GULLUBAG 96 MW HYDRO ELECTRIC POWER PLANT PROJECT, TURKEY

Document Prepared by GTE KARBON SÜRDÜRÜLEBİLİR ENERJİ EĞİTİM DANIŞMANLIK VE TİCARET A.Ş.

Project Title	GULLUBAG 96 MW HYDRO ELECTRIC POWER PLANT PROJECT
Version	V09
Date of Issue	03-July-2023
Prepared By	GTE KARBON SÜRDÜRÜLEBİLİR ENERJİ EĞİTİM DANIŞMANLIK VE TİCARET A.Ş.
Contact	MAIDAN - Mustafa Kemal Mah. 2118. Cad. No: 4 C Blok 42 06510 Cankaya - Ankara – TURKEY +90 312 514 63 63 kemal@gte.com.tr www.gte.com.tr

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

Gullubag hydroelectric power plant, which is owned by SENERJI Enerji Uretim AS, is on the Coruh River in the East of Turkey, in the province of Erzurum. Its total installed capacity is 96 MW. The aim of this project is electricity generation and meeting energy demand with using the hydroelectric potential of Coruh River. License application for the Hydroelectric Power Plant was made to the Energy Market Regulatory Authority and the Generation License was awarded in accordance with the Electricity Market Law (No: 4628) for a period of 49 years by the decision numbered EU/1054-1/770 on January 11th, 2007.

Proposed project is not a part of grouped project and involves a dam with reservoir, conveyance line, and powerhouse and switchgear station. Gullubag project will utilize the elevation difference of 105 meters between 1147 meters and 1042 meters on the Coruh River. The dam is located on 1090 meters riverbed elevation. It consists of 3.246.50 meters long and 6 meters diameter tunnel and 118.31 meters, 5 meters diameter penstock connecting the powerhouse, where three turbines in the powerhouse will transfer the flow rate into electrical energy. The project is designed for a flow rate of 113 cubic meters per second.

The generated electrical energy is transferred to the electrical grid by a 154 kV transmission line, through ISPIR HEP substation which is in the powerhouse. The project activity generates greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants connected to Turkish National Power Grid. The average annual electricity generation significantly dependents on the other HEPP projects planned to be built at the upstream of Gullubag HEPP. These plants were constructed, thus average estimated electricity generation is increased from 281 GWh to 313.898 GWh with commissioning of plants at the upstream[1]. The total emission reductions from the project are estimated to be on the average 144,895 tCO_2e per year over the second 10-year renewable crediting period. Since these plants are still in design and construction phase, average electricity generation is estimated as 281 GWh initially which is expected to be increase up to 313.898 GWh will be able to deliver about 144,895 tCO_2e (tons of carbon dioxide equivalent) per annum after commissioning of plants at the upstream. The projects which have been planned in the upstream of the project, Ispir HPP and Laleli HPP.

Project milestones are presented in the table below.

[1] Gullubag HEPP, feasibility report, section one, page one

Table 1: Project implementation milestones

Milestone	Date
Generation License (Final Amendment Date)	11/07/2007 (06/06/2012)
Commissioning of the Project (Project Start Date)	23/03/2012
Environmental Impact Assessment Exemption	17/05/2007
Loan Agreement (Investment Decision Date)	February 2008
Construction Start Date	22/05/2009
VCS Registration Date	21/04/2010
First Index Protocol	07/03/2012
System Connection Agreement	13/06/2019
System Use Agreement	04/03/2021
First Crediting Period	23/03/2012- 22/03/2022 (10 years)
Second Crediting Period	23/03/2022- 22/03/2032 (10 years)

For projects undergoing crediting period renewal, include the audit history of the project using the table below. For the project validation, state the validation date in the Period column. This table should include all monitoring periods, including the period of this monitoring report.

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification	(23-March-2012-- 31-August-2013)	VCS	Bureau Veritas Certification	1 year 5 months 9 days
Validation/ Verification	(01-September-2013-- 30-April-2020)	VCS	RINA Services S.p.A.	6 years 8 months
Validation/ Verification	(01-May-2020-- 22-March-2022)	VCS	CCIPL	1 year 10 months 22 days
Total	(23-March-2012-- 22-March-2022)	VCS	Bureau Veritas Certification, RINA Services S.p.A. and CCIPL	10 years

1.2 Sectoral Scope and Project Type

Proposed project activity is a large-scale project activity involves electricity generation from renewable sources therefore it is categorized in the sectoral scope 1 “Energy Industry – Renewable -/Non-renewable Sources” according to the UNFCCC definition[2]. Project consists of a dam and a hydroelectric power plant. Project is not a part of grouped project.

1.3 Project Eligibility

Gullubag Hydropower Plant project is eligible under the scope of VCS therefore the project meets the requirements below.

* Gullubag HEPP project is grid-connected renewable power generation project that applies a methodology (AMS-I.D.) eligible under VCS program.
* The implementation of the project activities does not cause the violation of ant applicable law.

This is the renewal of crediting period stage of project activity thereby its eligibility had been already demonstrated at the start of the first crediting period.

1.4 Project Design

The project is not a part of grouped project.

Eligibility Criteria

N/A

1.5 Project Proponent

Organization name	SENERJI Enerji Uretim A.S.
Contact person	Burcu Erik
Title	Owner of the VER rights of the project.
Address	Yıldırım Tower, Maslak Mahallesi, Taşyoncası Sok. B2 Blok, No:20C, Sarıyer / İSTANBUL 34485
Telephone	+90 212 290 30 80
Email	burcu.erik@yildirimenergy.com

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

Organization name	GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S.
Role in the project	Carbon Consultant
Contact person	M. Kemal Demirkol
Title	Director
Address	MAIDAN - Mustafa Kemal Mah. 2118. Cad. No: 4 C Blok 42 06510 Cankaya - Ankara – TURKEY
Telephone	+90 312 514 63 63
Email	kemal@gte.com.tr

1.6 Other Entities Involved in the Project

There are no other entities involved.

1.7 Ownership

As per the license issued by Energy Market Regulatory Authority (EMRA), all legal rights of the project are given to SENERJI ENERJI URETIM A.S.

GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S. is a project proponent that is the project developer and consultant.

1.8 Project Start Date

23/03/2012 which is date of preliminary acceptance, is the start date of the project.

1.9 Project Crediting Period

Renewable crediting period is chosen for the project activity. The first crediting period of the project was between the dates of 23/03/2012- 22/03/2022.

The second crediting period was started in 23/03/2022 and will end in 22/03/2032 (both dates included). The crediting period is 10 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	x
Large project	

Table 2: Annual estimated GHG emission reductions/ removals

Year	Estimated GHG emission reductions or removals (tCO_2e)
23/03/2022- 31/12/2022 (284 days)	123,856
2023	144,895
2024	144,895
2025	144,895
2026	144,895
2027	144,895
2028	144,895
2029	144,895
2030	144,895
2031	144,895
01/01/2032- 22/03/2032 (81 days)	21,040
Total estimated ERs	1,448,953
Total number of crediting years	10
Average annual ERs	144,895

1.11 Description of the Project Activity

SENERJI Enerji Uretim A.S, that aims to be one of the largest and currently is one of the most credible companies of Turkey, also develops hydro energy-based projects, one of the principal forms of energy generation from renewable energy. SENERJI realizes self-developed projects within a generation company model in accordance with market conditions. Such projects will gap some of the national energy deficit, will contribute the development of local industries as it will allow the use of cheaper energy for industrialists and gain advantage in a competitive environment.

In this context, being one of SENERJI"s projects, Gullubag is a hydroelectric power plant (HEPP) on the Coruh River in the East of Turkey, in the province of Erzurum, with total installed power of 96 MW.

License application for the Hydroelectric Power Plant was made to the Energy Market Regulatory Authority and the Generation License was awarded in accordance with the Electricity Market Law (No: 4628) for a period of 49 years by the decision numbered EU/1054-1/770 on January 11th, 2007.

Proposed project is not a part of grouped project and involves a dam with reservoir, conveyance line, and powerhouse and switchgear station. Gullubag project will utilize the elevation difference of 105 meters between 1147 meters and 1042 meters on the Coruh River. The dam is located on 1090 meters riverbed elevation. It consists of 3.246.50 meters long and 6 meters diameter tunnel and 118.31 meters, 5 meters diameter penstock connecting the powerhouse, where three turbines in the powerhouse will transfer the flow rate into electrical energy.

The project is designed for a flow rate of 113 cubic meters per second. The generated electrical energy will be transferred to the electrical grid by a 154 kV transmission line, through ISPIR HEP substation which is in the powerhouse. The project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants connected to Turkish National Power Grid. The average annual electricity generation significantly dependent on the other HEPP projects planned to be built at the upstream of Gullubag HEPP. These plants were constructed, thus average estimated electricity generation is increased from 281 GWh to 313.898 GWh with commissioning of plants at the upstream3. The total emission reductions from the project are estimated to be on the average 144,895 tCO_2e per year over the second 10-year renewable crediting period.

Table 3: Characteristic of Gullubag HEPP

Location	Gullubag Dam on The Coruh River within The Boundaries of Erzurum Province
Design Flow Rate	113 m^3/sec
Length Of Conveyance Line	3,245 m
Total Installed Capacity	96 MW
Number Of Units	3 Each
Turbine Capacity	33 MWm/ 32 MWe (Each)
Turbine Type	Francis Type – Vertical Axis
Turbine Make	Fujian Nandian Co Ltd
Energy Transmission Line	154 kV, ISPIR SUBSTATION
Length Of Penstock	118.31 m
Diameter Of Penstock	5 m

[3] Gullubag HEPP, feasibility report, section one, page one

Average Annual Power Generation	313.898 GWh

The project complies with the relevant regulations and laws in Turkey. In line with Turkish environmental regulations, an "Environmental Impact Assessment (EIA) Report" was presented to the Ministry of Environment and Forestry in October 2007 and was approved in 10/12/2007.

Main goals of the Gullubag HEPP include:

- Utilize the hydroelectric potential of Turkey to meet the increasing electricity demand and contribute to the security of energy supply,
- Increase the share of private sector owned hydroelectricity plants in the electricity generation mix of Turkey, reducing dependency on imported fossil fuels and thereby reducing the GHG emissions,
- Wider use of distributed energy generation systems which help to decrease the transmission loss in the grid and aids system stability,
- Contribute to the economic development by creating direct and indirect job opportunities.

Erzurum is at a critical point whereby about 308.1 MW energy flowing into Erzurum, from Ozluce – Erzurum 380 kV Transmission line is transferred further East (216.4 MW[4]) and the rest is consumed in Erzurum and its environment (about 91.7 MW).5

3 MW energy is lost on the 3x954 MCM 202 km 380 kV transmission line from Ozluce to Erzurum whereas another 2.9MW is lost between 3x954 MCM 150 km Keban – Ozluce transmission line. When Gullubag is completed, the amount of energy flowing on the Ozluce – Erzurum transmission line will decrease about 96 MW (one third of the current value). So, in parallel to the reduced load and energy flow, the energy loss on Keban-Erzurum line will be reduced from 6 MW down to 4 MW and total savings will add up to about 2 MW.

Assuming a capacity factor of 34% (same as Gullubag HEPP), the 2MW installed power saving will generate about 6GWh electricity per year, which prevents additional 3,500 tCO_2e due to avoided grid loss.

Considering the contribution of the project on local and national economy, environment and local community, project will have positive influences on sustainable development in the region and in Turkey. The Ispir District ranks as 629th among 872 districts in Turkey in terms of socio-economic development index. Nearest settlement to the project site is Gullubag and Yedigoze villages. Main economic activities in the region are animal breeding, agriculture, fishing, and beekeeping. Since agricultural land is limited and there exist no industrial facility

[4] 2005 Puant (Kış) yük şartlarında yük akışı üç faz ve faz toprak kısa devre etüdü 2006 TEIAS, page 41
[5] 2005 Puant (Kış) yük şartlarında yük akışı üç faz ve faz toprak kısa devre etüdü 2006 TEIAS, page 26

in the region, the population decrease has reached about 15%6. Project will also contribute to sustainable development in the region through creating new job opportunities during construction and operational phase. According to the initial assessments made during EIA study, about 320 people will be employed during the three years construction stage whereas the number of permanent staff planned to be recruited during operation phase is estimated as 20. The ratio for unemployed population of Erzurum is about 6%7. Project will contribute to this number positively, assuming that the employment will be maintained within the project activity. Although the new opportunities that will be created during the operation stage has been estimated as 20 during the EIA study, 25 people were employed directly at the plant since the project activity has started. - Out of the 25 staff, about 20 of them are planned to be selected from local people living in Erzurum Province.

As the berry and nut growing and beekeeping are the most common agricultural activities in the region, project owner is intending to support the training activities in the region for initiation of organic product certification and increasing yield from agricultural activities through trainings about hygiene, packaging, and marketing activities. Also, as a complementary activity to berry growing, silkworm growing will be encouraged in the region which has significant potential and high economic value.

Coruh River Basin has been suffering from erosion and loss of efficient agricultural lands6 which is planned to be prevented through projects implemented. In addition to reducing erosion risk in the region, the project will enable the use of local resources for energy generation and thus decrease dependency on imported fossil fuels as an energy source. Gullubag weir is located at about 6 km away from Ispir District whereas the powerhouse is located at Yedigoze Village of Ispir, which is about 10km from Ispir. The project site lies along the Ispir-Trabzon motorway which will be submerged after commissioning of the project. Therefore, a new road of about 7 km length is being built which will provide a more comfortable and shorter access for local people. The project owner will also build a new road from Gullubag Village to the new road as a contribution which will save time and ease of access to village especially in winter time. The penstock and powerhouse will be located at Yedigoze village of Ispir. During construction of these facilities, expropriation of houses and lands will take place according to local regulations and by relevant government authorities. In addition to payments made for properties, the project owner will also compensate the expropriated land through constructing new buildings for the village and building access roads and providing irrigation water for local people.

The economic life of an HEPP in Turkey is assumed as 49 years. According to regulation by Ministry of Finance which was published on Official Gazette on 30/12/2006 (26392), turbines and generators have an average lifetime of 15 years and transformers have an average lifetime of 10 years.8

[6] https://media.iskur.gov.tr/14277/erzurum-2017.pdf (Page 2, table 1)

[7] https://media.iskur.gov.tr/14277/erzurum-2017.pdf (Page 5, table 6)

[8] https://www.mevzuat.gov.tr/File/GeneratePdf?mevzuatNo=10941&mevzuatTur=Teblig&mevzuatTertip=5

1.12 Project Location

Gullubag Dam and hydroelectric power plant project is located between 40 ˚ 31"0.0' – 40 ˚ 34" 0.0' north latitudes and 41˚ 02" 0.0' – 41 ˚ 04" 0.0' east longitudes, on the Coruh river, between 6 to 10 kilometers east of Ispir district, in Erzurum province, in the East of Turkey.

The closest residential area to the reservoir is Gullubag District and to the powerhouse is Yedigoze Village. The location of powerhouse and weir is given below:

	Latitude	Longitude
Weir	40°30'52"N	41° 1'6.94"E
Powerhouse	40°32'29"N	41° 2'35"E

Figure 1 Location of the Project on the Map

1.13 Conditions Prior to Project Initiation

This document comprises the second crediting period of the project that has already been validated. Therefore, the initial condition was not considered.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

It is important to note that there are no local laws and regulations in Turkey because it is not a federal state. Gullubag Hydro Electric Power Plant, Turkey is following relevant national laws and regulations related to the project.

The general scheme of the regulations this kind of facilities in line with, are defined by The Renewable Energy Law and Environmental Law. 9,10 . Project is a renewable energy project and is a hydropower plant, which is in the scope of the Renewable Energy Law. A pre-environmental impact assessment report has been prepared according to the Environmental Law. The project received required Environmental Impact Assessment (EIA) clearances, according to the law. Such laws also include land use regulations, forest use permissions and environmental risk management regulations. The company has had the Pre-Assessment Report, Energy Production License, Provisional Acceptances and System Usage Agreement.

The project follows all required relevant regulations but is not a mandatory project. There is no breach of any legislation, and all required permits are obtained.

Table 4: Relevant law and regulations

	Name of the Law	Related Law Nr.	Compliance in this Crediting Period
1	Electricity Market Balancing and Settlement Regulation[11]	12985	Yes
2	Regulation Concerning Electricity Demand Forecast[12]	21528	Yes
3	Communiqué Regarding Preparation of Retail Contract in The Electricity Market[13]	36132	Yes
4	Electricity Transmission System Supply Reliability and Quality Regulation	19217	Yes
5	Electricity Market Grid Regulation[14]	4628	Yes
6	Electricity Market Import and Export Regulation[15]	19679	Yes
7	Electricity Market Distribution Regulation[16]	19217	Yes
8	Communiqué Regarding Wind and Solar Measurements[17]	19796	Yes

[9] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=5346&MevzuatTur=1&MevzuatTertip=5
[10] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=2872&MevzuatTur=1&MevzuatTertip=5
[11] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=12985&MevzuatTur=7&MevzuatTertip=5
[12] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=21528&MevzuatTur=7&MevzuatTertip=5
[13] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=36132&MevzuatTur=7&MevzuatTertip=5
[14] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=4628&MevzuatTur=1&MevzuatTertip=5
[15] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=19679&MevzuatTur=7&MevzuatTertip=5
[16] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=19217&MevzuatTur=7&MevzuatTertip=5
[17] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=19796&MevzuatTur=9&MevzuatTertip=5

9	Electricity Market Customer Services Regulation[18]	24630	Yes
10	Electricity Market Tariffs Regulation	19217	Yes
11	Electricity Market Licensing Regulation[19]	18985	Yes
12	Electricity Market Law[20]	6446	Yes
13	Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[21]	5346	Yes
14	Energy Efficiency Law[22]	5627	Yes

1.15 Participation under Other GHG Programs

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

The project has not been registered or is seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been registered or is seeking registration under any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not claim Green or White certificates or equivalents that may result in double counting because of carbon dioxide emission reduction purposes.

1.16.2 Other Forms of Environmental Credit

The project does not claim Green or White certificates or equivalents that may result in double counting because of carbon dioxide emission reduction purposes.

Supply Chain (Scope 3) Emissions

N/A.

1.17 Sustainable Development Contributions

The project helps following sustainable development goals:

[18] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=24630&MevzuatTur=7&MevzuatTertip=5
[19] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=18985&MevzuatTur=7&MevzuatTertip=5
[20] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6446&MevzuatTur=1&MevzuatTertip=5
[21] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=5346&MevzuatTur=1&MevzuatTertip=5
[22] https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=5627&MevzuatTur=1&MevzuatTertip=5

1) Affordable and Clean Energy (SDG 7): The project promotes clean and sustainable energy production and use. The total net electricity production of the project is estimated to be 313.898 GWh/year. The total energy is generated over hydro-electricity power which is clean and affordable.

    - The monitoring of SDG 7 will be performed the EPIAS data. Generation data is recorded by three main, three back-up metering devices continuously. These records provide the data for the monthly invoicing to TEIAS which form the basis for EPIAS data. EPIAS data is developed remotely by TEIAS and includes grid loss. According to meter reading protocols, the internal consumption of the facility was subtracted from the gross generation.

2) Decent Work and Economic Growth (SDG 8): The project generates employment for all. The employees have required technical training and certifications. In total 21 employees work at the facility, and it will be remained throughout the crediting period.

    - The employment records will be checked for the verification of SDG 8.

3) Climate Action (SDG 13): The project contributes to SDG 13 with an amount of 144,895 tons of CO_2e reduction per annum, which represent direct and quantifiable impact on climate security.

Combined margin emission factor calculated by Turkey Ministry of Energy and Natural Resources will be used for the calculation of tCO_2 emission reductions.

1.18 Additional Information Relevant to the Project

Leakage Management

No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected[23]

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

N/A.

[23] ACM 0002, para 53

2 SAFEGUARDS

2.1 No Net Harm

There is no negative harm caused by the project implementation. Instead, it has several positive contributions both environmentally and socially. It used renewable energy, generates clean electricity, and provides job opportunities. Wastes generated at the site are handled according to Turkish law and regulations.

2.2 Local Stakeholder Consultation

Project is operational since 2013 and there is an ongoing communication with locals. A grievance book has been placed at Mukhtar's office so that the local people can write their opinions, suggestions or complaints during the operation of the plant. Stakeholder consultation has been organized before project start date, details of which is given in PDD.

Project manager is accessible by locals all the time. Project sponsors also support local community through providing support for local organization cultural events.

After implementation of the project, no unexpected change has occurred with respect to risks, cost of locals. In terms of regulation, all staff recruited is trained as per the requirements of their assignment and regulations. Trainings include first aid, electrical equipment operation certificates, crane operator and occupational competency trainings. Details of the trainings organized for staff has been submitted to DOE.

2.3 Environmental Impact

As one of the sustainable renewable energy generation technologies, this large scale HEPP poses low environmental impacts, which can be mitigated by taking appropriate measures. The Project activity has been exempted by the Ministry of Environment, Urbanization and Climate Change from the requirement to prepare an Environmental Impact Assessment because each has a planned capacity below 10 MW[24]. The Project has a capacity of 96 MW, and an EIA is not necessary. The Project is fully in line with national laws and regulations.

The Project Activity contributes positively towards sustainable development in Turkey in terms of social, environmental, technological, and economic well-being:

- Power shortages are common in Turkey, especially during peak demand due to insufficient capacity. With the Project Activity, a small but positive contribution is made to the grid stability and quality of electricity,
- Reduction of electricity imports of Turkey, dependency on fossil fuels and increased energy security and lower supply risks and improvement in price stability,

[24] A recent regulatory change lowered the threshold to 10 MW. This means that the Government of Turkey now requires an EIA study for the renewable energy projects having power output above 10 MW.

- Diversification of energy resources and support to development of the renewable energy sector in Turkey,
- Reduction of greenhouse gas emissions (e.g., carbon dioxide) and air pollutants (e.g., particulates, sulphur dioxide, nitrogen oxides etc.) by displacing electricity from fossil fuel-based power plants,
- Encouraging investments in the region and creation of new jobs in the region during construction and operation phases and support to local economy by procuring available products and services from the region,
- Contribution to a more sustainable energy generation infrastructure by showing that run-of-river type hydropower projects can bring a high contribution to local sustainable development.

2.4 Public Comments

N/A

2.5 AFOLU-Specific Safeguards

The project is a non-AFOLU project. For non-AFOLU projects, this section is not required.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

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

- Tool 01: Tool for the demonstration and assessment of additionality, Version 07.0.0
- Tool 07: Tool to calculate the emission factor for an electricity system, Version 07.0
- Tool 10: Tool to determine the remaining lifetime of equipment, Version 01
- Tool 11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 3.0.1.

3.2 Applicability of Methodology

The choice of methodology ACM0002, is justified as the project activity meets its applicability criteria. GULLUBAG HES is a large-scale hydro power type, greenfield, grid connected renewable electricity generation project.

No.	Applicability Conditions	The Project
1	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).	GULLUBAG HES is a large-scale hydro power type, greenfield, grid connected renewable electricity generation project. So, the project meets (a) Install a Greenfield power plant.
2	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 installation of a new grid connected renewable energy power plant of the type hydro power plant.
3	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 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.	The project does not involve a capacity addition to an existing plant, a retrofit of an existing operating plant, a rehabilitation of an existing plant, a replacement of an existing plant. Hence, this condition is N/A.
4	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 (7), 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 (7), 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 (7), is lower than or equal to 4 W/m2, all of	The project is a hydro power plant. (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m2.

	the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), 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 b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
5	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 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 of five years prior to the implementation of the CDM project activity.	The project is not a integrated hydro power project. Hence, this condition is N/A.
6	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.	-The project does not involve switching from fossil fuel use to renewable energy at the site of the project activity. -The project is not a biomass fired power plant.
7	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	The project does not involve retrofits, rehabilitations,

	identification of baseline scenario, is "the continuation of the current situation, that is 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".	replacements, or capacity additions. Hence, this condition is N/A.
8	In addition, the applicability conditions included in the tools referred to below apply.25	Given below.

Applicability as per "Tool 07: Tool to calculate the emission factor for an electricity system, version 07.0"

No.	Applicability Conditions	The Project
1	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g., demand-side energy efficiency projects).	The project activity supplies electricity to a grid. Hence, this condition is met.
2	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e., option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "combined margin" emission factor (CM) of the electricity system.
3	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project electricity system is not located partially or totally in an

[25] The condition in "TOOL02: Combined tool to identify the baseline scenario and demonstrate additionality" that all potential alternative scenarios to the proposed project activity must be available options to project participants; does not apply to this methodology, as this methodology only refers to some steps of this tool.

		Annex I country. Hence, this condition is N/A.
4	Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	The project does not involve biofuels in any way.

Applicability as per "Tool 01: Tool for the demonstration and assessment of additionality, version 07.0.0"

No.	Applicability Conditions	The Project
1	The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.	Tool for the demonstration and assessment of additionality is applied in this project since there is no new methodologies proposed. Hence, this condition is N/A.
2	Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The additionality tool is applied using this methodology.

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

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

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

Figure 2 Turkish electricity grid[26]

3.3 Project Boundary

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

Table 5: GHGs included in the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Generation mix of electricity grid in Turkey	CO_2	Yes	Main Emission Source
		CH_4	No	Minor Emission Source. Excluded for simplification
		N_2O	No	Minor Emission Source. Excluded for simplification

[26] TEIAS Faaliyet Raporu (2018) – Activity Report (2018), https://www.teias.gov.tr/tr-TR/faaliyet-raporlari

Source		Gas	Included?	Justification/Explanation
Project	Construction and operation of HEPP	CO_2	No	Zero emission electricity generation from renewable resources. Emissions from diesel generator are excluded for simplification as it is a minor emission source.
		CH_4	No	Zero emission electricity generation from renewable resources.
		N_2O	No	Zero emission electricity generation from renewable resources.
	Emission of CH_4 from the reservoir	CO_2	No	Zero-emission electricity generation
		CH_4	No	Zero-emission electricity generation
		N_2O	No	Zero-emission electricity generation

However, since the Turkish grid capacity is not enough to meet sharp increases in electricity demand, companies that build a power plant should also make an additional investment to build the connection transmission line to the grid, which increases the overall investment cost.

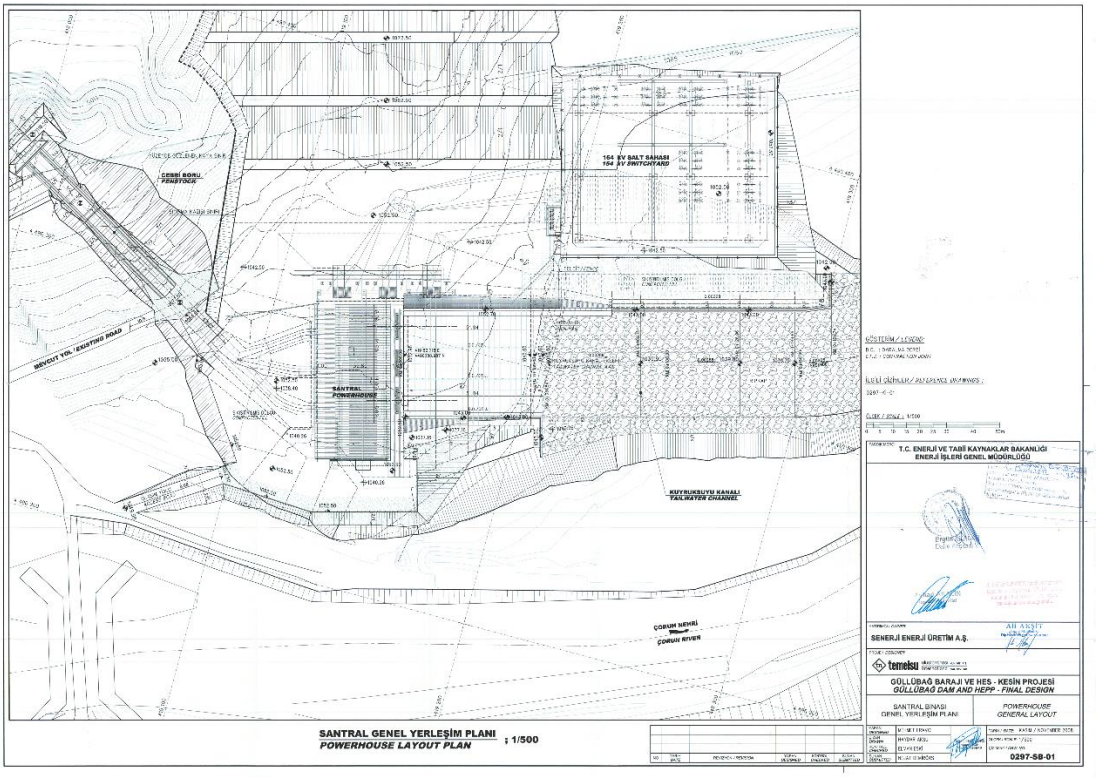
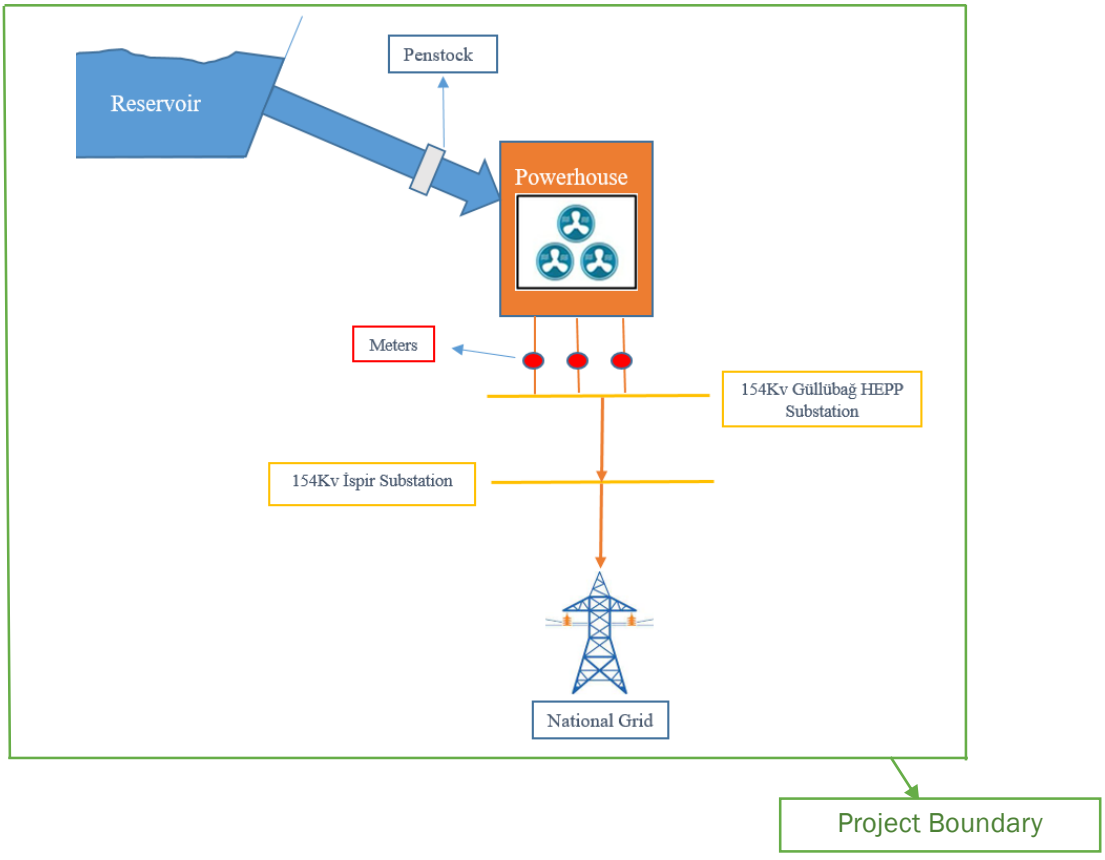


Figure 3 Layout of Gullubag HEPP



3.4 Baseline Scenario

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

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

The sub-steps for the Step 1 are:

- Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies: There is no change in national/sectoral policies affecting project implementation. All policies are still valid in the second crediting period.
- Step 1.2: Assess the impact of circumstances: The baseline circumstances are not valid in the second crediting period since the national grid properties / shares of each technology, etc. have been changed.
- 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: There is no change in the investment type and technology in the second crediting period.
- Step 1.4: Assessment of the validity of data and parameters: The default values and ex-ante values have been changed.

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

- Step 2.1: Update current baseline: The latest version of the applicable methodology and current circumstances have been used for the second crediting period.

. The applicability conditions of Tool 11 is given below in detail:

No	Applicability Conditions	The Project
Step 1.1	If the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2.	There is no change in national/sectoral policies affecting project implementation. Hence Step 1.2 can be evaluated.

	If the current baseline does not comply with relevant mandatory national and/or sectoral policies, then assess based on the examination of current practice in the country or region in which the policies apply, whether those policies are systematically not enforced and that non-compliance with those requirements is widespread in the country or region.	
Step 1.2	Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario. In the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period. Evaluate whether the conditions used to determine the baseline emissions in the previous crediting period are still valid. Assess the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions.	The combined margin is updated as per OM & BM calculations by Ministry of Energy and Resources.
Step 1.3	This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology. Assess whether the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity, as determined in the CDM-PDD or CDM-PDD-REN, exceeds the crediting period for which renewal is requested. Take into consideration the market penetration of different technologies. Evaluate the penetration rate of different technologies that are available in the market and evaluate how they could affect the baseline.	The project is a greenfield activity. Since it includes a new investment and the use of new equipment, this step is not applicable.
Step 1.4	Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:	The combined margin is updated as per OM & BM calculations by Ministry of Energy and Resources.

	• Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC; • Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values, or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity. *If the application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline as well as data and parameters are still valid for the subsequent crediting period, then this baseline, data and parameters can be used for the renewed crediting period. Otherwise, proceed to Step 2.*	Hence the assessment should proceed to Step 2.
Step 2.1	Update the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.	The latest version of the applicable methodology and current circumstances have been used for the second crediting period
Step 2.2	If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4.	The data and the parameters are updated for the second crediting period.

According to the methodology, baseline scenario was identified as “the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources”.

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

The trend in Turkey to date and given historically slow development of alternative energy resources is to build an increasing number of thermal power plants in the future to satisfy the annual growth in energy consumption demand. Turkey as an advanced developing nation has looked at dealing with energy security by developing and constructing high-capacity coal and natural gas power plants. The development of thermal power plants has been also encouraged by the large natural resource availability in Turkey, especially the abundance of economically accessible lignite. The statistics from TEIAS webpage show that the installed capacity that utilize lignite in Turkey has always showed an increasing trend, based on the available information covering the years from 1940 to 2019[27] [28] [29].

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

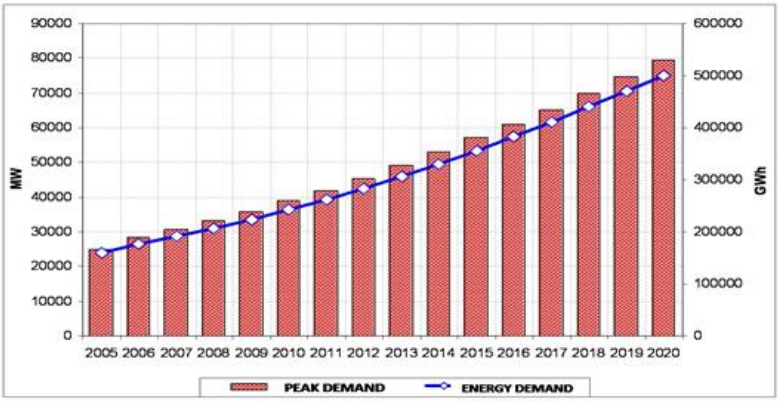


Figure 4. Peak Load and consumption projection for Turkish electricity system between 2005-2020[30]

According to the Ministry of Energy and Natural Resources statistics[31], share of WPPs together with geothermal power plants could hardly reach 11% in 2020 whereas share of Coal and natural gas are 20.46% (lignite and imported coal together) and 22.53%, respectively. When we look at the annual development of Turkey's gross generation in recent years, we see that grid is dominated by thermal power plants and which is boosted by increasing energy demand in parallel to increase population and per capita income. Hence, baseline of Turkey's electricity grid will continue to be dominated by fossil fuel power plants

[27] https://webapi.teias.gov.tr/file/18800125-dc32-4c4e-8a3e-c771863e5a49?download
[28] https://webapi.teias.gov.tr/file/07f76c00-d256-4ccb-b25e-9478c9dedc04?download
[29] https://webapi.teias.gov.tr/file/163dfadf-80d8-4271-baf8-bc0b76710177?download

[30] http://www.teias.gov.tr/apkuretimplani/veriler.htm

[31] https://webapi.teias.gov.tr/file/39abb292-4b3e-4e70-9e08-914d0ba9bd43?download

which is seen as the quickest solution in short term to meet the demand and enable energy security in supply side.

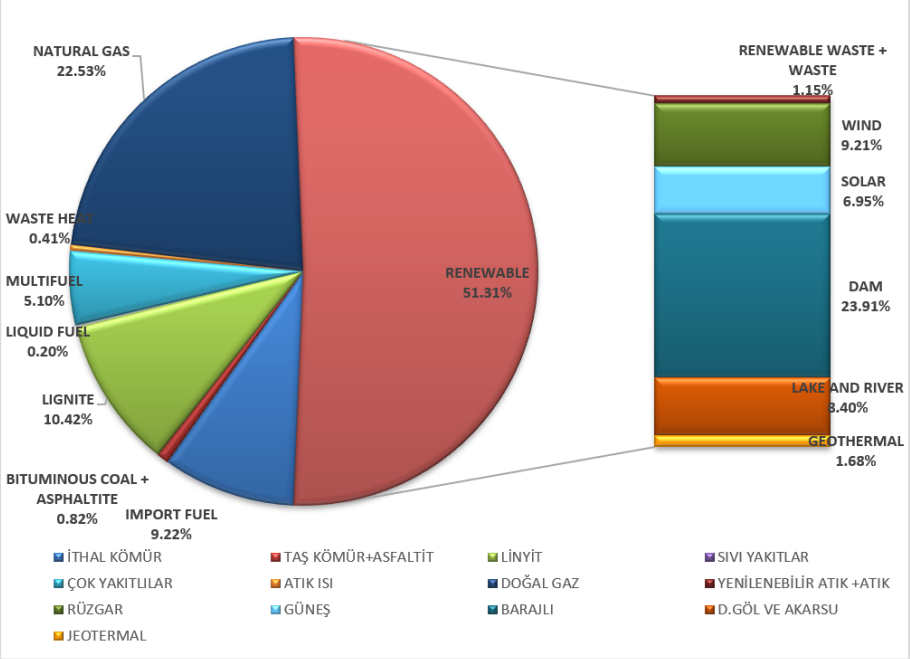


Figure 5 Distribution of installed capacity by primary energy resources[32]

- Step 2.2.: Update data and parameters: Default values and ex-ante values have been revised. Combined margin is revised as follows:

  $EF_{grid,CM,y} = EF_{grid,OM,y} \times 0.25 + EF_{grid,BM,y} \times 0.75$

  $EF_{grid,CM,y} = 0.7424 \times 0.25 + 0.3680 \times 0.75 = 0.4616\ tCO_2/MWh$

Therefore, new combined margin is calculated using values by Ministry of Energy and Natural Resources which is 0.4616 tCO_2/MWh[33].

3.5 Additionality

This is the second crediting period. In the first crediting period, additionality of the project was presented.

Equity IRR of Gullubag Hydroelectric Power Plant has been calculated as 10.23% in registered PD ver 02, dated 31/11/2008. For benchmark value of project IRR 15% has been selected as benchmark value for the investment analysis[34].From the sensitivity analysis, it is seen that equity IRR can exceed 11.73% for some cases (for 10% decrease in investment

[32] https://webapi.teias.gov.tr/file/39abb292-4b3e-4e70-9e08-914d0ba9bd43?download

[33] The emission factor sheet is provided in Appendix-1. The calculation of the combined margin is provided in Section 4.1.

[34] ..\ICR00004069-06192017.pdf

cost or 10% increase in tariff). However, since the realized costs are about 15% to 20% higher than estimated cost, decrease in investment cost cannot be mentioned. Also, considering that the figure 11.73% does not involve other risks (currency, project, and market risks) and extra return expectation of investor which are difficult to quantify, equity IRR of the project is not expected to exceed benchmark IRR unless the electricity prices unless reach much higher values.

There has been no capacity change in the project between the first and the second crediting period. The Project is following all required relevant regulations but is not a mandatory Project. There is no change in the relevant national and/or sectoral regulations with respect to project activity or its technology till date through which the project activity is not found mandated by regulations. There is no breach of any legislation, and all required permits are obtained. Laws and regulations that apply for power generation facilities in the host country are mentioned in section 1.14 of this PD. Hence this project is a regulatory surplus.

3.6 Methodology Deviations

N/A

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The ex-ante emission reductions (ER_y) are calculated as follows:

Where:

ER_y = Emission reductions in year y (tCO_2)

BE_y = Baseline emissions in year y (tCO2)

PE_y = Project Emissions in year y (tCO_2)

LE_y = Leakage emissions in year y (tCO_2)

Baseline emission is calculated according to the formula

$BE_y = EG_y \times EF_y$

Where:

EG_y = Net electricity delivered to the grid by the project activity in year y excluding transmission

losses of the grid.

EF_y = Emission factor calculated according to selected methodology

BE_y = 313,898 MWh × 0.4616 tCO_2e/MWh = 144,895 tCO_2e

4.2 Project Emissions

Emissions from the reservoir

The reservoir surface area is 765,842.81 m^2 whereas installed capacity is 96 MW. The project activity involves the generation of electricity by a hydroelectric power plant which has power density higher than 10 W/m^2 and does not include significant vegetation in the catchment area, therefore emissions from reservoir is ignored as per the applied methodology.

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

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$

Where:

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

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (t CO_2/yr)

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

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (t CO_2e/yr)

Since this project uses hydroelectric power $PE_{GP,y}$ is "0" (t CO_2/yr)

The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. In urgent cases, a diesel-powered generator will be operated for the daily consumption of personnel and the building, which is negligible. Project emissions are taken as zero due to use of fossil fuel for backup generator. The same is also stated in para 33 of "ACM0002: Grid-connected electricity generation from renewable sources" Ver 20, which refers by AMS.I.D. Ver 18. Hence it is neglected. Therefore:

$PE_{FF,y}$ = 0 (t CO_2/yr)

Beside of the diesel generator, other potential project emission for this proposed project is $PE_{HP,y}$

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_2e/yr)

$PE_{HP,y} = EF_{RES} * TEG_y/1000$

Where:

EF_{RES} = Default emission factor for emissions from reservoirs of hydro power plants (kg CO_2e/MWh)

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

However, if the power density of the project activity is greater than 10 W/m^2 than $PE_{HP,y}$ =0

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

$PD = (Cap_{PJ} – Cap_{BJ}) / (AP_J - AB_L)$

Where:

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

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

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

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

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

Cap_{PJ} = 96,000,000 W

Cap_{BJ} = 0 W

A_{PJ} = 765,842.81 m^2

A_{BL} = 0 m^2

PD= (96,000,000 W – 0 W)/ (765,842.81 m^2 – 0 m^2) =125 W/m^2 > 10 W/m^2

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

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$

$PE_y = 0 + 0 + 0 = 0$ (tCO_2/yr)

4.3 Leakage

The energy generating equipment is not transferred from or to another activity. Therefore, leakage is also considered as "0"[35].

As a result, Total Emission Reduction is:

$ER_y = BE_y$

4.4 Net GHG Emission Reductions and Removals

Table 6: Estimated Emissions Calculations

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)
23/02/2022-31/12/2022 (312 days)	123,856	0	0	123,856
2023	144,895	0	0	144,895
2024	144,895	0	0	144,895
2025	144,895	0	0	144,895
2026	144,895	0	0	144,895
2027	144,895	0	0	144,895
2028	144,895	0	0	144,895
2029	144,895	0	0	144,895
2030	144,895	0	0	144,895
2031	144,895	0	0	144,895
01/01/2032-22/02/2032 (53 days)	21,040	0	0	21,040
Total	1,448,953	0	0	1,448,953

[35] PPD page 30

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	**EFgrid,y**
Data unit	tCO_2/MWh
Description	CO_2 emission factor of the grid electricity in year y
Source of data	Combined margin emission factor calculated by Turkey Ministry of Energy and Natural Resources https://enerji.gov.tr//Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/TUESEmisyonFktr/Belgeler/Bform2020.pdf
Value applied	0.4616
Justification of choice of data or description of measurement methods and procedures applied	” Tool to calculate the emission factor for an electricity system”
Purpose of Data	Baseline emission calculation
Comments	EFgrid,CMy value (0.4616 tCO_2/MWh) is valid for the duration of the crediting period.

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,facility, y}$
Data unit	MWh
Description	Quantity of electricity generated and supplied by the project power plant to the consumers/electricity consuming facility i in year y
Source of data	Metering devices installed in the power plant and EPIAS records obtained by TEAIS monthly
Description of measurement methods and	Generation data is recorded by three main, three back-up metering devices continuously. These records provide the data for the monthly invoicing to TEIAS which form the basis for EPIAS data. EPIAS data is developed remotely by

procedures to be applied	TEIAS and includes grid loss. According to meter reading protocols, the internal consumption of the facility was subtracted from the gross generation. EPIAS data and site records are both used for cross-check. Whichever is smaller between the site records and EPIAS, it is used for quantification of emissions due to conservative approach. Relevant documents were provided.
Frequency of monitoring/recording	Continuous measurement at the site and daily and monthly recording were applied. The plant manager and the staff extracted the records regularly every day. The monthly records recorded by TEIAS, and the plant were used for monitoring emission reductions. Data are cross checked with EPİAS records.
Value applied	313,898 MWh
Monitoring equipment	Please see Tables Section 5.3.
QA/QC procedures to be applied	Six calibrated ammeters (three of them are spare). As per the regulations, it should be following the regulation on meters issued by relevant government agencies[36] . The meters are EMH with accuracy class of 0.5S.
Purpose of the data	To calculate the baseline emission value
Calculation method	Net Electricity generated and delivered to the grid by the project during the monitoring period is calculated by subtracting the internal consumption of the facility from the gross power generation.
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	Project site
Description of measurement methods and	Measured from topographical surveys

[36] http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

procedures to be applied	
Frequency of monitoring/recording	Yearly
Value monitored	765,842.81 m^2
Monitoring equipment	Topographical studies
QA/QC procedures to be applied	Calibration and Maintenance of equipment are made regularly by authorized service companies.
Purpose of the data	Emission reduction calculation
Calculation method	-
Comments	-

Data - Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydro power 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	Observed via the SCADA system of the project activity.
Frequency of monitoring-recording	Once for each monitoring period
Value monitored	96,000,000 W
Monitoring equipment	SCADA System of the Project activity
QA-QC procedures to be applied	Turbine labels checked with SCADA System reading.
Purpose of the data	To monitor capacity of the project
Calculation method	N-A
Comments	

Data / Parameter	Minimum flow
Data unit	m^3/ sec
Description	The project releases the required flow as per the regulations.
Source of data	Gauging stations of which locations are identified by DSI. Three gauging stations are installed within the framework of the project. One is on the main riverbed before the reservoir, one is after the reservoir to record life water, last one is installed on the Gullubag Creek.
Description of measurement methods and procedures to be applied	Remote gauging stations installed within the framework of Water Utilization Rights Protocol record the level of water continuously at real time. DSI extracts data remotely and checks.
Frequency of monitoring/recording	Continuous
Value monitored	According to the report of Turkey State Hydraulic Works[37] , minimum flow should be 5 m^3 /s at least. Minimum flow will be provided in the following period.
Monitoring equipment	Gauging stations
QA/QC procedures to be applied	-
Purpose of the data	Conservation of regional ecology
Calculation method	-
Comments	-

5.3 Monitoring Plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable, and long-term GHG emission reductions, the monitoring plan has been established.

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

[37] Turkey State of Hydraulic Works (DSİ), Erzurum ilinde olan HES tesisleri izleme ve kontrol raporu

In the validated PDD it was stated that “Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the plant manager/electricity technician of the plant will record the reading and sign. This record will form the basis for monthly invoicing.”

During the monitoring period site records and EPIAS readings were used as the source of calculation of electricity generation and emission reductions. Facility meter reading protocols and EPIAS readings were compared for cross-check, and whichever is smaller, it is used for quantification of emissions due to conservative approach.

Net electricity generation was measured and recorded by both TEIAS and project owners for billing purposes therefore no new additional protocol was needed for monitoring emission reduction. Power Plant Manager was responsible for the electricity generated, gathering all relevant data and keeping the records. He was informed about VER concepts and mechanisms and how to monitor and collect the data which was used for emission reduction calculations. The procedures to collect data were in line with the TEIAS requirements and rules. The project deploys software to track the generation and consumption all times. As an internal audit step, the records extracted from the software were also checked with the manual records which were extracted by the project staff. The records were reported to the plant manager who acts as the final internal auditor. Should nonconformity be identified; the plant manager was responsible for communication with TEIAS and undertaking the corrective action in line with the TEIAS procedures and rules if it fell under the authority of the plant manager. However, this might need the involvement of TEIAS as well as the project owners were not allowed to make changes or fixes on the meters. Thus, in case of non-conformity, the plant manager reported it instantly to TEIAS.

Generation data collected during crediting period was submitted to GTE who is responsible for calculating the emission reduction subject to verification. Generation data was used to prepare monitoring reports which were used to determine the vintage from the project activity. These reports were submitted to the duly authorized and appointed Designated Operational Entity ‘DOE’ before each verification period. VER Team Members is expected to include the following staff of the HEPP:

Plant Manager: Responsibility for running the HEPP plant and compliance with VER monitoring plan

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

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

Installation of meter and data monitoring was carried out according to the regulations by TEIAS. 6 metering devices (3 of them used as spare) were used for monitoring the electricity

generated by the power plant. The meters are installed at the project site on 06/12/2011 as shown in the “Meters Testing Protocol”. Readings were done using main metering devices and spare metering device was used for comparison only. Generation data were recorded by three main, three back-up metering devices continuously. These records provided the data for the monthly invoicing to TEIAS which form the basis for EPIAS data. EPIAS data is obtained remotely by TEIAS and includes grid loss. Meter reading protocols and EPIAS data are used for cross-check. Whichever is smaller between the site record and EPIAS, it is used for quantification of emissions due to conservative approach. The internal consumption of the facility was subtracted from the gross generation. Both the site records and EPIAS records were considered for comparison and to identify any abnormalities. TEIAS started remote reading of the generation of the facility as of June 2012.

TEIAS is the governmental energy transmission institution in Turkey. However, it gives authorization to several local distribution companies in specific regions to manage local energy distribution works. According to the communique given in file 7 in attached documents, calibration of the meters is done by TEIAS every ten years.

According to the revised agreement between TEIAS & PP i.e., Annex 3, Article 3.3 of “The Transmission System Usage Agreement dated 04/03/2021”, it has been found that the testing of energy meters will be carried out every 2 years. The installed meters are in line with the regulations. Calibration of the metering devices has been made by TEIAS and sealed before the commissioning of the power plant. The meters were calibrated by TEIAS. The installed meters are in line with the regulations.

Serial numbers of the main meters and back-up meters are tabulated below. New main meters and back-up meters were installed in 03/12/2019. For this reason, main and back-up meters will be replaced with new ones in 2029.

Table 7: Meter Serial Numbers

Previous Meters		New Meters	
Main Meter Serial Numbers (ELSTER)	Back-up Meter Serial Numbers (ELSTER)	Main Meter Serial Numbers (EMH)	Back-up Meter Serial Numbers (EMH)
424835	424836	8923726	8923727
424837	424838	8923728	8923739
424839	424844	8923730	8923731

Also, back-up meter with serial number as 8923729 were replaced the meter with serial number 8923739 in 03/01/2020 due to breakdown. For this reason, Table 7 has been revised to this update. Also, the detailed information of the replaced meter was given in Table 8.

Table 8: Summary of Replaced Meter

	Back-up Meter (Removed on 03/01/2020)	Back-up -Meter
Serial no.	8923729	8923739
Brand (Type)	EMH- LZQJ-XC	EMH- LZQJ-XC
First Index Date (First Calibration Date)	03/12/2019	03/01/2020
Calibration Due	02/12/2029	02/01/2030
Calibration Frequency	10 years	10 years
Test Date	03/12/2019	03/01/2020
Test Frequency	2 years[38]	2 years
Class	0.5S	0.5S
Entity responsible for calibration	TEIAS	TEIAS

The net electricity fed to the grid was measured continuously and recorded monthly by the TEIAS and plant staff. For consistency, recorded data were compared with electricity sale receipts.

The maximum area of the reservoir is provided in map of reservoir, the level of water was also checked from topographical surveys and maps and found that it did not exceed the limit value.

ABL value was taken as zero as the project is a new project and there was no reservoir area before the project is released, thus, as per the methodology.

All data was archived electronically and be kept at least for 2 years after the end of the last crediting period.

Project emissions from fossil fuel consumption due to diesel generator (PEFF,y) was calculated and approved in the first monitoring period. Since it was found insignificant and it is not required to monitor this parameter according to the new version of the methodology, it was not monitored and not included in this monitoring period. With the same reason, the parameter of quantity of fuel type combusted in diesel power (FCi,j,y) was not monitored and not included in this monitoring period.

The monitoring parameters wC,i,y and CapPJ would be monitored once for the crediting period according to the registered PD (dated 30/01/2010), Section B.7.1.. These parameters have been monitored once for the crediting period in the first verification. Therefore, these parameters have been removed from Section 4.2.

Water Utilization Rights Protocol was published by State Water Works (DSİ). According to this protocol, DSİ record the level of water continuously at real time and extracts data

[38] Gullubag HEPP- System Use Agreement, page 13, section 3.3., item d

remotely. Data checks and the water level is monitored continuously by DSİ. For this reason, this parameter (minimum flow) is added to Section 4.2.

EPIAS records and meter reading forms will be used for ER calculations. Though there is no significant difference between, lowest figure in records have been used for conservativeness.

According to revised agreement between TEIAS and PP, System Use Agreement was revised on 04/03/2021.

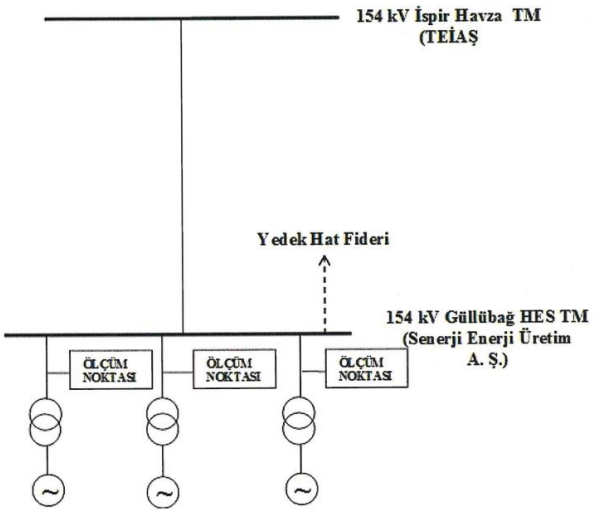


Figure 6 Gullubag HEPP single- line diagram

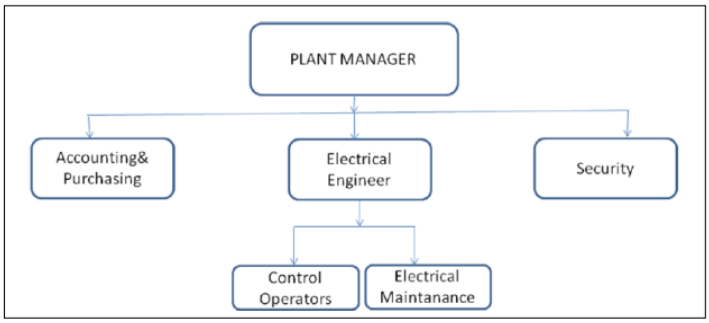


Figure 7 Organizational chart of Gullubag HEPP

APPENDIX

Reservoir Area

Figure 8 Reservoir Area of Gullubag HEPP