



**Verified Carbon
Standard**

KEPEZKAYA HYDROELECTRIC POWER PLANT PROJECT



CLIMATE BALANCED

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Prepared by	Climate Balanced İklim Enerji Ticaret ve Eğitim Ltd. Şti.

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Kepezkaya Hydroelectric Power Plant, Karaman is located on the Göksu River in the Eastern Mediterranean region of Turkey. The Project is being used only for energy generation purposes. It has an Energy Generation License for 48 years and two and half months obtained from Energy Market Regulatory Authority (EMRA) in 2007.

The Project Activity is a run-of-river type composed of a weir, water intake structures, 3 610 m long conveyance tunnel, a head pond, penstocks, and a powerhouse equipped with 2 turbines each having 14.7 MWm/14.0 MWe capacity and 29.40 MWm/28.00 MWe installed capacity turbines.

As was also explained in the DSI approved project feasibility study report, the Project Activity is a part of the Konya-Çumra 3rd Stage Irrigation Plan of DSI. At the upstream basin of the Kepezkaya HEPP, a large-scale irrigation project was conducted by the General Directorate of State Hydraulic Works (DSİ). Within the scope of this irrigation project at the upper elevation of 1,000 m of Göksu basin three dams: Namely Bağbaşı, Afşar, and Bozkır dams.

For the first crediting period, the expected annual energy generation was 107,587 MWh, and the estimated amount of GHG emission reduction was 61,443 tonnes CO_{2e} per year in the registered PDD. For the second crediting period, which is between 01/10/2020 and 30/09/2030, the expected annual energy generation is 107,587 MWh, and the estimated amount of GHG emission reduction is 61,389 tonnes CO_{2e} per year.

The purpose of the Kepezkaya HEPP is to utilize the hydropower potential of the Göksu river to generate electricity based on a renewable resource and thus generate Verified Emission Reductions (VERs), displacing electricity generation from grid-connected fossil fuel-fired power plants. Plant is connected to Kepezkaya Havza TM, 154 kV (substation).

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 timeline¹

Date	Milestone
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¹ Due to delays in the project process, an exemption request regarding the subsequent project process and the revalidation timeline was submitted to and approved by Verra. The approved Exemption Request is publicly uploaded to Verra Registry.

12/09/2006	Correspondences start to seek consultancy to develop Carbon asset of the Project
15/11/2016	A proposal was taken from E&C Services GmbH Germany to develop the projects in the pipeline of the mother company
5/07/2007	EMRA granted Electricity Production License to Selen Elektrik Üretim A.Ş.
13/07/2007	EIA not Needed Certificate Issued by MoEF Karaman Province Representation
28/01/2008	Turnkey Engineering Procurement and Construction Contract Signed between Selen Elektrik Uretim A.S. and IC İċtaş İnşaat
06/02/2008	Loan Agreement Signed
18/03/2008	Construction start Date
02/04/2008	The project Owner was granted the Ultimate Forestry Permit to operate within the jurisdictions of the forestry authorities' lands
15/04/2008	Electromechanical equipment procurement agreement was signed between IC İċtaş (as the Turnkey EPC Contractor) and Harbin electric Co.
01/01/2008	Feasibility study Report Finalized
22/09/2008	DSI Approval for the Feasibility Study
23/01/2009	Water Usage Agreement Signed between Selen and DSI
07/10/2009	TEIAS Connection Agreement Signed
06/09/2010	Government officials approved the Project to be suitable to be connected to the grid
01/10/2010	First Date Electricity is supplied to the grid (crediting period start date)
01/10/2010	Start date of the first monitoring period
31/08/2012	End date of the first monitoring period
01/09/2012	Start date of the second monitoring period
28/02/2018	End date of the second monitoring period
01/03/2018	Start date of the third monitoring period
30/09/2020	End date of the third monitoring period

30/09/2020	End date of the first crediting period
01/10/2020	Start date of the second crediting period

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	01-October-2010 to 30-September-2020	VCS	TÜV Rheinland Energie und Umwelt GmbH	10 years
Verification	01-October-2010 to 31-August-2012	VCS	TÜV Rheinland Energie und Umwelt GmbH	2 years
Verification	01-September-2012 to 28-February-2018	VCS	Re Carbon Gözetim Denetim ve Belgelendirme Ltd. Şti.	6 years
Verification	01-March-2018 to 30-September-2020	VCS	RINA Services S.p.A.	2 years
Validation	01-October-2020 to 30-September-2030	VCS	RINA Services S.p.A.	10 years

1.3 Sectoral Scope and Project Type

Sectoral scope ²	Sectoral Scope 1
Project activity type	Energy industries (renewable / non-renewable source)

Kepezkaya Hydroelectric Power Plant Project is not an AFOLU project.

1.4 Project Eligibility

1.4.1 General eligibility

Kepezkaya 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.

² Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

1.4.2 AFOLU project eligibility

Since Kepezkaya Hydroelectric Power Plant Project is not an AFOLU project, this section is not applicable.

1.4.3 Transfer project eligibility

Since Kepezkaya Hydroelectric Power Plant Project is not a transfer project, this section is not applicable.

1.5 Project Design

- ☒ Single location or installation
- ☐ Multiple locations or project activity instances (but not a grouped project)
- ☐ Grouped project

The Project Activity is a run-of-river type hydropower plant with a total installed capacity of 28 MW (2 x 14.00 MW). A concrete gravity weir diverts water into the conveyance tunnel with 40 m³/s flow rate capacity. A net water head of 81.57 m (gross head 87.88 m) is formed, and water is discharged into two vertical Francis turbines. A 30 km 33 kV transmission line interconnects to the national grid at the Kepezkaya Basin Transformer Substation. Figure 1.1 summarizes how the project activity is operating and what needs to be considered within the physical project boundary. The project boundary may be seen in Figure 1.1.

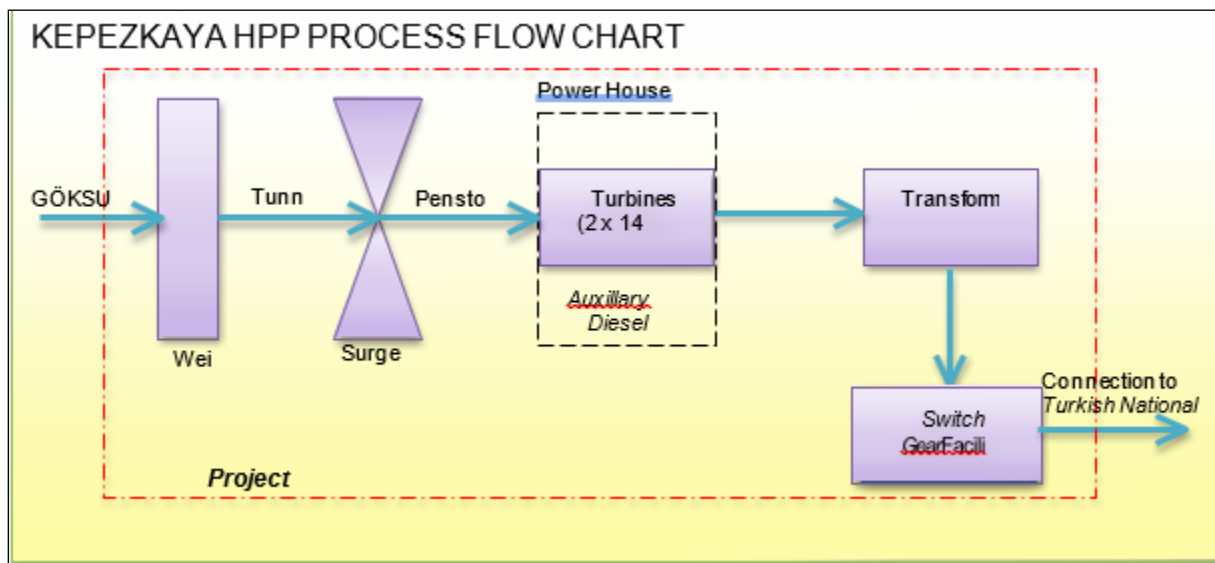


Figure 1.1: The project boundary of Kepezkaya Hydroelectric Power Plant

1.5.1 Grouped project design

Since Kepezkaya Hydroelectric Power Plant Project is not a grouped project, this section is not applicable.

1.6 Project Proponent

Organization name	Entek Elektrik Üretimi A.Ş.
Contact person	Gül Topal
Title	Trade Manager
Address	Köseköy Mah. Yeni Demiryolu Cad. No:70 41250 Kartepe/Kocaeli
Telephone	+90 216 217 11 00
Email	Gul.Topal@entekelektrik.com.tr

1.7 Other Entities Involved in the Project

Organization name	Climate Balanced İklim Enerji Ticaret ve Eğitim Ltd. Şti.
Role in the project	Project Consultant
Contact person	Ramazan Oğuz Tosun
Title	CEO
Address	Beyaz Zambaklar Sk, GOP, 4/10, Çankaya, Ankara, Türkiye
Telephone	+90 505 617 6832
Email	oguz@climatebalanced.com

1.8 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.

1.9 Project Start Date

Project start date	01-October-2010
Justification	First date electricity is supplied to the grid

1.10 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other (Ten years, renewable twice)
Start and end date of first or fixed crediting period	01-October-2020 to 30-September-2030

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

- ☒ < 300,000 tCO₂e/year (project)
☐ ≥ 300,000 tCO₂e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO ₂ e)
01-October-2020 to 31-December-2020	15,473
01-January-2021 to 31-December-2021	61,389
01-January-2022 to 31-December-2022	61,389
01-January-2023 to 31-December-2023	61,389
01-January-2024 to 31-December-2024	61,389
01-January-2025 to 31-December-2025	61,389
01-January-2026 to 31-December-2026	61,389
01-January-2027 to 31-December-2027	61,389
01-January-2028 to 31-December-2028	61,389
01-January-2029 to 31-December-2029	61,389
01-January-2030 to 30-September-2030	45,916

Total estimated ERRs during the first or fixed crediting period	613,890
Total number of years	10
Average annual ERRs	61,389

1.12 Description of the Project Activity

The Project Activity is a run-of-river type hydro power plant with a total installed capacity of 28 MW (2 x 14.00 MWe). The following is a list of the main components of the project activity:

- A weir with an 80 m crest length and 15.5 m height.
- Spillway equipped with two flap gates for flood control.
- A water intake structure dedicated for energy water diversion purpose.
- A 3 610 m long conveyance tunnel with a diameter of 4.0 meters and a capacity of 40 m³/s.
- A head pond with 15.00 x 13.50 x 9.20 m dimensions.
- Two, 152 m long penstocks with diameter of 2.40 m.
- A powerhouse with 29.40 x 22.20 x 27.00 m dimensions where the turbines and generators will be placed.
- A specially designed fish ladder to allow fish to swim upstream and over the dam.
- Two “Francis” turbines. For an 81.57 m of net head, these turbines are considered to be state-of-the-art technology. Each turbine will have a design discharge of 20 m³/s.
- Two generators, each rated at 16.90 MVA, placed on the top of each turbine.
- A 30 km 33 kV transmission line will interconnect to the national grid at the Karaman Transformer Substation.
- Substation for the electricity dispatch.

Related with the electromechanical equipment of the Project Activity, a contract, “The Supply and Installation of Electro-Mechanical Equipment for Kepezkaya Hydro-Electric Power Plant” has been signed with Harbin Electric (HE) Corporation. Harbin Electric, headquartered in Harbin, China, which is one of the well-known international company about developing and manufacturing a wide array of electric motors. In this context, technology transfer has been provided from China within the scope of Project Activity.

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.

The main technical characteristics obtained from the DSI Approved and final feasibility report are provided below:

Table 1.2. Technical characteristics of the Kepezkaya HEPP

Characteristics of Kepezkaya HEPP	
Thalweg elevation of the weir	490.50 m
Crest elevation of the weir	503.50 m
Weir height	15.50 m
Spillway capacity	1 084.78 m ³ /s
Max. operation level	501.80 m
Min. operation level	497.00 m
Project design capacity	40 m ³ /s
Conveyance tunnel length	3 610 m
Average flow	28.63 m ³ /s
Gross head	87.88 m
Net-head	81.57 m
Turbine type	Francis (Vertical)
Number of units	2
Capacity of each unit	20 m ³ /s
Installed Capacity	28.00 MWe
Total Gross Energy (Maximum)	124.05 GWh/year
Average Annual Energy over the 1st Crediting Period	107.587 GWh/Year



Figure 1.2 A-Location of the planned weir. B-Location of the penstock and powerhouse

The project has using two vertical Francis turbines. The Francis type of turbine is a reaction type of turbine. In case of reaction turbines, the water approaches a set of curved blades mounted on a shaft and glides over them thereby changing direction and so imparting pressure on the blades due to centrifugal force, i.e. the force experienced by a passenger in a car when turning very fast. The water enters the blades nearly at a tangent and for the highest efficiency leaves the blades radially and at a reduced velocity. Francis turbines were invented by an English engineer J.B.Francis (1815 – 1892) water is delivered into a volute casing which completely surrounds the runner and is under pressure as well as velocity. The water is guided through both fixed and adjustable veins in the casing and glides onto the runner blades at an angle. The water then turns in the runner to exit parallel with the axis of rotation. The adjustable vanes cater for load changes. A bypass valve or a surge tank deals with sudden load changes. In a Francis turbine the entire wheel assembly is immersed in water and surrounded by a pressure casing. In a Francis turbine the pressure casing is spiral shaped and is tapered to distribute water uniformly around the entire perimeter of the runner. It uses guide vanes to ensure that water is fed into the runners at the correct angle. See the below Figure, for a schematic explanation of working principles of a Francis Turbine.



Figure 1.4: Map showing the location of Kepezkaya HEPP on the Göksu River, Karaman, Turkey

1.14 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.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

Laws as relevant to the project are (Law No. and Enactment Date):

- (1) Electricity Market Law⁴
- (2) Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy⁵
- (3) Environment Law⁶
- (4) Occupational Health and Safety Regulation⁷

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

⁴ See: <https://www.epdk.gov.tr/Detay/Icerik/3-14650/6446-guncel-elektrik-piyasasi-kanunu>

⁵ See: <https://www.epdk.gov.tr/Detay/Icerik/3-0-156/kanunlar>

⁶ See: <https://www.mevzuat.gov.tr/MevzuatMetin/1.5.2872.pdf>

⁷ See: <https://www.mevzuat.gov.tr/MevzuatMetin/1.5.6331.pdf>

☐ Yes ☒ No.

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

Is the project active under the other program?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes

☐ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, “Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities].”

☐ Yes

☐ No

1.18 Sustainable Development Contributions

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.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

Not applicable since the project is a green field project.

1.19.2 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.

1.19.3 Further Information

No further information to be added.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The Project Proponent identified key stakeholders likely to be affected by or interested in the project. Identification was carried out through reviewing the administrative structure of the project area, consultations with local authorities, and considering proximity to the project site. Official stakeholders were identified through direct contact with local and provincial institutions, while community stakeholders were identified through the Mukhtars (village mayors). The identified stakeholders were: • Karaman Governorship • Provincial Environment and Forestry Directorate (2 officials attended) • Karaman Municipality (the mayor was informed separately) • Mukhtars and residents of Damlapınar, Güzer, Çukurköy, and Buçakkışla villages • Regional and national media (Anadolu Manşet and Türkiye Gazettes).
Legal or customary tenure/access rights	Stakeholders, including the local communities of Damlapınar, Güzer, Çukurköy, and Buçakkışla villages, hold legal and customary access rights to surrounding agricultural lands, water resources, and forested areas. The project does not interfere with any private or communal lands. No indigenous peoples or customary rights holders with conflicting claims exist in the project area.
Stakeholder diversity and changes over time	The stakeholder group includes a mix of local villagers (farmers, small business owners, and households), local government representatives, and public authorities. The local population is socioeconomically homogenous. There have been no significant

	demographic or cultural changes in the stakeholder composition over time.
Expected changes in well-being	The project is expected to positively affect local well-being by providing temporary and permanent employment opportunities during the construction and operation phases. Five workers from the local region were employed. No negative impacts on local livelihoods or access to natural resources were identified. The project contributes to regional development and supports climate change mitigation through renewable energy generation.
Location of stakeholders	The main project stakeholders are located in Karaman Province, Türkiye. The local communities of Damlapınar, Güzer, Çukurköy, and Buçakkışla villages are within or near the project's area of influence. Governmental stakeholders are based in Karaman city center.
Location of resources	The resources that stakeholders use or have customary access to (such as agricultural land and local water sources) are located in the vicinity of the project site. The project does not restrict or modify access to these resources.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	02-October-2007
Stakeholder engagement process	The stakeholder consultation meeting was organized and conducted by Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti., marking the company's first experience with stakeholder engagement. Invitations were sent via fax and personal delivery to the Mukhtars of Damlapınar, Güzer, Çukurköy, and Buçakkışla villages. The meeting was publicly announced in both a regional (Anadolu Manşet) and a national (Türkiye) newspaper. Officials were invited by phone calls to relevant institutions. The meeting included a presentation, dialogue session, and a personal questionnaire. All materials were presented in Turkish, ensuring cultural and linguistic appropriateness. Documentation was maintained through attendance sheets and distributed brochures.
Consultation outcome	A total of 42 participants attended the meeting. The presentation included: (1) general principles of run-of-river type hydro plants, (2)

	specific technical details of the proposed project, and (3) the environmental impact assessment (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. Local villagers asked about employment possibilities. The project owner promised that priority would be given to local villagers for unskilled jobs. Five people were later employed from the local region. No environmental problems or objections were raised. Participants noted clear signs of climate change.
Ongoing communication	Continuous communication is maintained between the project owner and the local communities through the village Mukhtar. The Mukhtar holds the contact information of the plant's responsible person. Regular check-ins are conducted by the project owner to identify any complaints or requests. The Mukhtar's signed confirmation (dated 13-January-2020) was submitted to the DOE.
Stakeholder input	Stakeholders' input focused on employment expectations. The project owner addressed this by hiring five local workers and maintaining an open channel for future collaboration. No design updates were required as all concerns were adequately addressed through ongoing communication.

2.1.3 Free Prior and Informed Consent

Obtaining consent	Consent for the project implementation was obtained transparently during and following the stakeholder consultation. The meeting provided all relevant information regarding the project's design, environmental and social impacts, and contact channels for feedback. The Mukhtars represented the collective interests of the local communities and expressed their support for the project. No disputes or conflicts existed regarding land use or project activities.
Outcome of FPIC	The consultation resulted in the local community's consent to proceed with the project. Information was fully disclosed in accessible language and format. The project has not caused or contributed to any land encroachment, physical or economic displacement, or involuntary resettlement. No unresolved conflicts or ongoing disputes remain.

2.1.4 Grievance Redress Procedure

Development process	The grievance redress mechanism was developed during the stakeholder consultation process. It ensures that grievances can be submitted through culturally appropriate and accessible methods, primarily via the village Mukhtar or directly to the project owner. Complaints are received, heard, and addressed promptly by the project management team.
Grievance redress procedure	• The Mukhtar acts as the first point of contact for local grievances. • The project owner regularly communicates with the Mukhtar to inquire about any issues. • Stakeholders can also directly contact the plant's responsible person (whose contact information is publicly available). • Any complaint is recorded, evaluated, and resolved within a reasonable timeframe. • To date, no complaints have been received.

2.1.5 Public Comments

Comments received	Actions taken
Main concerns were about the Project were water rights and irrigation issues. Most villagers are farmers, and their fields are within the Project's border. They are concerned that the implementation of the Project will affect water availability.	The Project Owner assured the Mukhtar that sufficient water will be left for irrigation. Moreover, realizing his genuine concern, the Owner raised the possibility that, if technically feasible, the water for irrigation will be released from the top of the penstock, increasing water pressure which will enable the local villagers to use drip irrigation. Drip irrigation systems improve agricultural yields, increase water conservation and lower work load. However, drip irrigation requires high pressure which is currently unavailable, leaving the local villagers to use inefficient irrigation methods. The Mukhtar was grateful for this initiation, stating that such a gesture would greatly improve the quality of their life, and the Project Owner promised to look into it

Another issue was future employment possibilities. The results suggest that the locals think that the most urgent problem of the region is unemployment.	The Project Owner promised that when hiring unqualified workers during construction and operation, priority will be given to local villagers.
All people believed that the presentation was clear, and the majority believed that the presented information was genuine.	-

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Climate Balanced İklim Enerji Ticaret Ve Eğitim Ltd Sti. team has expertise or experience in implementing similar project activities and engaging communities

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified.	All necessary precautions are taken. Occupational, health, and safety trainings are provided to workers in the project.
Risks to stakeholder participation	No risk identified.	Grievance input/logbook is provided to Mukhtar.
Working conditions	No risk identified.	All precautions regarding working conditions being implemented.
Safety of women and girls	No risk identified.	Project provides equal opportunities that have been provided in the context of gender equity and pay for labor and work. Currently there are no woman employees, but project owner is willing to employ woman in order to maintain gender equality.
Safety of minority and marginalized groups, including children	No risk identified.	Workers under the age of 18 will not be involved in the project.

Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No risk identified.	Solid waste, hazardous waste and wastewater will be handled in line with regulations.
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2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ⁸	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	In Kepezkaya Hydroelectric Power Plant Project no discrimination or sexual harassment has occurred. The project complies with Business Law in Turkey and thus complies with Article 5 of Business Law ⁹ .
Sexual harassment	No risk identified	In Kepezkaya Hydroelectric Power Plant Project no discrimination or sexual harassment has occurred. The project complies with Business Law in Turkey and thus complies with Articles 24 and 25 of Business Law.
Equal pay for equal work	No risk identified	Kepezkaya Hydroelectric Power Plant Project provides equal opportunities have been provided in the context of gender equity and pay for labor and work.
Gender equity in labor and work	No risk identified	Kepezkaya Hydroelectric Power Plant Project does not use victims of forced labor

⁸ The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

⁹ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=4857&MevzuatTur=1&MevzuatTertip=5>

Forced labor	No risk identified	Staff and laborers are not asked to work in conditions that directly impact their health, safety, or religious values, and workers
Child labor	No risk identified	Kepezkaya Hydroelectric Power Plant Project does not use victims of human trafficking.
Human trafficking	No risk identified	In Kepezkaya Hydroelectric Power Plant Project no discrimination or sexual harassment has occurred. The project complies with Business Law in Turkey and thus complies with Article 5 of Business Law ¹⁰ .

2.3.2 Human Rights

Turkey is a party to the Universal Declaration of Human Rights¹⁶, therefore, does not violate these rights, and it's not a matter of discussion for Turkey. Therefore, the project developer and the project do respect nationally and internationally proclaimed human rights and are not complicit in violence or human rights abuses of any kind. The project respects internationally proclaimed human rights, including dignity and cultural property. Therefore, the project will not discriminate with regard to participation and inclusion.

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	Turkey is a party to the Universal Declaration of Human Rights. The project proponent also agrees to follow Turkey.

2.3.3 Indigenous Peoples and Cultural Heritage

The project does not include indigenous people or cultural heritage within the project area that can be influenced by the project activity.

Risks identified	Mitigation(s) or preventative measure taken
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¹⁰ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=4857&MevzuatTur=1&MevzuatTertip=5>

No risk identified	Project does not include indigenous people or cultural heritage within the project area that can be influenced by the project activity
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2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	Land acquisition was done according to the Turkish expropriation laws and regulations.

2.3.5 Benefit Sharing

Project does not impact property rights and Land acquisition was done according to the Turkish expropriation laws and regulations.

Process used to design the benefit sharing plan	N/A
Summary of the benefit sharing plan	N/A
Approval and dissemination of benefit sharing plan	N/A

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	Waste generation	Waste management will be done in line with the regulations ¹¹ .

¹¹ <https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=20644&MevzuatTur=7&MevzuatTertip=5>

Soil degradation and soil erosion	No risk identified	Project does not lead to soil degradation or erosion.
Water consumption and stress	Water quality	PP is storing waste water in septic tank. And municipality is collecting waste water from this septic tank. Transports it for the waste water treatment.

2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes ☒ No

Species and habitat	N/A
Areas needed for habitat connectivity	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	N/A	N/A
Areas for habitat connectivity	N/A	N/A

2.4.2 Introduction of Species

N/A

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
N/A	N/A

N/A	N/A
N/A	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	N/A	N/A

2.4.3 Ecosystem Conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	N/A	N/A

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0002	Consolidated baseline methodology for grid-connected electricity generation from renewable sources	20.0
Tool	TOOL11	Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	03.0.1
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	07.0.0
Tool	TOOL03	Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion	03

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:

Methodology ID	Applicability condition	Justification of compliance
ACM0002	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 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.
ACM0002	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.
ACM0002	In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the	The project activity does not involve capacity additions, retrofits, rehabilitations or replacements. Hence, this criterion is not applicable to the project activity.

	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.	
ACM0002	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/m²; 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/m²; 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/m², all of the following conditions shall apply:	The project activity is a hydro power plant. In case of Kepezkaya HEPP, there is only a weir that rises the water level to transfer the water to the water conveying system. At the maximum operation level of 501.80 m water level the total extent of the area that is flooded by river is 166,258.40 m² therefore the power density is calculated to be 168 W/m², which is much greater than 4W/ m².

	i. The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; 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/m² shall be: a. Lower than or equal to 15 MW; - and Less than 10 per cent of the total installed capacity of integrated hydro power project.	
ACM0002	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 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	The project activity is not an integrated a hydro power plant. Hence, this criterion is not applicable to the project activity.

	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.	
ACM0002	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; 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.
ACM0002	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	The project is not a retrofit, rehabilitations, replacements or capacity addition; hence, this criterion is not applicable to the project activity.

	activity and undertaking business as usual maintenance”.	
ACM0002	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 ₂ O	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 ₂ O	No	Minor emission source
		Other	N/A	N/A
	Auxiliary Diesel Generator 5	CO ₂	No	Minor emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	N/A	N/A

3.4 Baseline Scenario

According to the guidelines of the applicable large scale approved methodology ACM0002 (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.

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 6.0.0” and the numbering in this section reflects the Tool’s Guidelines provided at EB 65.

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

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

The project alternatives can be defined as follows:

1. The proposed project activity undertaken without being registered as a VCS project activity. This alternative is very unlikely as it is not financially attractive, please refer to step 2 for details.
2. Potential alternatives with the output of renewable electricity such as a geothermal, solar or wind power plants. These alternatives are very unlikely as, wind or geothermal resources are not existing in the project area and the solar plants are technologically not available and is not technically feasible to implement.
3. 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 Scenario (c) Continuation of the current situation, without any project undertaken (a) is not realistic as shown below by the financial analysis that exhibits that the project is not viable without VER revenues.

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. 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 6.0.0 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 626, 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 “KPZHPPFinancialAnalysis” 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 Kepezkaya HEPP Project

Parameter	Value	Unit	References
Installed Capacity	28.00	MWe	Production Licence
Expected Annual Electricity Generation	107,587 ¹ 81,298	MWh MWh	See table 1, calculated based on the assumptions in chapter 9 of DSI Approved Feasibility Study Report (dated March 2008)
Expected Annual Emission Reduction(ER)	61,443	tCO ₂ e	Calculated (see Chapter 3 for details)
Expected VCS-SCS- VCU sales price	7.00	USD/t CO ₂ e	State of the Voluntary Markets 2010 ⁸
Total Investment	61,684,214	USD	Based on FSR Report table 8.11
Annual Operation Costs	768,881.21	USD	Based on Chapter 9 of FSR
Loan	41,100,000	USD	Loan Agreement
Loan Period	10	years	Loan Agreement
Electricity Sales Price	0.073	USD/KWh	Based on the guaranteed price by the "Renewable Energy Law" number 6094
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. And 70 % of the long-lasting assets are depreciated over 45 years and the residual book value of 23,876,422.05 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 report⁹ 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 years¹⁰.

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 7.86 %, 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 $\pm 10\%$ 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	11.0%	9.2%	6.8%	5.8%	No
Operating Cost	8.1%	8.0%	7.8%	7.7%	No
Electricity Revenue	6.3%	7.1%	8.7%	9.6%	No

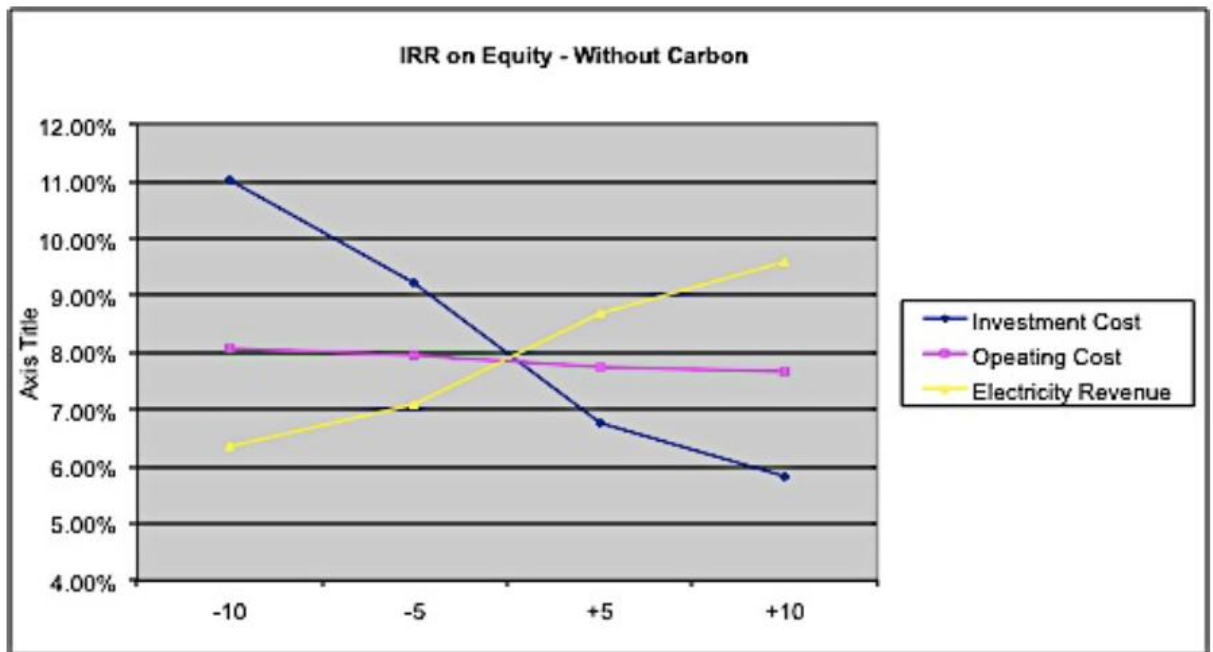


Figure 3.1: Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by $\pm 10\%$

To exceed the benchmark, the electricity revenue must increase by about 24.65% over the life of the project, or the investment cost must be reduced by about 13,18%. As the Renewable energy law only guaranties a minimum price of USD 0.073 per kWh, and as the project is a run of river type project, it is unlikely for it to wait and catch the best price of the day in the day a head electricity market. As the feasibility report considers the upstream developments and water usage in 4 phases, as these phases will realize, the water available to produce electricity will decrease therefore such an increase in 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 of 24,55%. 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.

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 $\pm 10\%$ 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 Kepezkaya HEPP.

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 framework, investment climate, access to technology, access to financing, etc. According to the Guidelines on Common Practice (version 01), common practice analysis is presented through the following 4 steps.

Common Practice tool Step 1: Calculate applicable output range as $\pm 50\%$ 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 24.00 MW of the proposed project is selected as the

design capacity. Therefore, the range from 12.00 MW to 36.00 MW is considered as applicable capacity.

Common Practice tool Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number as Nall. Registered VER project activities shall not be included in this step:

Projects located in different geographical regions in Turkey have different natural conditions.

The different water availability, climatic regime and considering that the permissions are given from the same regional district of the DSI, lead us to conclude that only the hydroelectric power projects in the 4th region of DSI-Konya, that covers the Karaman Province where the Kepezkaya HEPP Project is located, The Konya, and Mersin, provinces that are the closest neighbouring cities, of the Eastern Mediterranean region, where the Göksu River Basin is located is chosen as a realistic comparison geography. See the below figures for the boundary of DSI regional jurisdiction boundaries (Figure 8) and the geographical location of the boundary of the Göksu River Basin (Figure 9). Therefore, only projects that are in the Göksu Basin and or are located in one of these provinces are considered: Konya, Karaman and Mersin



Figure 3.2: The Map showing the jurisdictional boundaries of the DSI regional directorates. (Please note that the project is located in Karaman Province)

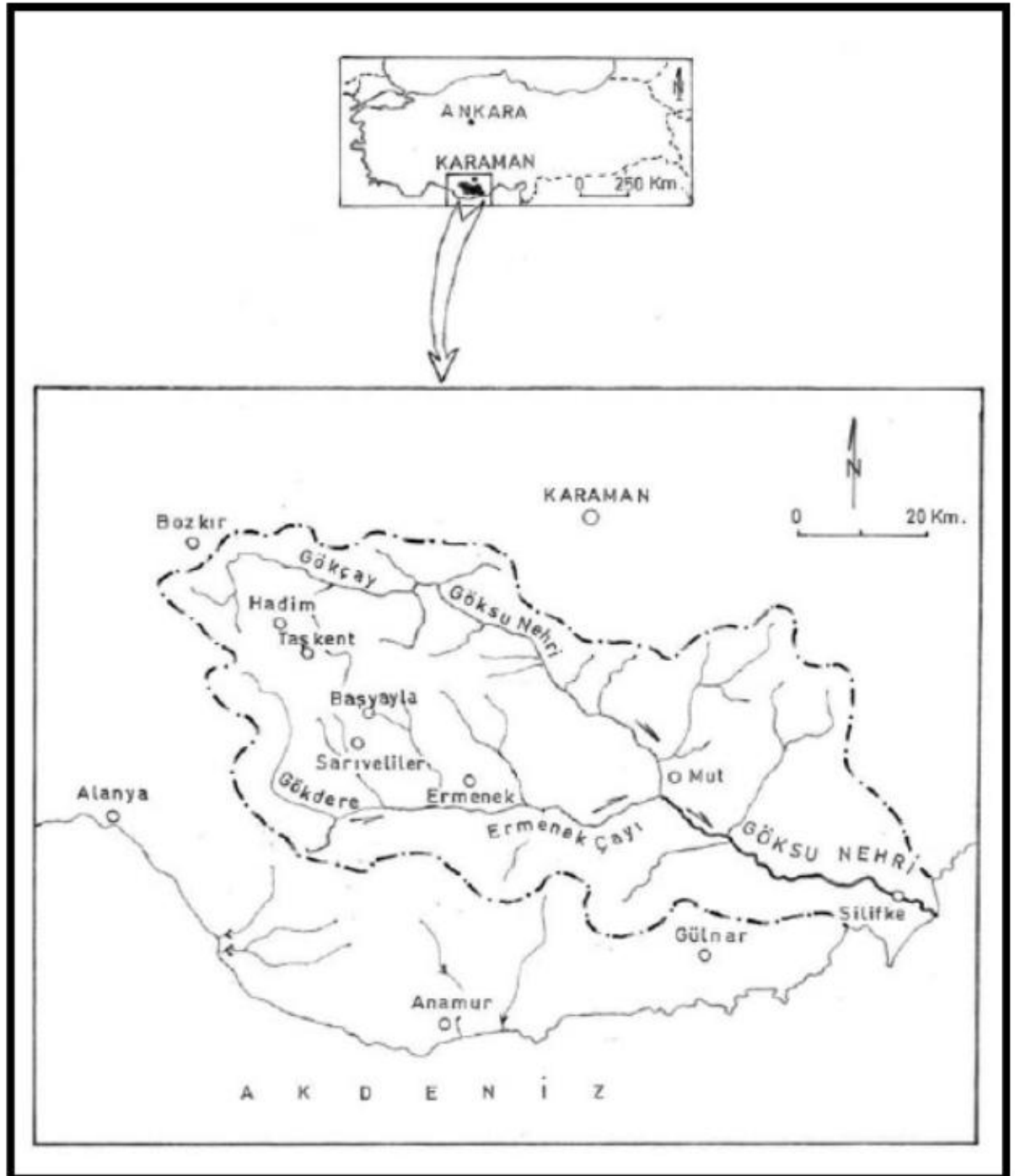


Figure 3.3: Location Map showing the boundaries of the Göksu River basin¹².

Projects located in this geography with installed capacity of 12 MW to 36.00 MW, having started commercial operation before the start date of the project, were selected for further analysis. With the above-mentioned criteria, a number of projects under construction or seeking VER revenue assistance are therefore not included.

Within the jurisdiction of DSI 4th Geographical District, there is only one hydroelectric power projects within the range from 12 MW to 36 MW, which started commercial operation before the start date of the Kepezkaya HEPP. The number of Nall is 1.

Table 3.3: Projects that are commissioned before the project activity that can be considered to be included in the count of Nall.

Name	Investment Type	Capacity (MW)	Mean Annual (GWh)	Province	DSI District	Commissioned in
Pamuk	PL	23.7	81	Mersin	06 Adana	2004

Common Practice tool Step 3: identify the different technologies delivered the same output and differ by at least one of the following aspects, Note their number Ndiff :

- (i) Energy source/fuel;
- (ii) Feed stock
- (iii) Size of installation (power capacity):
 - Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision3/CMP.6);
 - Small (as defined in paragraph 28 of Decision 1/CMP.2);
 - Large;
- (iv) Investment climate in the date of the investment decision, inter alia:
 - Access to technology;
 - Subsidies or other financial flows;
 - Promotional policies;
 - Legal regulations
- (v) Other features, inter alia:
 - Unit cost of output (units costs are considered different if they differ by at least 20%);

Common Practice tool Sub-step 3a:

When we consider the project listed in Table 3.3, this project is different from Kepezkaya HEPP in the following aspects:

- The project Pamuk HPP was commissioned in 2004 long before carbon finance was available in Turkey.
- It was developed before the 2008 financial crisis so it was developed in a different investment climate.
- This project is 23.7 MW so it is smaller in size than Kepezkaya Project.
- The project was developed in DSI Adana Jurisdiction.

Conclusion of Common Practice tool Sub- Step 3b is $N_{diff}=1$

Common Practice tool Step 4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

$$F=1-N_{diff}/N_{all}$$

$$F=1-(1/1)$$

$$F=0$$

Common Practice tool Step 5: Conclusion

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 $N_{all}-N_{diff}$ is greater than 3

Factor F is calculated to be $0 < 0.2$

$N_{all}-N_{diff} = 1-1=0 < 3$ in that case the Kepezkaya HEPP is not common practice.

Conclusion of Step 4: 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.

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☒ Annex 1 country

☐ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes

☒ No

3.5.2 Additionality Methods

There was no design change in the project activity since the first crediting period of the project. Therefore, Project Owner did not reassess the additionality of the project activity as per para 281 of CDM standard for project activities for renewal of crediting period of a registered CDM project activity, the project

participants are not required to reassess the additionality of the project activity nor update the section of the PDD relating to additionality.¹²

3.6 Methodology Deviations

There is no methodology deviation.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

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.

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

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

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

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

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

As methodology states PE_y and LE_y 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:

$$ER_y = BE_y$$

¹² https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210921115752577/reg_stan04_v03.0.pdf

4.2 Project Emissions

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

“Emissions from water reservoirs of hydro power plants (PE_{HP,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:”

The power density has been calculated by using formula in Section 5.4.3. of ACM0002 methodology, stated as Equation (7).

The formula which is mentioned above is as follows:

$$PD = \frac{CapPJ - CapBL}{APJ - ABL}$$

Where:

PD: Power density of the project activity (W/m²)

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

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

APJ: Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²)

ABL: Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero.

Thus,

$$PD = (28,000,000 - 0) \text{ W} / (166,258.40 - 0) \text{ m}^2$$

Where installed capacity is 28.00 MWe and the area of reservoir is 166,258.40 m². The project has a power density of 168 W/m², so that the power density is greater than 4 W/m².

$$PE_{HP,y} = 0$$

Where:

PEH: Project emissions from water reservoirs (tCO_{2e}/yr)

In addition to this since there will be two auxiliary diesel generators, one at the powerhouse and one at the weir to support electrical motors that control the gates.

4.3 Leakage Emissions

There is no leakage emissions related to project activity.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide 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 E_{Ry} by the project activity during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

Estimated emission reductions for the crediting period 01-October-2020 to 30-September-2030 is provided below:

Vintage period	Estimated baseline emissions (tCO ₂ e)	Estimated project emissions (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated reduction VCU (tCO ₂ e)	Estimated removal VCU (tCO ₂ e)	Estimated total VCUs (tCO ₂ e)
01-October-2020 to 31-December-2020	15,473	0	0	15,473	0	15,473
01-January-2021 to 31-December-2021	61,389	0	0	61,389	0	61,389
01-January-2022 to 31-December-2022	61,389	0	0	61,389	0	61,389
01-January-2023 to 31-December-2023	61,389	0	0	61,389	0	61,389
01-January-2024 to 31-December-2024	61,389	0	0	61,389	0	61,389

01-January-2025 to 31-December-2025	61,389	0	0	61,389	0	61,389
01-January-2026 to 31-December-2026	61,389	0	0	61,389	0	61,389
01-January-2027 to 31-December-2027	61,389	0	0	61,389	0	61,389
01-January-2028 to 31-December-2028	61,389	0	0	61,389	0	61,389
01-January-2029 to 31-December-2029	61,389	0	0	61,389	0	61,389
01-January-2030 to 30-September-2030	45,916	0	0	45,916	0	45,916
Total	613,890	0	0	613,890	0	613,890

This project is not required to assess permanence risk.

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EFgrid,CM,y
Data unit	tCO ₂ /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	EGPJ,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. EPIAS 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 TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.								
Frequency of monitoring/recording	Monthly Readings								
Value applied	Will be determined at the monitoring stage								
Monitoring equipment	Power meters: <u>Unit 1:</u> <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</td></tr></table>				Main Meter	Back-up Meter	Description	Bi-directional electricity meter in compliance with TS-620 EN 60044-1 and TS718 IEC60044.2	
	Main Meter	Back-up Meter							
Description	Bi-directional electricity meter in compliance with TS-620 EN 60044-1 and TS718 IEC60044.2								

		standards	
	Location	TEIAS Meters located at Kepezkaya Basin Transformer Station	
	Brand	ITRON	ITRON
	Serial Number	84260262	84260263
Unit 2:			
		Main Meter	Back-up Meter
	Description	Bi-directional electricity meter in compliance with TS-620 EN 60044-1 and TS718 IEC60044.2 standards	
	Location	TEIAS Meters located at Kepezkaya Basin Transformer Station	
	Brand	ITRON	ITRON
	Serial Number	84260264	84260265
QA/QC procedures to be applied	- A back-up meter is used for crosschecking 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 crosschecked 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 years¹³. Since TEİAŞ meters are sealed by TEİAŞ, the project proponent cannot intervene with the devices. - The periodic tests are conducted every two years. However, as part of the PP initiative, electricity meters will be tested on an annual basis.		
Purpose of the data	Calculation of net electricity supplied to the grid and thus baseline emissions		
Calculation method	Direct continuous measurement		
Comments	Data will be used to calculate net electricity supplied to the grid.		

¹³ <http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.6381&MevzuatIliski=0&sourceXmlSearch>

Data / Parameter	Cap _H
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	28,000,000
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	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is full.
Source of data	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	166,258.40 m ²
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	-

Data / Parameter	$PE_{FC,j,y}$
Data unit	tCO ₂ /yr
Description	CO ₂ emissions from fossil fuel combustion in process j during the year y
Source of data	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 2.00 EB 41 Report Annex 11)
Description of measurement methods and procedures to be applied	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 2.00 EB 41 Report Annex 11)
Frequency of monitoring/recording	Once at every monitoring period
Value applied	-
Monitoring equipment	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 2.00 EB 41 Report Annex 11)
QA/QC procedures to be applied	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 2.00 EB 41 Report Annex 11)
Purpose of the data	Calculation of project emissions
Calculation method	As per the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 2.00 EB 41 Report Annex 11)
Comments	Used to determine Project Emissions related to use of auxiliary diesel generator at the power-house of the project activity.

Data / Parameter	FC _{i,j,y}
Data unit	Mass or volume unit per year (tonne/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Onsite logs and measurements
Description of measurement methods and procedures to be applied	N/A as option A is chosen
Frequency of monitoring/recording	Once at every monitoring period
Value applied	-
Monitoring equipment	Site Manager's logbook
QA/QC procedures to be applied	Continuous
Purpose of the data	Used for the calculation of Project Emissions related to use of auxiliary diesel generator
Calculation method	1. The auxiliary diesel generator work hours are recorded precisely and the annual work hours are summed and conservatively round up to the nearest whole hour. 2. The total hours multiplied by the diesel fuel consumption of 69.9 L and 6 L 100% load factor for the powerhouse and the regulator, respectively. The facts sheet of Volvo TAD94 1GE model BCV 360-50 E2 diesel generator and MI-33 ISUZU NK diesel generator are available to the DOE. 3. The Mass is calculated based on the following formula: • $M=dXV$ where: • M = Mass in kg, • d = the average density of diesel fuel (0.845 kg/L34) and • V is the Volume in litres • The Mass in kg is converted to tonnes by dividing into 1000.
Comments	Used to determine Project Emissions related to use of auxiliary diesel generator at the power-house of the project activity.

Data / Parameter	NCVi,y
Data unit	GJ/Mass or Volume Unit
Description	Net Calorific Values for fossil fuel type i in year, for the years 2008, 2009 and 2010
Source of data	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Description of measurement methods and procedures to be applied	Not Applicable as default values are used.
Frequency of monitoring/recording	Not Applicable as default values are used.
Value applied	43.3 GJ/ton
Monitoring equipment	Not Applicable as default values are used.
QA/QC procedures to be applied	Not Applicable as default values are used.
Purpose of the data	Used for the calculation of Project Emissions related to use of auxiliary diesel generator
Calculation method	Not Applicable as default values are used.
Comments	Used to determine Project Emissions related to use of auxiliary diesel generator at the power-house of the project activity.

Data / Parameter	EFCO_{2,i,y}
Data unit	tCO ₂ /GJ
Description	Weighted average CO ₂ emission factor of fuel type i in year y
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures to be applied	Not Applicable as default value of the IPCC guidelines is utilized

Frequency of monitoring/recording	Not Applicable as default value of the IPCC guidelines is utilized
Value applied	74.80 tCO ₂ /GJ (default value used for calculations-does not change throughout the monitoring period)
Monitoring equipment	Default IPCC value is used. Any future revision of the IPCC Guidelines will be taken into account
QA/QC procedures to be applied	Not Applicable as default value of the IPCC guidelines is utilized
Purpose of the data	To calculate project or leakage CO ₂ emissions from fossil fuel combustion.
Calculation method	Not Applicable as default value of the IPCC guidelines is utilized
Comments	Applicable as option B of the Methodological tool “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion” (Version 02) is chosen.

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 are 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. Figure 5.1 gives the management structure for the plant operation.

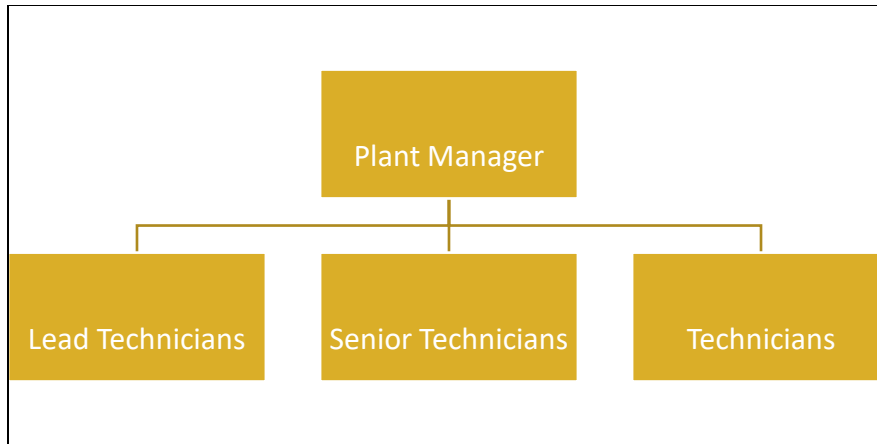


Figure 5.1: The management structure for the plant operation

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.

Four power meters are installed at the grid interface of the project. There are two main meters and two back-up meters of the main meters for cross-checking. All meters are jointly inspected and sealed in order to be protected from interference by any of the parties. All metering devices 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. Since the meters are within TEIAS' province, TEIAS executes all the procedures for handling non-conformities. Therefore, the Project Participant does not have any internal auditing for this purpose.

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 crosschecked with EPIAS records. EPIAS 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 EPIAS 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 with turbines and generators including installed capacity is measured and stored in the system on real time basis.

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to 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.

The fourth data is project emissions related to diesel generator usage. The project activity is forced to use an auxiliary diesel generator in cases when there may be a power outage. The technicians are keeping a track record of the diesel consumed by the diesel generators located at the powerhouse and at the weir and the hours of diesel generator usage is recorded by the generator's computers on a day-to-day basis.

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 33 kV, the accuracy class for main power meter has been defined in the Communiqué for Power Meters as 0.2S class. The back-up meter has the same accuracy class of 0.2S. 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. All power meters are ITRON, 0.2S class they were calibrated and installed on 23/07/2019 tested on 07/08/2025.

The electricity produced is sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by two main meters and two back-up meters:

- The serial number for main power meter is 84260262 and the back-up power meter is 84260263.
- The serial number for main power meter is 84260264 and the back-up power meter is 84260265.

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 1: COMMERCIALY SENSITIVE INFORMATION

There is no sensitive information under this project activity.

Section	Information	Justification

APPENDIX 2: VOLUME VERSUS AREA CURVE

