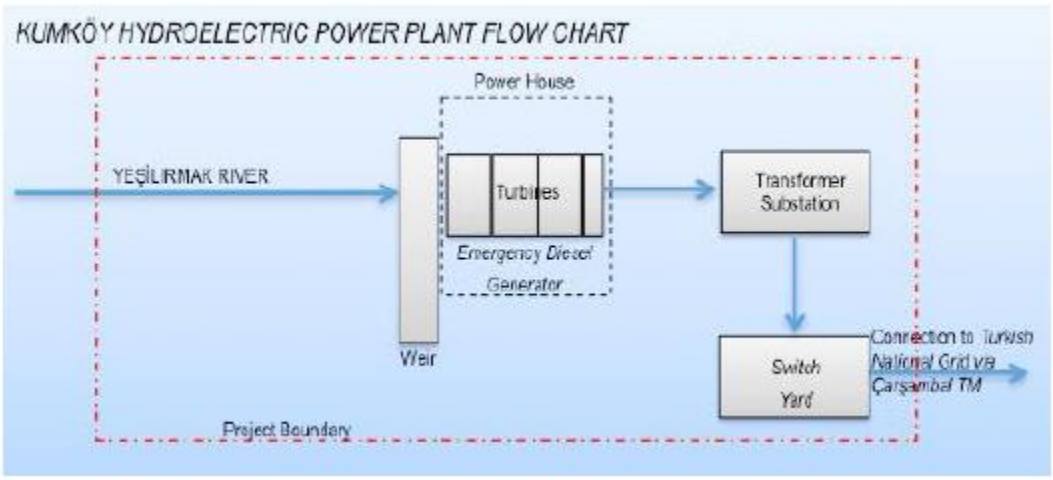


Figure 1.1: The project boundary of Kumköy Hydroelectric Power Plant, Samsun

1.5 Project Proponent

Organization name	*Entek Elektrik Üretimi A.Ş.*
Contact person	Betül Erdoğan
Title	*Commercial Operations and Carbon Senior Manager*
Address	*Köseköy Mah. Yeni Demiryolu Cad. No:70 41250 Kartepe/Kocaeli*
Telephone	*+90 216 217 11 90*
Email	*Betul.erdogan@entekelektrik.com.tr*

1.6 Other Entities Involved in the Project

Organization name	SEEM Danışmanlık Ltd Şti
Role in the project	*Project Consultant*
Contact person	*Işıl Timuroğlu*
Title	*Co-founder*
Address	*Buyaka Kule 2, No:8/C Blok Kat:16 34771 Ümraniye İstanbul*
Telephone	*+90 216 266 5844*
Email	*i.timuroglu@seemturkey.com*

1.7 Ownership

Ownership of the plant, equipment and electricity generation licence belongs to Entek Elektrik Üretimi A.Ş. and all emission reductions/removals are granted to the company.

1.8 Project Start Date

The project start date is 03/03/2011.

1.9 Project Crediting Period

Project's first crediting period is ten years and renewable twice. The first crediting period starts on 03/03/2011 and ends on 02/03/2021 (both days are included). The second crediting period started on 03/03/2021 and will end on 02/03/2031.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	**Estimated GHG emission reductions or removals (tCO_2e)**
03/03/2021-31/12/2021	43,705

2022	52,475
2023	52,475
2024	52,475
2025	52,475
2026	52,475
2027	52,475
2028	52,475
2029	52,475
2030	52,475
01/01/2031-02/03/2031	8,770
Total estimated ERs	524,750
Total number of crediting years	10
Average annual ERs	52,475

1.11 Description of the Project Activity

The Project Activity is a river type (run-of-river project without water conveyance system) hydropower project with a total installed capacity of 17.5 MW and a reservoir total surface area is 597,000 m2. The estimated annual stream flow in the Project Activity is 5,269.3 million m3. The design discharge flow of the project is 210 m3/s. (These numbers have been approved by DSI). The project discharge flow would run through a 9.41 m Net head (Gross head – 9.76 m) to generate annually 45.991 GWh of firm energy and 51.722 GWh of secondary energy with a total gross annual estimated energy of 97.713 GWh. Taking into account the generation losses due to the development of the irrigation projects the project is calculated to produce 91, 964 MWh of electricity over the next 20 year of the project lifespan.

Related with the electromechanical equipment of the Project Activity, a contract, “The Supply and Installation of Electro-Mechanical Equipment for Kumköy Hydro-Electric Power Plant” has been signed with Harbin Electric (HE) Corporation.

The Bulb type turbines, which are the most efficient type for the project’s specific characteristics have been designed and produced by this company according to the aforementioned supply agreement.

Since the scope of Kumköy reservoir is expected to provide irrigation water from the Yeşilırmak River to the nearby Çarşamba plain (downstream from the project), the future

annual average flow of the Project Activity is predicted to decline once the irrigation projects are developed. Net energy generation of the Project Activity is expected to drop to 75.868 GWh/year for the inprocess irrigation plan (2020) and to 63.860 GWh/year with the complete development of the irrigation facilities (2030). This situation is shown below in numbers.

Table 1.3. Table showing the electricity production potential of the project activity over the life span of the project.

Operation Period	Mean Annual Flow (hm^3/year)	Gross Generation (GWh/year)	Net Gen Gross x12% losses) (GWh/year)
2011-2020	5,269.3	97.71	85.99
2021-2030	4,711.3	86.21	75.87
2031-2056	4 ,24.4	72.57	63.86

According to these figures, an energy yield reduction is expected only at the last years of the first crediting period (2011-2021). The only exceptional cases would be at the time of river over flooding. In these specific events, surplus water would be diverted to dedicated accumulation reservoirs or would be released downstream through special flood control gates.

The Project Activity will be environmentally safe since it simply uses the water instead of any fossil fuel to produce electricity and it does not contaminate the water and environment. Furthermore there is no conveyance canal/tunnel to divert water for energy purpose in this Project Activity. The scope of the Project Activity is also composed of mainly installation of electromechanical equipment by using the existing structure. This is why; the Project Activity will not cause any negative impact to the environment.

The Kumköy project would be comprised of the following main parts:

- A weir with 135 m crest length, 14 m height (constructed by DSI)
- Spillway equipped with 12 radial gates for flood control (constructed by DSI)
- water intake structures dedicated for irrigation water diversion purpose (under construction by DSI)
- Dedicated radial gates to the HEPP in order to allow water inlet to the power house (constructed by DSI).
- Powerhouse– a 35 x 20 x 25 m dedicated construction where the turbines and generators will be placed (constructed by DSI).
- One specially designed fish ladders in order to allow the fish to swim upstream and over the dam (constructed by DSI).

- “Bulb” turbines. For a 9.41 m of net head (Gross head – 9.76 m) these turbines are considered as the state of the art technology. Each turbine will have 70 m3/s of design discharge (installed by the Project Owner).
- Generators each with 6.55 MVA powers that would be placed on the top of each turbine. (installed by the Project Owner)
- Transmission line- power will be transmitted to the national grid by approx. 1,2 km 1x477 MCM, 31,5 kV transmission lines to the Çarşamba Transformer Substation (constructed by the Project Owner).

The project activity will be producing electricity using bulb type turbines. The following drawing , provides a schematic representation of how the turbines of the project will operate.

Figure 1.2. A representative drawing that exhibits how a bulb type Kaplan Turbine works.

1.12 Project Location

The Project Activity is located between 41º05'40"- 41º05'50" north and between 36º41'10"- 36º41'25" east on the Yeşilırmak river in Samsun Province at the Black Sea Region northern part of Turkey. The Project Activity is approximately 50 km from the city of Samsun and about

10 km from the town of Çarsamba. The nearest settlements are the villages of Kumköy, Kurtahmetli and Kemer. The coordinates of the major project components are given in the following table.

Table 1.4 The location of the major project components

Structure	Latitude	Longitude
Weir	41° 7'12.77"N	36°43'9.34"E
Powerhouse	41° 7'15.34"N	36°43'4.76"E

Figure 1.3. The location of the project at the Google Earth sattalite image

1.13 Conditions Prior to Project Initiation

There was no other hydroelectric power plant installation at the project location. The project activity does not generate greenhouse gas emissions, so it can be excluded that the implementation has been made only in order to generate GHG emissions with their subsequent reduction.

The baseline scenario is the same as the conditions existing prior to the project initiation. Please see Section 3.4 for the baseline scenario.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Addition of a new power generation capacity to the grid is regulated by Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity additions are in compliance with its rules and regulations. Laws as relevant to the project are (Law No. and Enactment Date):

(1) Electricity Market Law[2]

(2) Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[3]

Furthermore, "Environment Law[4]" provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre-operation phases. Following the Environmental Law, there are many by-laws that the project must follow. These by-laws (in other words Regulations) that the project needs to follow are assessed under the Environmental Impact Assessment Report.

Lastly, the project needs to comply with the "Occupational Health and Safety Regulation[5]". Employees will have their health and safety trainings. Project contributes awareness of labour rights and safety precautions. The social securities of all employees will be done according to the Law. Project contributes awareness of labour rights and safety precautions.

1.15 Participation under Other GHG Programs

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

Not applicable

The project is a voluntary project and the host country, Turkey cannot host CDM or JI projects.

[2] See: https://www.epdk.gov.tr/Detay/Icerik/3-14650/6446-guncel-elektrik-piyasasi-kanunu

[3] See: https://www.epdk.gov.tr/Detay/Icerik/3-0-156/kanunlar

[4] See: https://www.mevzuat.gov.tr/MevzuatMetin/1.5.2872.pdf

[5] See: https://www.mevzuat.gov.tr/MevzuatMetin/1.5.6331.pdf

The project is not getting any benefit from any other certification schemes. Moreover, the project activity is neither included in emission trading nor it takes place in a jurisdiction or a sector in which binding emission limits are established on GHG emissions

1.15.2 Projects Rejected by Other GHG Programs

Not applicable

The project has not been rejected by any other Green House Gas programme.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Not applicable

The Project Activity is not embedded under any kind of Emission trading programs. Turkey is not an Annex-B country under Kyoto Protocol, neither has its set national emission reduction targets nor any related obligations.

1.16.2 Other Forms of Environmental Credit

Not applicable

The project will not generate other form of environmental credits such as Green Power Certificates.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable since the project is a green field project .

Commercially Sensitive Information

A detailed Excel workbook summarizing the financial analysis was provided to the validating DOE at the first crediting period with relevant evidences that are commercially sensitive, these will not be disclosed with the public.

Sustainable Development

The Project produces electricity from renewable energy sources using hydro as the power source and contributes to Turkey's growing electricity demand through sustainable and low carbon technology. The Project displaces the same amount of electricity generated by the grid dominated by fossil-fired power plants. The Project contributes to SDG7 Affordable and Clean Energy.

The Project contributes to improve the environmental situation in the region and the country as avoiding fossil fuel-based electricity will enhance the air quality and help to reduce the adverse effects on the climate. Through renewable technologies and hydro-based electricity, sustainable and climate-friendly development is promoted. The Project contributes to SDG13 Climate Action. While the Project reduces emissions, technology transfer is also realized as benefitting from hydropower.

During the construction and operational period, the Project has created employment opportunities for the local community. The Project contributes to 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 SDG8 Decent Work and Economic Growth.

Further Information

No further information to be added.

2 SAFEGUARDS

2.1 No Net Harm

The Project does not cause any negative environmental or socio-economic impact.

2.2 Local Stakeholder Consultation

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

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

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

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

The local villagers asked about employment possibilities. The Owner promised that when hiring unskilled workers during the construction and operation of the project activity, priority was given to the local villagers.

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 exists at the Mukhtar, the project owner and local community are always in touch. The project owner regularly checks with the Mukhtar if any complaint or a request exists. Any complaint or need from the local community could directly be received by the project owner and appropriate contributions or improvements are made to the local community. The signed letter (dated on 08.07.2019) by Mukhtar, which indicates that the contact information of the plant responsible is available to them, has been provided to the DOE. There is no complaint for the project.

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

2.3 Environmental Impact

According to the relevant Environmental Impact Assessment Regulation, an Environmental Impact Assessment is not required for the project. The official letters from Provincial Directorate of Environment and Urbanization confirming non-applicability of this regulation was available to DOE during validation process during the first crediting period.

2.4 Public Comments

A public meeting with stakeholders regarding the planned project activity was conducted in the meeting hall of Ömer Akyıldız Kıraathanesi Kumköy Köyü, Çarşamba, Samsun province, on October 3rd 2007. The meeting was organized and conducted by Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti. This meeting was the first dialogue ever conducted with stakeholders which was unfamiliar with the concept and its importance. By doing so, the Project Activity contributed to establishing a dialogue with stakeholders as common practice in other projects. To prepare for the meeting, key stakeholders, such as village heads (muhtars), government officials such as, the Kaimakam and the DSI personnel, and the local inhabitants in Çarşamba were identified and notified about the event.

For the participation of officials, phone calls were made to the Samsun Governorship and the Provincial Environment and Forestry Directorship Çarşamba Kaimakam's Office. For the participation of the local villagers, a fax notification and personal invitations were sent to the

Çarşamba municipality and to Kumköy and Orduköy villages inviting their residents. In addition, the event was announced in the regional and national newspapers calling for stakeholders to attend the meeting. The ads were published at the Samsun Halk Gazette (regional), and the Türkiye Gazette (national). Both ads were published on September 28th 2007 and had the following wording (translated from Turkish):

"A public participation meeting regarding the Carbon Trade procedure will be conducted for Kumköy HEPP, which is planned to be built in Samsun province by AES-IC İçtaş Enerji Üretim ve Ticaret A.Ş. The dialog meeting will be done in order to inform the people about the Project Activity, learn about their opinions and concerns, answer their questions and receive suggestions. The event will be conducted at the meeting hall of Ömer Akyıldız Kıraathanesi Kumköy Köyü, Çarşamba, Samsun province, at 11:00 am on October 3rd 2007. For more information, please contact the developing company AES-IC İçtaş Enerji Üretim ve Ticaret A.Ş by phone: 312-467 35 03 or by fax:-312- 467 29 51 or the organizing company: Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. By phone: 312- 472 38 39 or fax: 312-472 39 33.

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

1. General description of run-of-river type hydro plant.

2. Specific technical details of the Project Activity including information and location of each component shown on a topographic map.

3. Environmental impact assessment of the project activity.

4. The issue of global warming and climate change.

5. The Kyoto protocol and emission reduction credits.

6. The role of the projects within the context of climate change.

7. Details and contact information of the developer, and a contact person for any information and clarifications.

Summary of the comments received:

After the presentation, participants were encouraged to comment on the Project Activity, raise any concerns they may have, ask questions or request clarifications. The villagers expressed their overall satisfaction with the implementation of such a Project in their region, and expressed their hope that after many years of delays, the Kumköy Project will finally be completed. The following issues were discussed:

The local villagers asked about employment possibilities. The Owner promised that when hiring unskilled workers during the construction and operation of the project activity, priority will be given to the local villagers.

The only concerns were related to the side embankments of the weir and doubts about whether they can reliably prevent flooding of the nearby villages. The Owner replied that to the best of its knowledge, they can be trusted. However, planning and construction will be done by DSI, and are not under the responsibility of the Owner.

The following table summarizes the results of the questionnaires. 11 questionnaires were completed. The mean age was 41.1 and all were males (more statistics are available).

The results suggest that the locals think that the most urgent problem of the region is unemployment followed by poverty and insufficient land. There were no specific environmental problem that concerned the locals more than others, and environmental issues need to be solved by the government. All people see clear signs of climate change in the region in recent years.

The villagers are not satisfied with the electricity infrastructure or prices, and they believe that the project activity may contribute to improving the situation. Everyone have their support for hydroelectric projects, which are perceived as the preferable mean for electricity production. Everyone also believed that the presentation was clear. The majority believed that the presented information was genuine; however, a considerable amount believed that some important issues were not presented. The Project Activity received high ranking for overall satisfaction as having a positive contribution to solving global and local environmental problems, and for solving general local issues.

Most urgent problems of the region (%)	Unemployment	Insufficient land	Health	Poverty
	37	21	5	21
Profound environmental problems (%)	Excess use of Chemicals	Loss of Biodiversity	Habitat Destruction	Water Pollution
	22	22	22	22
Responsibility of solving environmental problems (%)	Government	Municipality	Private Entities	
	90	5	5	
	Yes (%)	No (%)		
Did you notice any evidences for climate change? (Such as decrease in precipitations and river flow, or temperature increase)	100	0		
Are electricity outages occur often?	74	26		
Are electricity prices too high?	92	8		
Do you support hydroelectric Plants in general?	100	0		
If so, why?	All answerered: Insufficient energy			
The most preferable mean of electricity production (%)	Hydro	Nuclear	Thermal	
	100	0	0	
Was the presentation clear?	Yes (%)	No (%)		
	100	0		
Do you believe that the information presented was genuine? (with no hidden information)	58	42		
	From 1-5			
The contribution of the project to reducing greenhouse gas emissions?	4,6			
Contribution of the project to the environment	4,6			
Will the project help solve unemployment problems?	4,5			
Overall support of the project	4,8			

2.5 AFOLU-Specific Safeguards

Not applicable

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

For the second crediting period, "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)6" is used. Furthermore, the emission factor calculation is renewed according to "Tool to calculate the emission factor for an electricity system". (Version 07.0.0). Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources." Version 20.0.0 is applied.

3.2 Applicability of Methodology

The methodology ACM0002 (Version 20.0.0) is applicable to the proposed project activity because the proposed project meets all the applicability criteria stated in the methodology:

The methodology is applicable under the following conditions:

Applicability Conditions in the ACM0002/Version 20	**Applicability to this project activity**
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) (e) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity consists of installation of Greenfield power plant at a site where no renewable power plant was operated prior to the implementation of the project activity. Thus, it meets the said applicability condition.
The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is the installation of hydropower plant units. Hence, it meets this criterion.
In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects	The project activity does not involve capacity additions, retrofits, rehabilitations

[6] See; https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

Applicability Conditions in the ACM0002/Version 20	Applicability to this project activity
the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	or replacements. Hence, this criterion is not applicable to the project activity.
In case of hydro power plants, one of the following conditions shall apply: a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m^2; or c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m^2; or d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m^2, all of the following conditions shall apply: i. The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m^2; ii. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	The project activity is a hydro power plant. The project activity results in new reservoirs and the power density of the project activity is 29.31 W/m2 which is greater than 4 W/m2.
In the case of integrated hydro power projects, project proponent shall: a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or	The project activity is not an integrated a hydro power plant. Hence, this criterion is not applicable to the project activity.

Applicability Conditions in the ACM0002/Version 20	Applicability to this project activity
b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
The methodology is not applicable to: a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; b) Biomass fired power plants/units	Project activity does not involve: • Switching from fossil fuels to renewable energy sources at the site of the project activity. • Biomass fired plants. Hence, this criterion is not applicable.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	The project is not a retrofit, rehabilitations, replacements or capacity addition; hence, this criterion is not applicable to the project activity.
In addition, the applicability conditions included in the tools referred to above apply.	Applicability conditions of the applied tool are justified.

3.3 Project Boundary

Table exhibits the gases included in the project boundary. CO2 emission is included in the baseline but the project activity does not emit any of the gases listed.

The project boundary includes net electricity generated and supplied to the Turkish national grid. The internal consumption and the GHG due to the temporary use and burning of the diesel fuel by the auxiliary power generators.

Source		Gas	Included?	Justification/Explanation
Baseline	Electricity generation in baseline (Turkey's Grid)	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	N.A.	N.A.
Project	Emission from the reservoir of the proposed project	CO_2	No	Minor emission source
		CH_4	No	Minor emission source (Power density greater than 10W/m_2)
		N_2O	No	Minor emission source
		Other	N.A.	N.A.

3.4 Baseline Scenario

According to the guidelines of the applicable large scale approved methodology ACM 0002 (Version 20), "The baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid." Thus, proposed project activity will evacuate power to the National Grid complying with the stated guideline.

As per "ACM0002: Grid-connected electricity generation from renewable sources --- Version 20.0", the baseline emissions are calculated as the net electricity generated by the project activity, multiplied with the baseline emission factor for the project grid.

According to "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period", the following stepwise approach has been followed.

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

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no new mandatory national and/or sectoral policies that came into force which will affect the current baseline.

Step 1.2: Assess the impact of circumstances

The project still benefits from the feed-in-tariff mechanism with the same price. The project has not done any new investment for the project. The existing circumstances still continue.

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.

The project activity uses the current equipment(s) without any investment.

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

Ther data and the parameters are not still valid, there is more up to date data and parameters. Thus, the baseline needs to be updated for the second crediting period.

Under Section 4, the baseline is updated with the new data and parameters.

3.5 Additionality

The proposed project activity reduces GHG emissions by substituting fossil fuel based electricity generation by renewable resources (hydro) based electricity generation.

This part refers to the "Tool for the Demonstration and Assessment of Additionality Version 7.0.0" and the numbering in this section reflects the Tool's Guidelines provided at EB 70, Annex 8..

Step 1 - Identification of Alternatives to the project activity consistent with current laws and regulations

Regulatory Surplus: Turkey has a special circumstances, where it is listed as Annex I country of the UNFCCC and not listed as Annex B country of the KP. Thus, Turkey cannot benefit from the CDM. This project is not mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. In Turkey, there is feed-in-tariff mechanism to support the renewable energy, which gave certain economical advantage to the investors. This is taken into account while developing the investment analysis.

Sub-step 1a - Define alternatives to the project activity:

The tool notifies that "Project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity."

The project alternative can be defined as follows:

Continuation of the current situation (No project activity or other alternatives undertaken). This alternative is the most likely scenario, since there are no legal

obligation to implement such a project and without VCS support the project implementation is financially not attractive.

Outcome of Step 1a: The only realistic and credible alternative scenario to the project activity is Continuation of the current situation, without any project undertaken .

Sub-step 1b. Consistency with mandatory laws and regulations:

The project alternative, the baseline scenario, which is the continuation of the existing situation, is in compliance with all mandatory applicable and legal and regulatory requirements. Also the alternative scenario of addition of a new power generation capacity to the grid is regulated by Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity applies with its rules and regulations.

Outcome of Step 1b: The alternative scenario to the project activity is the supply of electricity by the existing grid with additional capacity is in compliance with mandatory legislation and regulations.

Step 2 - Investment analysis

At this step it will be demonstrated that "the proposed project activity is not the most economically and financially viable" option without the VER revenue. Please note that, at this step, the "Guidelines on the assessment of investment analysis" (EB 62 Report Annex 5) Version 05 is taken into account.

Sub-step 2a - Determine appropriate analysis method

There are three options for investment analysis method:

- Simple Cost Analysis
- Investment Comparison Analysis and
- Benchmark Analysis

"Simple Cost Analysis" is not applicable for this project activity as the project generates economical benefits from sale of electricity to the Turkish national grid". Investment Comparison Analysis is also eliminated since the baseline for the project is "the generation of electricity by the existing grid" and no similar investment alternatives exist. Therefore, Benchmark Analysis is the most appropriate approach for the evaluation of the project activity.

Sub-step 2b - Option III-Apply benchmark analysis

Internal Rate of Return (IRR) on equity is taken for this project to be the financial indicator for assessing the financial viability of the project activity..

Equity IRR is the cash flow return to equity shareholders after debt repayments. And therefore also takes into account the debt repayments. Equity IRR takes into consideration that you use debt for the project, so the inflows are the cash flows required minus any debt that was raised for the project. The outflows are cash flows from the project minus any interest and debt repayments.

To be able to assess the financial viability of the project a benchmark to compare the equity IRR is needed.

The Tool for the Demonstration and Assessment of Additionality Version 7.0.0 (EB 70, Annex 8) and the Guidelines issued at EB 62 state that "...Discount rates and benchmarks shall be derived from: Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data"

The Guidelines issued at EB 62, provides the default values for the expected return on equity as an appendix, and Moody's index values of most of the CDM Countries. Turkey's Moody's index (Ba2) is comparable to country's with the same Moody's index, and same default benchmark value from this point of view a reasonable and appropriate benchmark to compare the Equity IRR can be taken as 12.50 %.

Sub-step 2c - Calculation and comparison of financial indicators

The following parameters are taken into account for the assessment of the investment and supplementary parameters are provided in the "KumkoyFinancialAnalysis" workbook and submitted to the validating DOE.

Table 3.1: *Major parameters taken into account for the financial analysis and determination of the* Equity IRR of the Kumköy HPP Project:

Parameter	Value	Unit	References
Installed Capacity	17.50	MWe	Electricity Generation License of the project activity.
Expected Annual Electricity Generation	91,964	MWh	Revised Feasibility Report
Expected Average Annual Emission Reduction (ER)	49,037	tCO_2e	Calculated (see Chapter 3 for details) based on the electricity production values.
Total Investment	55,820,378	USD	EPC contract
Annual Operation Costs	706,338.22	USD	Based on FSR (Table 9.2, maintenance & spare parts), EIA report (staff & labour).
Loan	Confidential	USD	Loan Agreement
Loan Period	7	years	Loan Agreement
Electricity Sales Price	0.0913	USD/KWh	This is a calculated weigthed average price, based on the price expectations of project owner (over the 20 years of financial analysis period) explained in chapter 9, of the FSR.
VAT	18	%	V.A.T. Law No:3065
Income Tax	20	%	Income Tax Law number 5281

The value of the investment has been depreciated on a reducing balance basis over 20 years, 75 % of the long lasting assets are depreciated over 45 years and the residual book value of 22,946,390.63 USD is added back to the cash flow. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report7 on energy under the 8th development plan published by the State planning organization. Even if the facility can last for 50 years the major equipment needs to be replaced in every 20 years8. As a result the project lifetime is estimated to be about 20 years and the investment analysis is therefore done for a time frame of 20 years.

For the assessment of the viability of the project activity the Equity IRR is compared to the benchmark. The equity IRR is worked out as 8.87 %, which is below the benchmark of 12.50%.

Sub-step 2d - Sensitivity Analysis

To be able to conclude if the investment decision is the financially the most attractive alternative, a sensitivity analysis is performed. Three parameters that affect the equity IRR are examined for the sensitivity analysis:

• Investment Cost

• Operating and Maintenance Cost

• Electricity Revenue

The sensitivity analysis is performed for a range of ±10% fluctuations in the above parameters. The figures in the following table are obtained. Following the "Guidelines on the assessment of investment analysis (Version 05)" of EB 62 Annex 5 when any of the key variables are increased or decreased by at least 10%, and the benchmark is not exceeded.

Table 3.2: Sensitivity analysis for the Equity IRR without carbon revenue for the project (Benchmark: 12.50%)

Change	-10%	-5%	5%	10%	Exceed Benchmark?
Investment Cost	10.5%	9.6%	8.2%	7.6%	No
Operating Cost	9.0%	8.9%	8.8%	8.8%	No
Electricity Revenue	8.1%	8.5%	9.2%	9.6%	No

To exceed the benchmark, the electricity revenue must increase by about 48.40 % over the life of the project, or the investment cost must be reduced by about 19.00 %. As the Renewable energy law only guaranties a minimum price of USD 0.073 per kWh, the unit price we have utilized in our financial analysis is very conservative and we do not expect an increase in the electricity revenue related to a price increase and since the feasibility report and the design of the project is based on the maximum available capacity of the Yeşilırmak

river, and all our financial analysis is based on the maximum electricity output of the project, such an increase based on the increased amount of electricity generation is very unlikely. In addition to that as the availability of the water decreases due to the globally accepted results of global climate change, electricity production is very unlikely to reach to an increased generation amount of an additional 48.40%. In addition to this the climate change models indicate for the Mediterranean basin an increased drought and water scarcity that could even risk the project to reach the firm energy values.

The investment costs we have considered in our financial analysis is reasonable and reflect the average market conditions but are unlikely to go down, and the turnkey, engineering, procurement and construction contract indicates even a higher investment cost. Therefore these numbers reasonable and reflect the average market conditions but are unlikely to go down, as the focus of the project developer is to secure and improve the electricity yield and therefore they will not be able to cut costs. Therefore it is very unlikely for the investment cost to finalize below the amounts estimated and shown in the financial analysis.

Outcome of Step 2:

Without the VER revenue the Internal Rate of Return of the project cannot get close to the benchmark of 12.50 %, with an equity internal rate of return of 7.86%. A fluctuation of ± 10% in the key parameters also does not make the project exceed the benchmark.

Step 3 - Barrier Analysis

As the investment analysis concludes that the proposed project activity is unlikely to be the most financially attractive option, the sub step 3- Barrier analysis is optional to be applied and barrier analysis is not considered for the Kumköy HPP.

Step 4: Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the proposed project activity

As per “Tool for the Demonstration and Assessment of Additionality”, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory frame-work, investment climate, access to technology, access to financing, etc. Although the tool does not consider the Sectoral Scope 1: Energy industries (renewable-/non -renewable sources) projects amongst the measures that can make use of the common practice guideline version 02, we preferred to utilise the same guideline to demonstrate that within the boundaries of the Yeşilırmak catchment there are no similar projects that are developed and operational without the assistance of the VER revenue. According to the Guidelines on Common Practice (version 02), common practice analysis is presented through the following 4 steps.

Common Practice tool Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity:

As a hydropower project, the installed capacity is chosen as an appropriate proxy for "similar scale". The power generation capacity of 17.50 MW of the proposed project is selected as the design capacity. Therefore, the range from 8.75 MW to 26.25 is considered as applicable capacity.

Outcome of Step 2: Applicable output range is 8.75 MW to 26.25.

Common Practice tool Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity9.

The host country is geographically divided into 25 catchements as shown in the following figure. As can be seen from the figure the project site is located within the borders of the

Yeşilırmak Catchment. Yeşilırmak and its major tributary Kelkit River constitute the Yeşilırmak River Catchment. Therefore we have considered the geographical boundry of our common practice analysis as the Yeşilırmak Catchment, and we have checked the hydropower plants that are operational and located on the Kelkit and Yeşilırmak Rivers.

Figure 3.1 The 25 Water Catchements defined in Turkey.

Name of the Power Unit	Ownership	Capacity (MW)	Mean Production (GWh)	Firm Production (GWh)	Province	Town
Yavuz HES[11]	Private	22.5	83.0	47.0	Amasya	Tasova
Taşova-Yenıdereköy	Private	2	10.0	6.0	Amasya	Tasova
Kumköy (Project Activity)	Private	17,5	98.0	55.0	Samsun	Çarşamba
Kılıçkaya	Government	120	332.0	277.0	Sivas	Su Şehri
Çamligöze	Government	32	102.0	68.0	Sivas	Su Şehri
Koyulhisar[12]	Private	42	329.0	155.0	Sivas	Koyulhisar
Reşadiye[13]	Private	64.28		400.3	Sivas	Reşadiye
Almus Dam	Government	27	99.0	39.0	Tokat	Almus
Ataköy Dam	Government	5.5	8.0	8.0	Tokat	Niksar
Hasan Uğurlu	Government	500	1217.0	820.0	Samsun	Çarşamba
Suat Uğurlu	Government	69	350.0	250.0	Samsun	Çarşamba
Köklüce	Government	90	588.0	300.0	Tokat	Niksar

Table 3.3. Power Plants that are operaional on Yeşilırmak and Kelkit Rivers as of 11 April 2012 (as announced by the DSI as an answer to a question asked by a parliament member in the Turkish National Assembly).

Outcome of Step 2:

Only Yavuz HPP is identified as a comparable project.

Step 3: Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number Nall.

The above list covers all the power plants within the geographical boundary defined above (as Yeşilırmak River Catchement). Checking all the power plants within the capacity range determined in Step 1, and looking projects that have started commercial operation before the start date of the project, it is revealed that there are no power plants operational in the Yeşılırmak Catchement comparable to project activity except Yavuz HPP (Determent in Step 2), which is a registered GS VER Project. . Therefore the number of Nall is 0.

Nall=0

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number Ndiff.

When we consider the project listed in Step 3 as, Nall is zero there is no project that can be compared to Kumkoy HPP so the Ndiff is also zero.

Outcome of Common Practice tool Step 4 is Ndiff=0

Common Practice tool Step 5: Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F=1-Ndiff/Nall

F=1-(0/0)

F=0

Conclusion of Common Practice tool version 2.0 (EB 69 Report Annex 8):

The proposed project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndiff is greater than 3

Factor F is calculated to be 0 < 0.2

Nall-Ndiff =0-0=0 <3 in that case the Kumköy HPP is not common practice.

Conclusion: In conclusion the proposed project is deemed to be additional according to ACM0002 and the tool and guideline for the demonstration and assessment of additionality.

3.6 Methodology Deviations

No deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Emission reductions are calculated as follows:

$ERy = BEy - PEy - LEy$

Where:

ERy = Emission reductions in year y (t CO2/yr).

BEy = Baseline emissions in year y (t CO2/yr).

PEy = Project emissions in year y (t CO2/yr).

LEy = Leakage emissions in year y (t CO2/yr).

The above equation shows how to reach emission reductions on an annual basis. As can be seen from the equation, to reach the emission reductions, 3 other parameters needed to be defined and calculated: baseline emissions, project emissions and leakage emissions. The following sections shows how to define and calculate these three parameters.

4.2 Project Emissions

As the methodology states the PEy in case of a hydro power project will be calculated:

"Emissions from water reservoirs of hydro power plants (PEHP,y)

For hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH4 and CO2 emissions from the reservoir, estimated as follows:"

"...the power density of the project activity (PD) is greater than 4 W/m2 and less than or equal to 10 W/m2:"

Capacity (W)	/	Reservoir Area (m2)	=	Power Density (W/m2)	>10 (W/m2)
17,500,000	/	597,000	=	29.31	>10 (W/m2)

The project has a power density of 29.31 W/m2 therefore.

PEHP,y = 0

Where:

PEH Project emissions from water reservoirs (tCO2e/yr)

Although there will be an emergency/back up diesel generator installed within the project boundary, the emissions from these have been deemed negligible as per the ACM0002 (version 20.0.0) methodology, since it will be solely utilized in case of an emergency, such as a power outage.

4.3 Leakage

There are no leakage emissions related to project activity.

4.4 Net GHG Emission Reductions and Removals

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction Ery by the project activity during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

As methodology states, and as the details are given under 4.2 and 4.3, PEy and LEy in case of a hydropower plant project with a power density less than 10 W/m2 (which is 168 W/m2 for the Project Activity) to be zero. Hence:

ERy = BEy

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

BEy = EGPJ,y x EFgrid,CM,y

Where:

BEy = Baseline emissions in year y (tCO2/yr).

EGPJ,y = Quantity of net electricity generation that is produced and fed into the grid

as a result of the implementation of the CDM project activity in year y

(MWh/yr)

EFgrid,CM,y = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system (v6)”.

Turkish Ministry of Energy and Natural Resources published the Emission Factor for both solar and wind projects, and the other type of projects in 2021 by using the 2019 data. Since this PDD was based on the 2019 data, and since the calculation done by the MoENR is also referring to “Tool to calculate the emission factor for an electricity system”, the resulting EF value is used for this project.

According to the publishment by MoENR, the CM for hydro type of projects is 0.5706 tCO2/MWh; OM is 0.7258 tCO2/MWh; BM is 0.4153 tCO2/MWh.

ERy = BEy = EGPJ,y x EFgrid,CM,y = 91,964 MWh/year * 0. 5706 tCO2/MWh = 52,475 tCO2/year

The details of the calculation can be fund in “ CM_Kumkoy_13.01.2022”.

Year	Estimated GHG emission reductions or removals (tCO_2e)
03/03/2021-31/12/2021	43,705
2022	52,475
2023	52,475
2024	52,475
2025	52,475
2026	52,475
2027	52,475
2028	52,475

2029	52,475
2030	52,475
01/01/2031-02/03/2031	8,770
Total estimated ERs	524,750
Total number of crediting years	10
Average annual ERs	52,475

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)
03/03/2021 - 31/12/2021	43,705	0	0	43,705
2022	52,475	0	0	52,475
2023	52,475	0	0	52,475
2024	52,475	0	0	52,475
2025	52,475	0	0	52,475
2026	52,475	0	0	52,475
2027	52,475	0	0	52,475
2028	52,475	0	0	52,475
2029	52,475	0	0	52,475
2030	52,475	0	0	52,475
01/01/2031 - 02/03/2031	8,770	0	0	8,770
Total	524,750	0	0	524,750

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EFgrid,CM,y
Data unit	tCO2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year y
Source of data	Turkey National Electricity Network Emission Factor Information Form (Document no: ETKB-EVÇED-FRM-039 Rev.00)
Value applied	0.5706
Justification of choice of data or description of measurement methods and procedures applied	Turkish Ministry of Energy and Natural Resources published the Emission Factor for both solar and wind projects, and the other type of projects in 2021 by using the 2019 data. Since this PDD was based on the 2019 data, and since the calculation done by the MoENR is also referring to "Tool to calculate the emission factor for an electricity system", the resulting EF value is used for this project.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the second crediting period.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$
Data unit	MWh/ yr
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
Source of data	The primary source is the Meter Reading Forms. The data is crosschecked with EPIAS records. EPİAS is the financial settlement center of TEIAS (the national grid operator). The Meter Reading Forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters that belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.

<table>
<tr><td>Frequency of monitoring/recording</td><td>Monthly Readings</td></tr>
<tr><td>Value applied</td><td>Will be determined at the monitoring stage</td></tr>
<tr><td>Monitoring equipment</td><td>Power meters:
The meters are changed on 20/10/2019. The new meters are :
<table><tr><td></td><td>Main Meter</td><td>Back-up Meter</td></tr><tr><td>Description</td><td colspan="2">Bi-directional electricity meter in compliance with TS-620 EN 60044-1 and TS718 IEC60044.2 standards</td></tr><tr><td>Location</td><td colspan="2">TEIAŞ Switch Yard Facility Telecommunications Hall</td></tr><tr><td>Brand</td><td>ITRON</td><td>ITRON</td></tr><tr><td>Serial Number</td><td>84260361</td><td>84260362</td></tr></table></td></tr>
<tr><td>QA/QC procedures to be applied</td><td>A back-up meter is used for cross-checking the accuracy and both meters are calibrated if required.
The Meter Reading Forms are considered as the main source for the net electricity and the values are cross-checked with the EPIAS records.
TEIAS is responsible for calibration and maintenance of the devices. The periodic calibration or maintenance is under the responsibility of TEIAS and has been fixed as once in 10 years[7]. Since TEİAŞ meters are sealed by TEİAŞ, the project proponent cannot intervene with the devices. The periodic tests are executed on annual basis.
The power meters were changed on 20/10/2019[8].</td></tr>
<tr><td>Purpose of the data</td><td>Calculation of net electricity supplied to the grid and thus baseline emissions</td></tr>
<tr><td>Calculation method</td><td>Direct continuous measurement</td></tr>
<tr><td>Comments</td><td>Data will be used to calculate net electricity supplied to the grid.</td></tr>
</table>

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

[8] The reference document is submitted to the DOE at the third monitoring period.

Data / Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydropower plant after the implementation of the Project Activity
Source of data	Project site computers with SCADA system and the turbine name plates.
Description of measurement methods and procedures to be applied	Observation via the SCADA system of the Project Activity
Frequency of monitoring/recording	Once for each monitoring period
Value applied	17,500,000
Monitoring equipment	SCADA system of the Project Activity
QA/QC procedures to be applied	Can be confirmed also by the parameter readings on the design plates of each turbine and by summing up the two units.
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	-

Data / Parameter	APJ
Data unit	m2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is full.
Source of data	Scada System of the project
Description of measurement methods and procedures to be applied	The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In

	order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, presented in Annex 1.
Frequency of monitoring/recording	Once during each monitoring period
Value applied	597,000 m2
Monitoring equipment	Scada system water level readings
QA/QC procedures to be applied	Can be checked and compared to satellite imagery available by Google Earth.
Purpose of the data	Calculation of project emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

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

According to the methodology applied, ACM0002 version 20.0.0, the electricity supplied to the national grid by the proposed Project and the electricity consumed by the project activity are monitored. The net electricity is the difference of the electricity supplied from electricity consumed by the Project and is taken into account for emission reduction calculations.

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

Please see below the management structure for the plant operation:

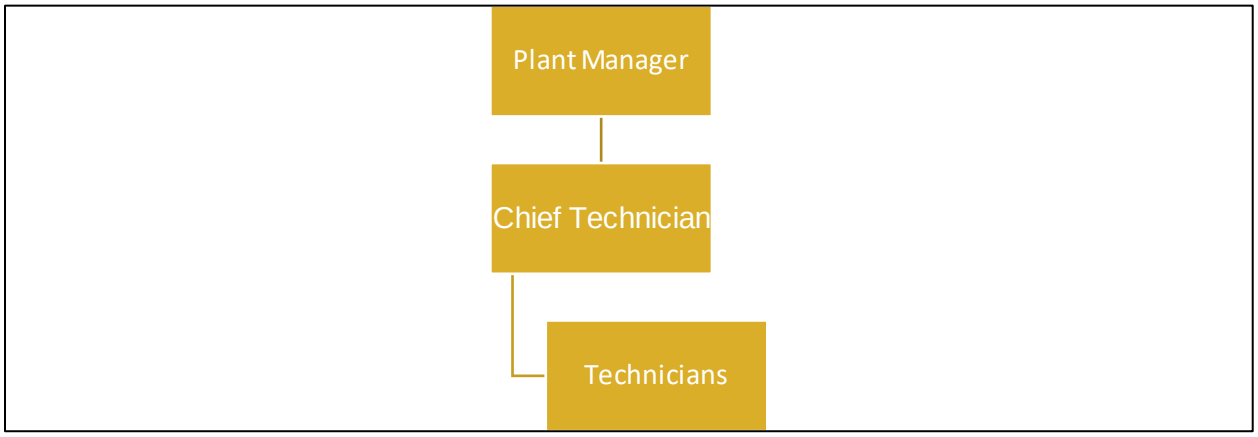


Figure 5.1: The management structure for the plant operation

The plant manager is responsible for the whole management of the Project Activity and the technicians are responsible for the implementation of the Project Activity.

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

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

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

The installed capacity is measured through the SCADA system. By means of the SCADA system established in the plant, all kinds of technical parameters related to turbines and

generators, including installed capacity, is measured and stored in the system on a real time basis.

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to the maximum operational level has been determined as a certain value according to the topographical maps. In order to make verification of the reservoir area, the coordinates may be measured by GPS around the border of the reservoir area.

Quality Control and Assurance (QC/QA)

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

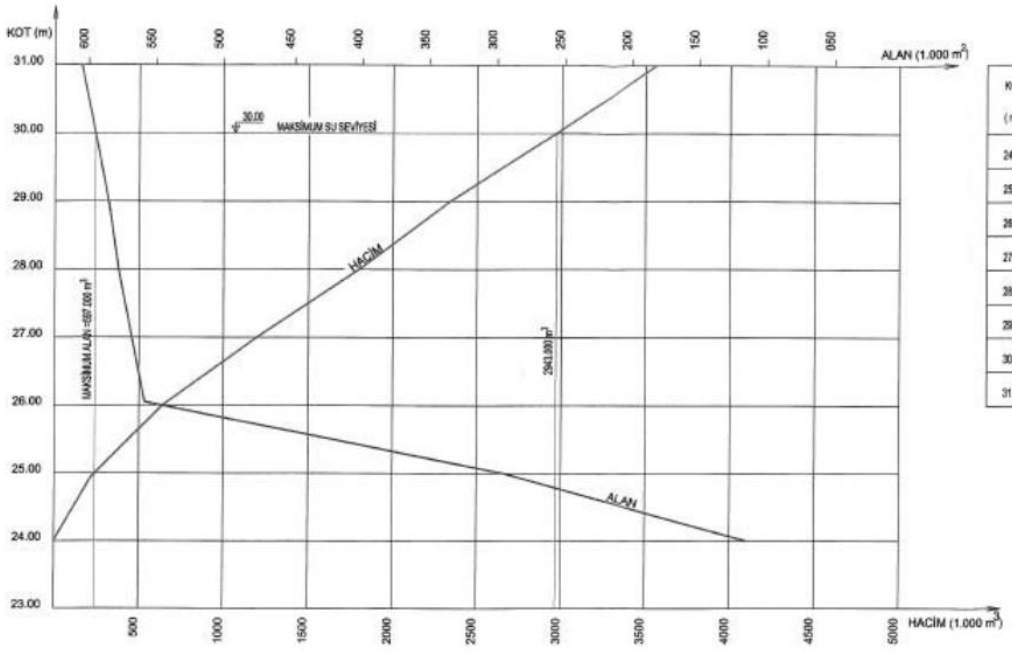
The grid operator's Metering Officer should be notified of any failure of one of the meters. He is the only one authorized to deal with fixing, calibrating, or changing the meters, which will be done either by the grid operator or by a company authorized by the grid operator. During this monitoring period, there were no records of meter failure. The data is hourly recorded by the personnel on the plant. TEIAS Load Dispatching Center also executes remote reading during 24-hour period. At the end of the month, the readings are taken to the center to be compared and approved. The data could be remotely accessed by TEIAS.

The capacity of the transmission line connected is 31.5 kV, the accuracy class for main power meter has been defined in the Communiqué for Power Meters as 0.5S class. The back-up meter has the same accuracy class of 0.5S. The calibration will be implemented in accordance with the related standard procedures (TS-620 EN 60044-1 and TS718 IEC60044.2) by either TEIAS or the provider company in the name of TEIAS. When the main meter has a breakdown, the readings of the back-up meter will be used. Both power meters are ITRON SL7000, 0.5S class. The serial number for main power meter is 84260361 and the back-up power meter is 84260362.

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

APPENDIX

Volume versus Area Curve



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