BOYABAT HYDROELECTRIC POWER PLANT

Document Prepared by Life İklim ve Enerji

Project Title	BOYABAT HYDROELECTRIC POWER PLANT
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1 PROJECT DETAILS

1.1 Summary Description of the Project

This RCP is carried out under VCS standard 4.4 and guideline V.4.3.

Boyabat Elektrik Üretim A.Ş is to construct a 513 MWe capacity Hydroelectric Power plant. The 528 MWm/513 MWe[1] Boyabat HPP produces electricity for transmission into the national grid. Boyabat Hydroelectric Power Plant (Boyabat HPP in short) is a project that is designed and planned to be constructed on Kızılırmak river, within the jurisdictions of Sinop where the Dam body is located and partially within the jurisdictions of Çankırı and Samsun Provinces of Turkey. Kızılırmak River, is one of the biggest rivers in Turkey, and gives its name to the Kızılırmak basin that makes up one of the 26 big river catchments of Turkey. The purpose of the project is to supply electricity to the Turkish power grid, from a renewable source.

Boyabat HPP Project's Dam structure crosses the Kızılırmak River, approximately 123 km inland from its confluence with the Black Sea. The River Basin of the Kızılırmak river is one of the most developed river basins in Turkey. Some of the large reservoirs fed by the Kızılırmak river include Yamula, Hirfanlı, Kesikköprü, Kapulukaya, Obruk and Altınkaya. These reservoirs are used for electricity production, irrigation and water supply.

The purpose of the project is to export the generated electricity to the regional grid, thereby contributing to the Turkey's electricity demand and rapidly growing economy. Since the Project generates electricity from renewable energy resources, it makes a significant contribution to climate protection. The project was expected to generate 1,370,000 MWh of electricity annually, and to reduce 580,882 tonnes of CO_2 emissions per year for first crediting period.

The electricity produced by project activity will result in an emission reduction of 500,272 tonnes of CO_2e/year and total emission reduction by the project activity is estimated to be 5,002,720 tonnes of CO_2e for the second crediting period, which is 29 November 2022 to 28 November 2032.

Third monitoring period for first crediting period covers the 2.6 years from 01-May 2020 to 28-Nov-2022 (both days included). Total emission reductions achieved in this period are 544,660 tons of CO_2e.

If Boyabat HPP does not generate renewable energy, the power from a new grid-connected thermal plant would be the most likely scenario – which would increase the amount of GHGs released to the atmosphere

[1] Please see, generation license

The project will help Turkey to stimulate and commercialize the use of grid connected renewable energy technologies and markets. Furthermore, the project will demonstrate the viability of grid connected hydro power which can support improved energy security, improved air quality, alternative sustainable energy futures, improved local livelihoods and sustainable renewable energy industry development. The specific goals of the project are to:

- reduce greenhouse gas emissions in Turkey compared to the business-as-usual scenario;
- help to stimulate the growth of the hydro power industry in Turkey;
- create local employment during the construction and the operation phase of the hydro power plant;
- reduce other pollutants resulting from power generation industry in Turkey, compared to a business-as-usual scenario;
- help to reduce Turkeys increasing energy deficit; and differentiate the electricity generation mix and reduce import dependency.

Audit Type	Period	Program	VVB Name	Number of years
Validation	24/07/2014	VCS	TÜV Rheinland	The project crediting period is 10 years: 29.11.2012-28.11.2022 (both days inclusive). The crediting period is renewable twice.
First Verification	29/11/2012 – 31/07/2014	VCS	TÜV Rheinland	1 year 8 months MP
Second Verification	01/08/2014 – 30/04/2020	VCS	Re Carbon	5 years 8 months MP
Third verification	01/05/2020-28/11/2022	VCS	Applus	2 years 6 months
Total	24/07/2014-30/04/2020	VCS	-	8 years MP

1.2 Sectoral Scope and Project Type

Title: Grid Connected Renewable Electricity Generation (Sector 1)

Reference: ACM0002 (Version 21.0)

Since the project activity is a hydro power plant, the respective sectoral scope is scope 1: "Energy Industry – Renewable/Non-renewable Sources". Project participant hereby confirms that this is not a grouped project.

1.3 Project Eligibility

Boyabat HPP is classified in the Renewable Energy Source category as electricity from non-fossil and non-depletable energy sources, in this case from hydro power, is fed into the Turkish electricity grid.

1.4 Project Design

Eligibility Criteria

The project includes a single location and installation only and the project activity is not a grouped project activity.

1.5 Project Proponent

Organization name	BOYABAT ELEKTRİK ÜRETİM VE TİCARET A.Ş.
Contact person	Suat Odaman
Title	Sales Manager
Address	Cumhuriyet Caddesi Gürsel Plaza No:123 Kat:3 Kavacık/Beykoz/İstanbul Turkey
Telephone	0216 537 81 41
Email	sodaman@boyabatelektrik.com.tr

1.6 Other Entities Involved in the Project

Organization name	Life İklim ve Enerji Ltd. Şti.
Role in the project	Project Consultant
Contact person	Ekin Kılıç
Title	Expert Carbon Consultant
Address	Oğuzlar Mah. 1377. Sk. No:19/9 Balgat, 06520 Çankaya/Ankara - Turkey

Telephone	+90 312 481 21 42
Email	ekin.kilic@lifeenerji.com

1.7 Ownership

The Project is owned by BOYABAT ELEKTRİK ÜRETİM VE TİCARET A.Ş and the project owner has the legal right to control and operate the project activity as per the project license.[2]

1.8 Project Start Date

Project start date is 29 November 2012 as indicated on the substantial completion document issued by the Ministry of Energy and Natural Resources.

1.9 Project Crediting Period

10 years two-times renewed crediting period.

First Crediting Period:

Start: 29-November-2012

End: 28-November--2022

Second Crediting Period:

Start: 29-November -2022

End: 28-November -2032

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	N
Large project	Y

Year	Estimated GHG emission reductions or removals (tCO_2e)
29-November -2022 to 31-December-2022	45,230

[2] Please see the appendix 3 for the generation license of the project activity

Year	Estimated GHG emission reductions or removals (tCO_2e)
2023	500,272
2024	500,272
2025	500,272
2026	500,272
2027	500,272
2028	500,272
2029	500,272
2030	500,272
2031	500,272
01-January-2032 to 28-November -2032	455,042
Total estimated ERs	**5,002,720**
Total number of crediting years	10
Average annual ERs	**500,272**

1.11 Description of the Project Activity

The Project Activity is constructed over the longest (1355 km) river of Turkey, the Kızılırmak river. The project is constructed as the third project counting from the upstream point. One of the largest tributaries of the Kızılırmak river Gökırmak joins the river upstream before the Boyabat Dam structure.

More information about the geography of the project, please see Figure 1.

The environmental impacts of the project is kept to a minimum level and all the regulations that are in act in the host country, Turkey, are obeyed during the construction and operation stages of the Boyabat HPP project. Since the project was initially a state owned and

Figure 1 Kızılırmak upstream view from Boyabat cofferdam during construction stage Source: Photo courtesey of Boyabat Elektrik Üretim A.Ş.

developed project with an history dating back to 1958, and since the project planning stage started earlier than the EIA legislation went in effect, the project was evaluated outside the extent of the EIA legislation, and the project is considered to be exempted from EIA. Even though the project was except from the EIA process, Boyabat Elektrik Üretim A.Ş. made sure that the social and environmental impacts of the project are handled properly and constructed a fish passage to facilitate fish migration, and organized wildlife rescue patrols during the filling of the reservoir.

The entire project development history can be summarized as follows:

- 1958 - The first feasibility for Boyabat Dam was conducted by EIEI (Electrical Works Study Office)
- 1979 - Technical and budgetary works were conducted by DSİ (State Hydraulic Works) and EPDC (a Japanese power generation development company)
- 1986 - The same parties continued their studies and completed the final design of Boyabat Dam and HPP Project. Construction of the derivation tunnels, transportation roads, the by-pass tunnels on the route of the roads and most of the site mobilization were completed by DSİ.
- 1995 - Due to the changes in energy policies, the Ministry of Energy and Natural Resources decided to implement the Boyabat Dam and HPP Project with BOT (Built Operate and Transfer) model and Boyabat was offered to the private sector by a tender under the internationally accepted procedures.

- 1998 - Doğuş Holding won the tender and Doğuş Holding and Ministry of Energy and Natural Resources signed a concession agreement.
- 1999 - Harza Engineering (an American engineering firm) updated the final design of the project.
- 2007 - Boyabat Elektrik Üretim ve Tic Ltd Şti's partnership structure has changed and Unit, Doğuş, and Doğan became the shareholders of the company. EMRA (Energy Markets Regulations Authority of Turkey) granted the generation license on November 13, 2007 after Doğus had released its concession rights according to the 24th provisional article of the Official Gazette numbered 25520 which is related to the regulations for changes in Electricity Market Regulations. (Accordingly the new license owners renewed the feasibility study report, as indicated below in table 3).
- 2010 – Boyabat was transformed to a joint stock company from a limited liability company with the same partnership structure.

Other important and significant dates in the project history can be listed as shown in the following table.

Table 1 Major project milestones

Date	Milestone	Reference
01/07/07	Feasibility Study Report	FSR 2007
25/10/07	Water Usage Agreement	Signed Agreement
13/11/07	Electricity Production License granted for the project	License numbered EÜ1374-3/992
24/03/08	The Project is officially exempted from the EIA process	EIA Exemptions Letter
01/05/08	Construction Worksite Opening Permit Accrued	NHS records
01/06/08	Expropriation process started	Summary of the expropriation process
28/11/08	Construction Contract Signed	Contract
31/08/09	Financial Closure	Signed Loan agreement
22/03/10	Hydro mechanical Equipment Procurement Contract	Contract
12/10/10	EMRA extended the construction period	EMRA Communication
22/11/12	DSI Substantial acceptance provision issued	DSI Protocol
29/11/12	The Unit 1-2 and 3 was commissioned	Substantial operation protocol
24/07/14	Approved PD	
24/07/14	Approved Validation Report	
03/09/14	Approved First Monitoring Report(29/11/2012 – 31/07/2014)	
04/09/14	Approved First Verification Report	
18/04/22	Approved Second Monitoring Report	

How the project activity will be operating, and the boundary of the project activity (indicated in broken red line) is outlined in the following figure.

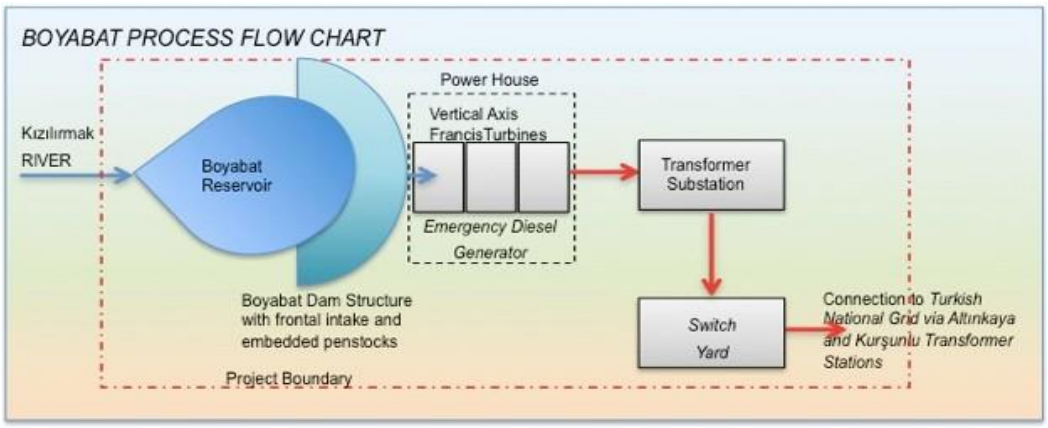

Figure 2 Flow chart showing the basic operational principles of the project activity, and the project boundary.

To summarize the technical description of the Project Activity, the main technical characteristics obtained from the feasibility study report are provided below Table.

Table 2 General properties of the project facilities

Characteristics of the Reservoir	
Max Water Level	335 m
Min Water Level	305 m
Active Volume	1,410,000,000 m3
Dead Volume	2,147,000,000 m3
Total Volume	3,557,000,000 m3
Area of the Lake	65,400,000 m2
Length of the Lake	60 km
Characteristics of the Dam Body	
Dam Location	10 km SW of Durağan town centre over the Kızılırmak river
Dam Type	Concrete Gravity Dam
Height from Base	195 m
Height from River Base	147 m

Crest Elevation	335 m
Volume of the Body	2,300,000 m3
Crest Width	10 m
Crest Length	262m
Thalweg Elevation	147 m
Characteristics of the Spillway	
Spillway Type	Concrete Gravity Dam
Number of Units	6
Cover Height	13 m
Cover Width	10 m
Capacity	9300 m3/sec
Characteristics of the power station	
Type	Semi-Underground
Width	22.5 m
Length	103 m
Annual Generation	1,500*106 kWh
Firm Energy Generation	925*106 kWh
Secondary Energy Generation	575*106 kWh
Characteristics of the Turbine and generator	
Type of Turbine	Vertical Shaft Francis
Type of Generator	Vertical Shaft Synchronous Generator
Number	3
Installed Capacity	171 MW X 3
Effective Rated Head	122.5 m
Maximum Rated Discharge	157 m3/sec each

The project is using three vertical axis Francis type turbines. In the 'Tool to determine the remaining lifetime of equipment'' (Tool 10) it is said that lifetime for the Hydro Turbines is 150,000 hours. The working principle of the Francis turbine is such that the water coming from the penstock is transferred to the inlet scroll, which distributes the water equally around the wicket gates. Water passes through the wicket gates, which controls the amount of water passing through the turbine, before reaching the runner. This in effect controls the power output of the hydroelectric power plant. The wicket gates also adjust the angle of the water reaching to the runner. After passing through the wicket gates, the water reaches the runner. The water pressure forces the runner to rotate. The rotation speed of the runner can be in the range of 80 to 1000 revolutions per minute. The water continues its motion downward under the runner to the exit pipe. The exit pipe discharges the water to the environment as low pressure water. The rotational motion of the runner is transferred to an electric generator. The generated electricity is converted to a high voltage current and is transferred to the grid to be consumed.. The following figure exhibits the working principle of a Vertical axis Francis Turbine.

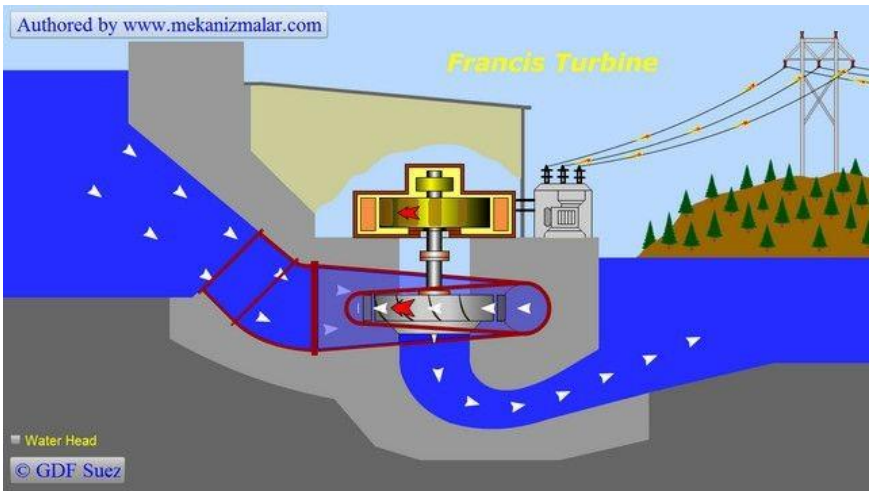

Figure 3 The working principle of a Francis type turbine.

1.12 Project Location

The Project is located at the Central Black Sea Geographical Region/ Sinop Province. The following are the coordinates of the four random points from around project area. Exact location of the project can be seen in Figure below.

Table 3: GPS coordinates of the Dam Body

	Dam Body
Latitude	41°20.316' N
Longitude	35°0.068' E

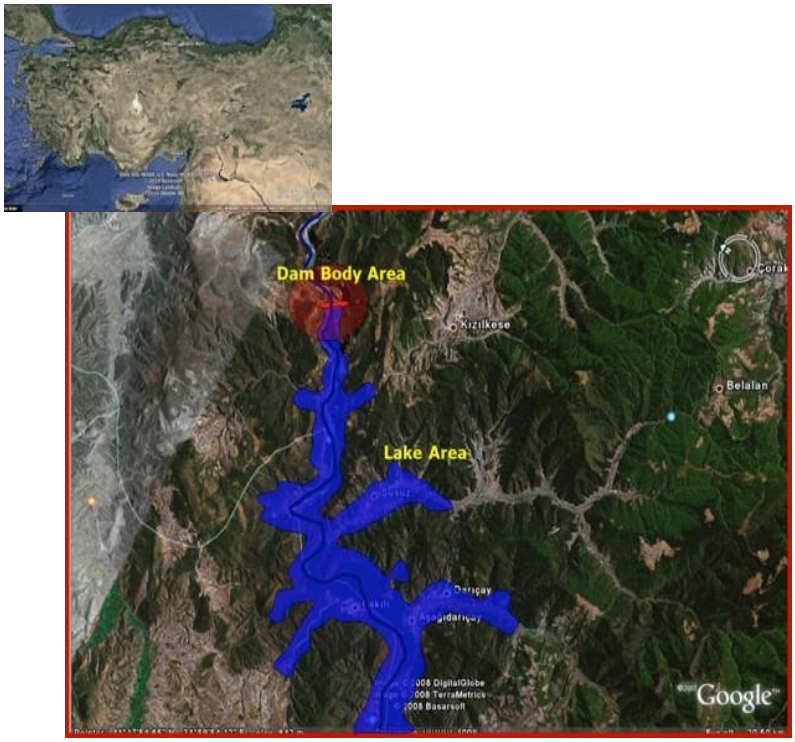

Figure 4 Project Location

1.13 Conditions Prior to Project Initiation

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

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Addition of a new power generation capacity to the grid is regulated by Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity additions are in compliance with its rules and regulations. The list of the rules and regulations of the host country that a new electricity generation project has to comply with is given in Appendix 2.

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 and seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

Boyabat HPP has not applied for crediting under any other GHG program, nor has it been rejected from any other GHG program. In addition, there is no double accounting for current monitoring period of project activity for participation in other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Not applicable: The project activity is neither included in an emissions trading program nor does it take place in a jurisdiction or sector in which binding limits are established on GHG emissions.

1.16.2 Other Forms of Environmental Credit

Not applicable

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

1.16.3 Supply Chain (Scope 3) Emissions

Project activity does not impact the emissions of goods of services in a supply chain. Therefore, there is no any scope 3 emissions by project activity.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project is expected to contribute 3 SDGs which are SDG 7, 8 and 13 for the second crediting period.

SDG 7 Energy: The project contributes SDG Target 7.2 “By 2030, increase substantially the share of renewable energy in the global energy mix” and Indicator 7.2.1 by the utilization of hydro power as a renewable energy source.

SDG 8 Decent Work and Economic Growth: During the operation phase of the project, job opportunities are created. Therefore, the project contributes to SDG Target 8.5 “By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value” SGK (Social Security Institution) Records will be provided during each monitoring period.

SDG 13 Climate Change: The project produces clean renewable energy by diminishing CO_2 emissions. Therefore, it contributes SDG Target 13.3 “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning” and Indicator 13.2.2.

1.17.2 Sustainable Development Contributions Activity Monitoring

Electricity generated by the project is fed into the national electricity grid, displacing energy that would otherwise be generated by fossil fuels. The project facilitated 1,286,967.88 MWh renewable electricity generation, 544,660 tCO_2e during its third monitoring period.

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Table 4: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	544,660 tCO_2 emission reduction during this MP	2,232,989 tCO2 emission reduction over the project lifetime 1st MP: 497,174 tCO2 (29/11/2012 to 31/07/2014) 2nd MP:1,681,349 tCO2 (01/08/2014 to 30/04/2020) 3rd MP: 544,660 tCO2 (01/05/2020-28/11/2022)
2)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	1,286,967.88 MWh during this MP	6,472,654 MWh over the project lifetime (29 Nov 2022 to 28 Nov 2032) 1st MP: 1,179,952.57 MWh 2nd MP: 4,005,735.439 MWh 3rd MP: 1,286,967.88 MWh

3)	8.5	Indicator 8.5.1: Average hourly earnings of employees, by sex, age, occupation and persons with disabilities	Implemented activities to increase	The project has been created permanent job opportunity for 28 people	Throughout the construction and operation phases, employment record has been provided by the Project Activity over the project lifetime. 1st MP: 29/11/2012 to 31/07/2014 2nd MP: 01/08/2014 to 30/04/2020 3rd MP: 01/05/2020- 28/11/2022 The project has been created permanent job opportunity for 28 people	

1.18 Additional Information Relevant to the Project

Leakage Management

There is no leakage management as per applied methodology ACM0002, Version 21.0.

Commercially Sensitive Information

Commercially sensitive information has been excluded from this document.

Further Information

Not applicable

2 SAFEGUARDS

2.1 No Net Harm

In the context of the "EIA Positive Letter" submitted within the project documents to the local branch of Sinop provincial directorate of environment and urbanism, during the project design phase, the following measures are undertaken in order to minimize the impacts during construction and operational periods:

Air Quality: Necessary precautions, such as watering roads, careful loading and unloading and covering the top of loaded trucks by tarpaulin; are to be taken in order to minimize the dust formed during any excavation. The dusting problem was more of an issue during the construction phase, but the project activity is not causing any process emissions or fuel burning emissions except the auxiliary diesel generator, that was only operated for testing purposes during the monitoring period.

Water & Wastewater Management: Water for domestic use is supplied by tankers to the site and wastewater is collected in septic tanks which is emptied regularly. The wastewater is discharged in accordance with Water Pollution Control regulations of the host country. The waste oil is collected in impermeable containers and transferred to recycling centres in accordance with Hazardous Waste Control Regulations and Waste Oil Control Regulations.

It is stated that the amount of water to be left will be specified in the EIA report, as it is stated in the 2nd page of the Water Use Agreement, as 2 paragraphs, for the subject related to life water. However, in the paragraph below, it is defined as the amount of water determined in the feasibility report and approved by DSI for projects that do not require an EIA. The Boyabat HEPP project is also exempt from the EIA report (EIA Writings). For this reason, the amount of water to be released downstream has been approved by DSI as at least 10% of the average water flow of the last ten years taken as a basis for the project. The average water flow of the last 10 years, which is the basis of the project, is calculated as 3108hm^3 and the amount of water to be released to the downstream is 310.8hm^3. This amount of water is already

released to the downstream by production. At the same time, this amount of water corresponds to approximately 100,000MWh electricity production. Even in 2018, when project owner made minimum production, project owner left the water downstream by 4.7 times of this amount. The main reason why there is no lifeline requirement in the project is that our tail water is discharged into the reservoir of Altınkaya dam in our downstream.

Solid Waste: Solid waste is collected, and recyclables are separated to be sent to recycling centers. The rest is disposed to the nearest landfill site in coordination with Sinop Municipality

Biodiversity: Necessary precautions are taken for the species under conservation by international conventions, if any found on the site.

The reason why there is no fish pass application in Boyabat HEPP project; Boyabat dam is a very large dam in terms of reservoir storage area and body height. There is a distance of 145m between the tail water(190m) and the body height(335m). As in Aslancık dam, it is not technically possible to make a passage over the dam body. Even if such a passage is made, it will not be possible for the fish rising from the tail water level (190 m) to the body (335 m) level to descend to the 305 m water level when the water level in the reservoir is minimum (305 m).

No negative socio-economic impacts have been observed/recorded by now as confirmed by the project participant and stakeholders during the interviews. The project activity takes into account negative comments -mostly provided by mukhtar- from local stakeholders for socio-economic impacts of the project activity and implements an action plan to take necessary actions.

2.2 Local Stakeholder Consultation

The project owner has decided to take actions related with VER carbon credits and their incomes for Boyabat Hydroelectric Power Plant approximately 9 years and half ago. The project owner was informing to the villager of Beybükü related with this hydro power plant.

On 5th January 2021, the project owner, the headman of Beybükü village and other villagers was hold a meeting[3]. During this meeting, all details including environmental and social benefits of this project, sustainable development goals has explained again and taken their comments by project owner. They have known all details and support from beginning construction phases of this Boyabat Hydroelectric Power Plant. The muchtar stated that this project does not have a negative impact and they were glad about the project's social and environmental benefits as a local stakeholder.

Muhtar (head of the village) had already taken the contact information of Company Executive of the company so that the local stakeholders have been able to reach company executive whenever they have any complaints, suggestions or ideas about the project. In case of any complaint or request, the stakeholders can communicate the situation to the villagers

[3] Please see decleration of headman about stakeholder meeting on 05/01/2021 at 10:00.

working in the project and the project owner response it asap. The current grievance mechanism does mainly rely on the existed grievance mechanism by the use of logbook.

There is no complaint received during the current monitoring period. There is no update and/or design change during this monitoring period. Yet, if there was any, project owner would consider the effects of the change on local people and take their opinion into account. After implementation of the project, no unexpected change has expected to occur with respect to risks, cost of locals.

2.3 Environmental Impact

In Turkey, there are 35 Nature Preservation Area[4] and 33 National Parks[5]. The project is not located in any of these. Furthermore, in Turkey, there are 58-registered Monument of Nature[6] and 16 registered Nature Park. None of these Monuments of Nature and Nature Parks is located in the project area.

Environmental benefits

The project helps Turkey to stimulate and commercialize the use of grid connected renewable energy technologies and markets. The specific economic, social and technological benefits are:

- Reducing Turkeys expanding energy deficit;
- Diversification of Turkish electricity generation mix and reduction of import dependency;
- Creation of local employment and income during construction and operation of HPP (directly as well as indirectly via contracts with local providers for supply of construction material);
- Foster infrastructural investments with connected development benefits to the local rural community in the remote project area;
- Making rural electricity supply more reliable, better available and cost efficient thanks to decreasing distances between generation and consumption points.

2.4 Public Comments

There are no public comments for 30 days during the first crediting period.

2.5 AFOLU-Specific Safeguards

This is a non-AFOLU project.

[4] https://www.ktb.gov.tr/EN-99884/natural-protection-areas.html

[5] https://www.ktb.gov.tr/EN-99769/national-parks.html

[6] https://www.ktb.gov.tr/EN-99825/nature-monuments.html

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: Grid Connected Renewable Electricity Generation

Reference: ACM0002 (Version 21.0)[7]

For the determination of the baseline, Version 21 of CDM approved baseline and monitoring methodology ACM0002 – "Grid-connected renewable electricity generation" is applied. For baseline calculations, ACM0002 refers to the "Tool to calculate the emission factor for an electricity system", Version 7.0. Additionality is demonstrated via application of the "Tool for the demonstration and assessment of additionality", Version 07.0. The methodology is used in conjunction with the following tools:

1. Tool to calculate the emission factor for an electricity system- Tool 07 (Version 07.0.0)[8]
2. Tool for the demonstration and assessment of additionality- Tool 01 (Version 07.0.0)[9]
3. Tool to determine the remaining lifetime of the equipment – Tool 10 (Version 01.0.0)[10]
4. Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period – Tool 11(Version 03.0.1)[11]

3.2 Applicability of Methodology

The choice of methodology ACM0002 Version 21 is justified as the proposed project activity meets the relevant applicability criteria:
The Hydroelectric Power Plant Project involves installation 513 MWe grid connected renewable electricity generation plant,

The methodology is applicable under the following conditions:

- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2. In addition, as in the case of Boyabat HPP this density is below the 10 W/m^2 threshold (7.844 W/m^2; reservoir size: 65,400,000 m^2, installed capacity: 513,000,000 W). Hence, the project emission ($PE_{HP,y}$) needs to be calculated in line with the ACM0002 methodology.

[7] Please see https://cdm.unfccc.int/UserManagement/FileStorage/ZPFJL01OU2RYC6N3HASIXV7K84QBG9

[8] Please see https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[9] Please see https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

[10] Please see http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

[11] Please see https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

- The project activity is the installation of a hydro power plant with a run-of-river reservoir.
- The project activity is not capacity additions, retrofits or replacements.
- Project activities do not involve switching from fossil fuels to renewable energy sources at the site of the project activity.
- Project activity is not a biomass-fired power plant.

The methodology is applicable as the proposed project is a grid connected greenfield hydropower plant project with a power density greater than 4 W/m^2. Hence, the approved consolidated methodology ACM0002 Version 21 is applicable to the project activity.

In addition, for the emission factors, that were used to calculate estimated emission reductions, publication of Turkish Ministry of Energy and Natural Resources, which is indicating Turkey's National Electric Grid Emission Factor for the year of 2020 was used. Publication includes calculated Emission Factor values that are Operating Margin (OM), Growth Based Margin (Build Margin-BM) and Combined Margin (CM) Emission Factors, for the relevant year (which is 2020) with usage of the IPCC's Clean Development Methodology Tool 07-V07.0. For this calculation, information regarding used data set is given detailed in section 4.1 of this document.

In brief, the latest version of the Turkish National Electricity Grid Emission Factor was published in 2022 and the Emission Factors included in this document belong to the 2020 calculation period[12]. Therefore, the recent available data of the emission factors (the data set used for calculation of emission factors also belongs to 2020.) used in the calculation of the baseline scenario belongs to 2020.

Emission factor calculation is not given in detail in the document published by the Turkish Ministry of Energy and Natural Resources. However, the most recent data and official values for emission factor of Turkey are those published in this report (Please see: https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru).

3.3 Project Boundary

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Greenhouse's gases included in the project boundary and used in calculations of emission reductions are given in Table below.

Table 5: *Emissions sources included in or excluded from the project boundary*

[12] Please see: https://enerji.gov.tr//Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/T%C3%BCrkiyeUlusalElektrik%C5%9EebekesiEmisyonFakt%C3%B6r%C3%BC/Belgeler/EK-2.pdf

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source: Fossil fuels fired for electricity generation cause CO_2 emissions. It is included to baseline calculation to find the displaced amount by the project activity.
		CH_4	No	Minor emission source. Excluded for simplification. This is conservative
		N_2O	No	Minor emission source. Excluded for simplification. This is conservative
Project	Emissions of CH_4 from the reservoir	CO_2	Yes	Considered and calculated
		CH_4	No	Minor emission source. The project activity will not create a new reservoir. Therefore, there will not be any project emission. This is conservative.
		N_2O	No	

3.4 Baseline Scenario

Since the proposed project activity is the installation of a new grid-connected hydroelectric, that is renewable power plant and therefore, the baseline scenario is defined as the following based on ACM0002 (Version 21.0.0):

"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, as reflected in the combined margin (CM) calculations described in the. Tool to calculate the emission factor for an electricity system (v.07.0.0)."

Since the proposed project activity is going to be connected to the Turkish national grid, the baseline scenario of the proposed project is the supply of the equivalent amount of annual power output by the existing Turkish national grid which is the continued operation of existing power plants and the addition of new sources to meet electricity demand.

Based on ACM0002, baseline emissions are equal to power generated by the project activity that is delivered to the Turkish national grid, multiplied by the baseline emissions factor.

The methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" Tool 11 (version 03.0.1)[13] is adopted to assess the continued validity of the baseline and to update the baseline. This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. According to this tool, the following steps are applied.

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

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

The validity of the current baseline is assessed using the following Sub-steps:

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

The project baseline is the "Grid-connected electricity generation". It complies with the current legal framework. There are no additional laws that came into force that has an impact on the project activity and the project activity is still in line with the available law and regulations.

Sub Step 1.2 Assess the impact of circumstances.

The new national circumstances have an impact on the EF of the grid and thus on the project's current baseline emissions. Accordingly, the EF is updated for the second crediting period in conformity with the latest version of the publication of the Turkey's National Electric Grid Emission Factor for the year of 2020. There has been no major deviation or change in the market characteristic during the first crediting period.

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

The technical lifetime of the equipment, (hydro turbines) are 150,000 hours (18 years) and lifetime exceeds the crediting period for which renewal is requested. Equipment only requires regular maintenance. The baseline scenario identified at the validation of the project activity was the continuation of grid-connected electricity generation. Under this scenario, no investment from the project's proponent or third party (or parties) has been envisioned later specifically for the project.

Sub Step 1.4 Assessment of validity of the data and parameters.

The emissions reduction calculations are based on two main parameters: the energy produced and the grid emission factor. The latter will be updated as explained in the next paragraph. As a requirement of the methodology, only the grid emission factor has been updated during the second crediting period renewal.

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

Sub Step 2.1: Update the current baseline

As confirmed in Step 1, under the current context of the sectoral policies and circumstances, the project baseline for the next crediting period is the use of electricity from the national grid. This is conformed to the provisions of the latest version of the approved applicable methodology. Therefore, there has been no deviation in the baseline scenario.

Sub Step 2.2: Update the data and parameters

The grid emission factor is updated according to the publication of Turkish Ministry of Energy and Natural Resources that is indicating Turkey's National Electric Grid Emission Factor for the year of 2020.

3.5 Additionality

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

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

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

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

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

The project alternative can be defined as follows:

Continuation of the current situation (No project activity or other alternatives undertaken). This alternative is the most likely scenario, since there are no legal obligation to implement such a project and without VCS support the project implementation is financially not attractive.

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

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

The project alternative, the baseline scenario, which is the continuation of the existing situation, is in compliance with all mandatory applicable and legal and regulatory requirements. Also, the alternative scenario of addition of a new power generation capacity to the grid is regulated by Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity applies with its rules and regulations. The list of the rules and regulations of the host country that a new electricity generation project has to comply with is given in Annex 1.

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 or financially attractive" option. Please note that, at this step, the "Guidelines on the assessment of investment analysis" (EB 62 Report Annex 5) Version 05 is followed.

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 economic benefits from sale of electricity to the Turkish national grid". Investment Comparison Analysis is also eliminated since the baseline for the project is "the generation of electricity by the existing grid" and no similar investment alternatives exist. Therefore, Benchmark Analysis is the most appropriate approach for the evaluation of the project activity.

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

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

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

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

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

The Guidelines issued at EB 62 provides the default values for the expected return on equity as an appendix, and Moody's index values of most of the CDM Countries. At the time of investment decision (2008 see table 3), Turkey's Moody's index (Ba3-Stable10 between

2005 to 2009) was 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 12.75 %.

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

The following parameters are taken into account for the assessment of the investment (Table 6).

Table 6: Major parameters taken into account for the financial analysis and determination of theEquity IRR of the Boyabat HPP Project:

Parameter	Value	Unit	References
Installed Capacity	513	MWe	BOYABAT Generation Licence Numbered EÜ/1374-3/992 Dated 13/11/2007
Expected Annual Electricity Generation	1,370,000	MWh	3rd party lender's evaluation report dated June 24, 2009, see page 29.
Expected Average Annual Emission Reduction (ER)	580,882	tCO_2e	Calculated (see Chapter 3 for details) based on the electricity production values.
Total Investment	Confidential	USD	Based on FSR and based on VAT calculations
Annual Operation Costs	Confidential	USD	Based on FSR and based on labour cost calculations.
Loan	Confidential	USD	Loan Agreement
Loan Period	10	years	Loan Agreement
Electricity Sales Price	0.089	USD/KWh	See page 113 of the FSR Dated July 2007
VAT	18	%	V.A.T. Law No:3065
Income Tax	20	%	Income Tax Law number 5281

The value of the investment has been depreciated on a reducing balance basis over 20 years, 75 % of the long lasting assets are depreciated over 45 years and the residual book value of

$382,200,000.00 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 report11 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 years12. 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 08.68 %, which is below the benchmark of 12.75%.

Sub-step 2d - Sensitivity Analysis

To be able to conclude if the investment decision is the financially the most attractive alternative or not, a sensitivity analysis is performed. Three parameters that affect the equity IRR are examined for the sensitivity analysis:

- Investment Cost
- Operating and Maintenance Cost
- Electricity Revenue

The sensitivity analysis is performed for a range of ±10% fluctuations in the above parameters. The figures in the following table (Table 7) 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 (also see Figure 6).

Table 7: Sensitivity analysis for the Equity IRR without carbon revenue for the project (Benchmark: 12.75%)

Change	-10%	-5%	5%	10%	Exceed Benchmark?
Investment Cost	10.98%	9.71%	7.83%	7.09%	No
Operating Cost	8.71%	8.69%	8.67%	8.66%	No
Electricity Revenue	7.47%	8.08%	9.27%	9.85%	No

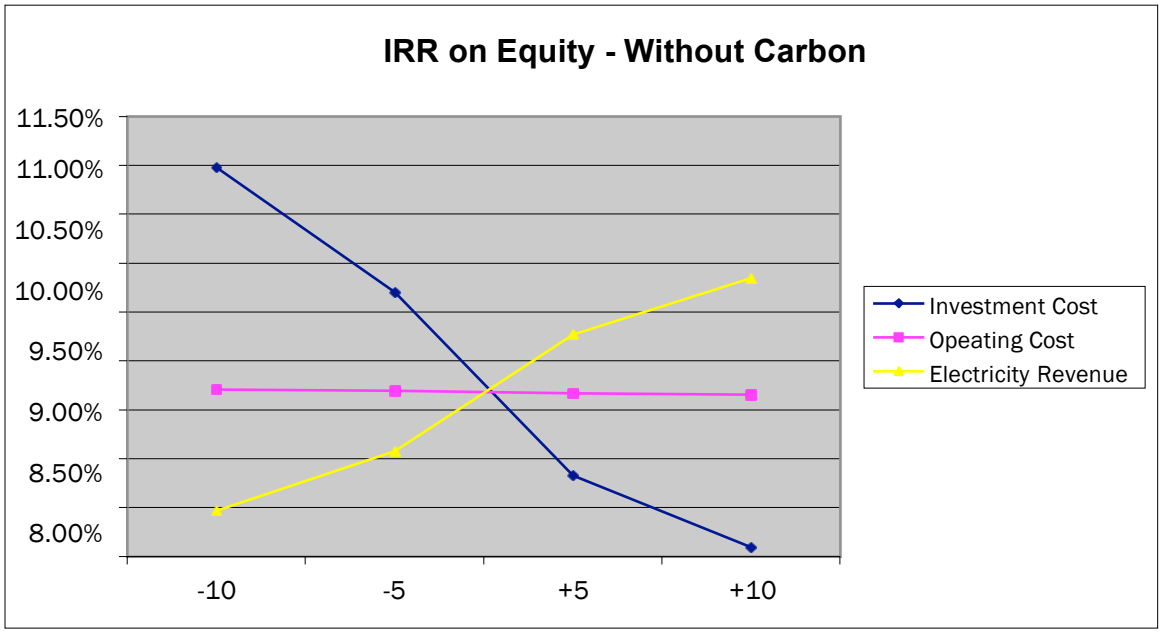

Figure 6: Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by ±10%

To exceed the benchmark, the electricity revenue must increase by about 36.80 % over the life of the project, or the investment cost must be reduced by about 15.22 %. The Renewable energy law only guaranties a minimum price of USD 0.073 per kWh for renewable energy and the price , and the price that was announced at the EMRA web site was approximately 6.4 US cents13,, indicating that our estimation for the renewable energy price was reasonable. However, we do not expect an increase in the electricity revenue related to a price increase and since the feasibility report and the design of the project is based on the maximum available capacity of the Kızılırmak river, and since our entire financial analysis is based on the maximum net electricity output of the project, such an increase based on an increased amount of electricity generation is very unlikely. In addition to that as the availability of the water decreases due to the globally accepted results of global climate change, electricity production is very unlikely to reach to an increased generation amount of an additional 36.80 %. 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 was based on the third party prepared revised feasibility report that was available to the project owner at the time of investment decision. Therefore these numbers are reasonable and reflect the average market conditions but are unlikely to go down, as the focus of the project developer is to secure and improve the electricity yield and therefore they will not be able to cut costs. Therefore it is very unlikely for the investment cost to finalize below the amounts estimated and shown in the financial analysis.

Outcome of Step 2:

Without the VER revenue the Internal Rate of Return of the project cannot get close to the benchmark of 12.75 %, with an equity internal rate of return of 08.68%. A fluctuation of ± 10% in the key parameters also does not make the project exceed the benchmark.

Step 3 - Barrier Analysis

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

Step 4: Common Practice Analysis

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

As per “Tool for the Demonstration and Assessment of Additionality”, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory

frame-work, investment climate, access to technology, access to financing, etc. Although the tool does not consider the Sectoral Scope 1: Energy industries (renewable-/non -renewable sources) projects amongst the measures that can make use of the common practice guideline version 02, we preferred to utilise the same guideline to demonstrate that within the boundaries of the Yeşilırmak catchment (see Figure 5 for the borders of the differentiated geographical region) there are no similar projects that are developed and operational without the assistance of the VER revenue.

According to the Guidelines on Common Practice (version 02), common practice analysis is presented through the following 4 steps.

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

As a hydropower project, the installed capacity is chosen as an appropriate proxy for "similar scale". The power generation capacity of 513 MW of the proposed project is selected as the design capacity. Therefore, the range from 256.5 MW to 769.5 MW is considered as applicable capacity.

Outcome of Step 1: Applicable output range is 256.5 MW to 769.5 MW

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

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

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

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

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

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

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity14.

The host country is geographically divided into 25 catchments as shown in the following figure (Figure 7). As can be seen from the figure the project site is located within the borders of the number 15 Kızılırmak Catchment. Kızılırmak and its major tributaries constitute the Kızılırmak River Catchment. Therefore we have considered the geographical boundary of our

common practice analysis as the Kızılırmak Catchment, and we have checked the hydropower plants that are operational, within the range defined in step 1 (256.5 MW to 769.5 MW) and located on the Kızılırmak River or over one of its tributaries. These are listed on Table 8.

Figure 7: The 25 Water Catchments areas identified in Turkey

Table 8: Power Plants that are operational on Yeşilırmak and Kelkit Rivers as of 11 April 2012 (as announced by the DSI as an answer to a question asked by a parliament member in the Turkish NationalAssembly[16]

Name of Facility	Ownership	Capacity	Province	DSI District	VER STATUS
Altınkaya HPP	EUAS	702.6	Samsun	07 Samsun	N/A
Boyabat HPP	Private	513	Sinop	07 Samsun	Project Activity

Outcome of Step 2:

There is only 1 project other than the project activity, and within the comparison range of the projectactivity.

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

Note their number N_{all}.

The above list covers the power plants within the geographical boundary defined above (as Kızılırmak River Catchment). Checking all the power plants within the capacity range

determined in Step 1, and looking projects that have started commercial operation before the start date of the project, and eliminating the ones that do claim VER credits, we end up with the following table (Table9):

Table 9 : The list of hydroelectric power plants that are identified to be counted in the N_{all} list.

Name of Facility	Ownership	Capacity	Province	DSI District	VER STATUS
Altınkaya HPP	EUAS	702.6	Samsun	07 Samsun	N/A

Therefore the number of Nall is 1. Nall=1

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

When we consider the project listed in Step 3, the projects differ from the project activity because it was developed by the government and was commissioned in 1988, when the investment climate and political climate was totally different.

Outcome of Common Practice tool Step 4 is Ndiff=1

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

F=1-Ndiff/Nall F=1-(1/1) F=0

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

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

Factor F is calculated to be 0 < 0.2. And,

Nall-Ndiff =1-1=0 <3 in that case the Boyabat HPP is not common practice.

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

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3.6 Methodology Deviations

Any methodology deviations have not been applied during this monitoring period and renewal.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The project includes the installation of a dam and hydroelectric power plant (HEPP) with an installed capacity of 528 MWm / 513 MWe on Kızılırmak River in Sinop city of Turkey. The purpose of the project activity is to generate electricity and supply it into the public grid. The project activity reduces greenhouse gas (GHG) emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources and it includes the installation of three vertical axis Francis turbines each having installed capacity of 176 MWm / 171 Mwe. On 27/11/2007 the Energy Market Regulatory Authority (EMRA) issued the Energy Generation License for the Boyabat HPP to Boyabat Elektrik.

The project entails a large reservoir of approximately 55 km length which is mostly inaccessible and only some roads enable access to the shore. According to the official volume-area diagram the maximum surface area is 65,4 km^2 and the minimum surface area is 47.5 km^2.

There is no operation of project activity during this monitoring period that affect GHG emission reductions/ removal and monitoring.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

For 1st Crediting Period:

According to the latest version (version 14.0.0) of ACM0002 and the tool to calculate the emission factor for electricity system, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 04.0.0 (EB 75, Annex 15)).

The Project therefore applies the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 04.0.0 (EB 75, Annex 15)).

Step 1 -Identify the relevant electricity systems

As the host country is not participating in the compliance markets hence does not have a DNA, a delineation of the project electricity system and connected electricity systems has not been published yet. For such cases, the tool suggests using the following criteria to determine the existence of significant transmission constraints:

1. "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." This criteria is not applicable as there is no spot electricity market in the host country.

2. "The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year": The transmission line operator (TEIAS) or any other official source has not published the capacity usage figures for the Turkish grid, hence this criterion can not be proved.

According to the tool, where the application of these criteria does not result in a clear grid boundary, a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial/ regional / national) shall be used. A provincial grid definition may indeed in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity. In other countries, the national (or other largest) grid definition should be used by default.

Therefore, for the case of the subject project activity "the project electricity system" and "the connected system" are same, and the Turkish National Grid is used as the "project electricity system". It is also confirmed by TEIAS that the Turkish grid is interconnected. There isn't any independent or regional grid system in any region of Turkey. The map of the Turkish Electricity Grid is given in the below figure (Figure 8)

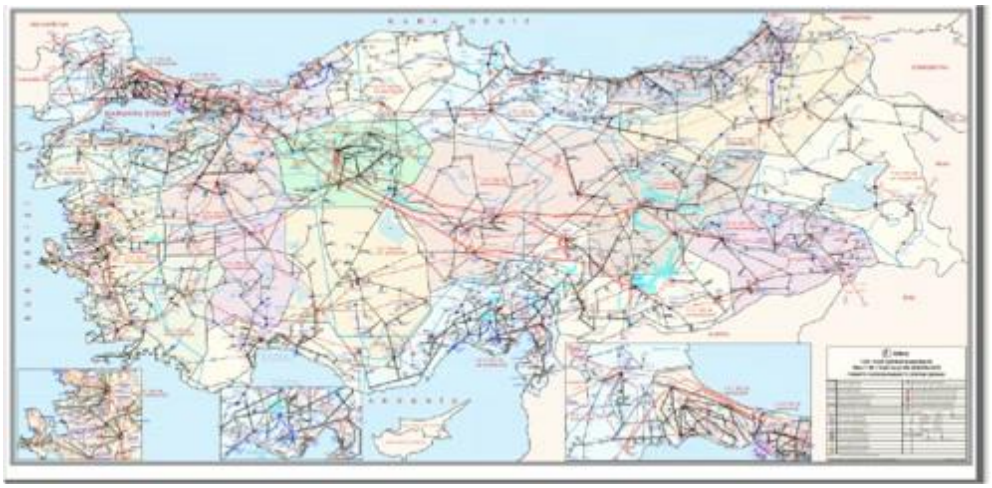


Figure 8: The Map showing the boundaries of Turkish Electricity Grid (Source Electricity Market Report 2010, by Electricity Market Regulatory Authority http://www.epdk.gov.tr/documents/10157/48dd12d4-74da-4dcf-9f48-86983146c0d8)

All the calculations details of which are given below are made for the entire Turkish Grid.

For the purpose of determining the operating margin emission factor, the tool directs us to use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 t CO2/MWh; or

(b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 section 6.4.1, if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or

(c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4 section 6.4.2 below; or

(d) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 section 6.4.4 below.

For imports from connected electricity systems located in Annex I country(ies), the emission factor is 0 tons CO2 per MWh.

And the tool also notes that the …"Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors."

In our case the host country (imports electricity mainly from Annex -1 countries, so the emission factor related to imports is considered to be zero"0".

Step 2 - Choose whether to include off-grid power plants in the project electricity system

The tool requires Project participants to choose between the following two options to calculate the operating margin and build margin emission factor

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

In our case, "Option I" has been selected for the calculation of grid emission factor, and only grid power plants are included in the calculation.

Step 3 – Select an operating margin (OM) method

According to the "Tool to calculate the emission factor for an electricity system", version 04.0.0 in calculating the Operating Margin grid emission factor for a given year y (EFgrid,OM, y), project developers have the option of selecting from four methods:

(a) Simple OM,

(b) Simple adjusted OM,

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As the share of "low cost/must run" resources are below 50% for the five most recent years (Table 10), therefore, in accordance with the Tool, (a) Simple OM method will be used in the calculations.

Table 10: Share of primary sources in electricity generation, 2008 – 2012

	2008	2009	2010	2011	2012
Thermal	82.72 %	80.5 %	73.78 %	74.82%	73.02%
Hydro	16.77 %	18.46 %	24.52 %	22.81%	24.16%
Wind & Geothermal	0.51 %	0.99 %	1.70 %	2.36%	2.82%
Total	100 %	100 %	100 %	100 %	100%

Since the Simple OM calculation (option (A)) is selected, the emission factor is calculated by the generation-weighted average emissions per electricity unit (tCO2/GWh), and averaged over the past three years of all generating sources serving the system, not including low-cost / must run power plants. The tool gives two options for the calculation of EFgrid, OM, y;

- Ex-ante option

A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VER-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period, or

- Ex-post option

The year in which the project activity displaces grid electricity, with the requirement that the emission factor be updated annually during monitoring.

For the calculation of the Simple OM, the "Ex-Ante" option is selected, at the time of PDD submission to the DOE, the data vintages that were most recent at the start of validation, belongs to

the years 2010, 2011 and 2012. All the data used in calculation of the Simple OM are taken from the TEIAS website, details of which are given below.

Step 4 - Calculate the operating margin emission factor according to the selected method

The Simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO2/MWh) for all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

- Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or

- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The following data are available from the Turkish Electricity Transmission Company (TEİAŞ) web site:

- Annual fuel consumption by fuel type ,

- Annual heating values for fuels consumed for electricity generation ,

- Annual electricity generation by fuel type, import and export

Taking into consideration the available data Simple OM method Option B is the applicable method for the project activity. Option A requires data on net electricity generation of each power plant / unit and a CO2 emission factor of each power unit, both of which are not publicly available, for the Turkish electricity grid.

$EF_{grid,OMsimple,y}$, using option B is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_{y,grid}}$$

Where;

$EF_{grid,\ OM\ simple,y}$ = Simple operating margin CO2 emission factor in year y (tCO2/MWh)

FCi,y = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

NCVi,y = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
EFCO2,i,y = CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

Step 5 - Calculate the build margin (BM) emission factor:

The tool indicates that, in terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

And ,

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used

We prefer the Option 1, calculating the Build Margin Emission factor, “ex ante”, for the first crediting period.

The sample group of power units m used to calculate the build margin are determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units) and determine their annual electricity generation (AEGSET-5-units, in MWh);

b) Determine the annual electricity generation of the project electricity system; excluding power units registered as CDM project activities (AEGtotal, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEGtotal (if 20% falls on part of the generation of a unit, the

generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEGSET-≥20%, in MWh);

c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SETsample); Identify the date when the power units in SETsample started to supply electricity to the grid. If none of the power units in SETsample started to supply electricity to the grid more than 10 years ago, then use SETsample to calculate the build margin.

According to the tool in terms of vintage of data, project participants can choose either the ex-ante option or the ex-post option. Between these two options, Option 1 is selected. For the first crediting period, the build margin emission factor is calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used. This option does not require monitoring the emission factor during the crediting period.

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EG_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where;

$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh) m = Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

According to the tool, the CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin. Taking into consideration the available data on the capacity additions, the formula given under Option A2 of the Simple OM option A is used to calculate $EF_{EL,m,y}$.

The CO_2 emissions from the most recent capacity additions are calculated by multiplying the $EF_{EL,m,y}$ values calculated for each fuel source by the annual generation of that fuel source (Table 18). The emission factor has been taken as "zero" for the renewable and wastes and the generation efficiencies for the thermal power plants type of which are not known are taken as 60% which is generation efficiency for the combined cycle natural gas power plants. The Build Margin Emission Factor for each year is calculated by dividing the total CO2 Emissions of the subject year by the total generation from the capacity additions of the same year.

The Build Margin Emission Factor of the grid is then calculated as an average for the years 2010 and 2011, as explained in the part where the actual calculations are shown, the assessed capacities added in these two years constitutes our SETsample.

Step 6 - Calculation of the combined margin emissions factor

Finally, the combined margin grid emission factor ($EF_{grid,CM,y}$) is expressed as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$):

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

Where:

$EF_{grid,BM,y}$ Build margin CO2 emission factor in year y (tCO2/MWh)

$EF_{grid,OM,y}$ Operating margin CO2 emission factor in year y (tCO2/MWh)

w_{OM} Weighting of operating margin emissions factor (%)

w_{BM} Weighting of build margin emissions factor (%)

w_{BM} Weighting of build margin emissions factor (%)

Where weights w_{OM} and w_{BM} are by default 0.50 and 0.50 according to the selected methodology. And EF_{OM} and EF_{BM} are calculated as described in the previous steps.

Then baseline emissions (BEy) are obtained as:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

BE_y = Baseline emissions in year y (tCO2/yr)

EG , = 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)

$EF_{grid,CM,y}$ = Combined margin CO2 emissions factor in year y (tCO2/MWh) And

$EG_{PJ,y} = EG_{facility,y}$

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant to the grid in year y (MWh/yr)

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

$$ER_y = BE_y - PE_y$$

Where:

ERy = Emission reductions in year y (tCO2)

BEy = Baseline emissions in year y (tCO2)

PE,y= Project Emissions in year y (tCO2)

According to details of registered PD,

*Operating Margin-OM: 0.68084 tCO_2/MWh
*Build Margin-BM: 0.34716 tCO_2/MWh

*Combined Margin-CM: 0.514 tCO_2/MWh

For 2nd Crediting Period:

For the emission factors, that were used to calculate estimated emission reductions, publication of Turkish Ministry of Energy and Natural Resources, which is indicating Turkey's National Electric Grid Emission Factor for the year of 2020 was used. Publication includes calculated Emission Factor values that are Operating Margin (OM), Growth Based Margin (Build Margin-BM) and Combined Margin (CM) Emission Factors, for the relevant year with usage of the CDM's Clean Development Methodology Tool 07-V07.0. For this calculation, information regarding used data set is given below in detail:

- TEİAŞ Turkey's electricity generation-consumption and loss statistics,
- Common prepared report under Turkey's National Greenhouse Gas Inventory Reporting Format. - Common Reporting Format (CRF) tables for electricity generation (1.A.1.a.i) emission values
- Chronological order of power generation plants from TEİAŞ Load Dispatch Department with commissioning dates, plant names, fuel types, installed power values, electricity generation for the calculated year

- Checking off Volunteers from the websites of Gold Standard (GS) and Verified Carbon Standard (VCS) for the ownership status of the carbon reduction certificate and,
- From Clean Development Mechanism (CDM) Tool 009- V2.0, Power plant efficiency figures are used

According to this publication,

Operating Margin-OM; 0.7424 tCO_2/MWh[14]

Build Margin-BM; 0.3680 tCO_2/MWh[15]

Combined Margin-CM (other renewables); 0.4616 tCO_2/MWh

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$BEy = EG_{PJ,y} \times EF_{grid,CM,y}$

Where:

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

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh).

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system". (tCO_2/MWh).

The project activity is the installation of a new grid-connected renewable power plant so, EGbaseline=0

If the project activity is the installation of a Greenfield power plant, then:

$EG_{PJ,y} = EG_{facility,y}$

Where:

14 https://enerji.gov.tr//Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/T%C3%BCrkiyeUlusalElektrik%C5%9EebekesiEmisyonFakt%C3%B6r%C3%BC/Belgeler/EK-2.pdf

15 https://enerji.gov.tr//Media/Dizin/EVCED/tr/%C3%87evreVe%C4%B0klim/%C4%B0klimDe%C4%9Fi%C5%9Fikli%C4%9Fi/T%C3%BCrkiyeUlusalElektrik%C5%9EebekesiEmisyonFakt%C3%B6r%C3%BC/Belgeler/EK-2.pdf

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr).

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

Calculation of the Operating Margin Emission Factor

By using all of the data which were given above, Turkish Ministry of Energy and Natural Resources calculated $EF_{grid,OMsimple,y}$:

➔ $EF_{grid,OMsimple,y} = 0.7424\ tCO_2/MWh$

Calculation of the Build Margin Emission Factor

For BM factor calculation, Chronological order of power generation plants from TEİAŞ Load Dispatch Department with commissioning dates, plant names, fuel types, installed power values, electricity generation for the calculated year were used as input data. Consequently, Turkish Ministry of Energy and Natural Resources calculated $EF_{grid,BM,y}$.

➔ $EF_{grid,BM,y} = 0.3680\ tCO_2/MWh$

Calculating of the Combined Margin Emission Factor

Emission factor calculations have been corrected with the relevant weighted calculations as stipulated by the methodology for the second crediting period. According to "Tool to calculate the emission factor for an electricity system" (Version 07), Article 86 clause (b), calculation of the combined margin for renewable energy projects (except wind and solar) second crediting period, the following values need to be used for wOM and wBM.

"All other projects [...] wOM = 0.25 and wBM = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool."

The data used to calculate the combined margin were published by Turkey's Energy and Natural Resources Ministry in September 2022. The data -which includes build margin and operating margin factors - have been obtained from the ministry's most recent factsheet. This document contains the latest available data in the country and is issued by the highest authority to make such calculations and determine the factors.

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

Then:

$BEy = EG_{facility,y} * EF_{grid,CM,y} = 1{,}370{,}000$ MWh/year * 0.4616 tCO_2/MWh = 632,392 tCO_2/year

Baseline scenario is identified and described in this section. Emission reductions due to project activity is calculated according to "Tool to calculate the emission factor for an electricity system" (Tool 07) version 07.0.

A brief explanation of this methodology is given in Tool as:

> This methodological tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "combined margin" emission factor (CM) of the electricity system.

5.2 Project Emissions

Project emission has been determined through ACM0002 Version 21, Section 5.4.3 The maximum reservoir area is observed to be 65,400,000 m^2 (see Annex 1 for details). Therefore, the power density calculates as follows 513,000,000 W /65,400,000 m^2=7.844 W/m^2.

Since power density (7.844 W/m2) is >4 W/m2 but < 10 W/m2 the project emissions need to be calculated.

The reservoir related project emissions can be calculated according to the following formula:[16]

$PE_{HP,y} = (EF_{Res} \text{ X } TEG_{y)} / 1000$

Where:

- $PE_{HP,y}$: Project emissions from water reservoirs (t CO2e/yr)

- EF_{Res}: Default emission factor for emissions from reservoirs of hydro power plants in year y (kg CO2e/MWh) (Which is 90 kg CO2e/MWh[17])

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

For detailed monthly basis project emission calculation of Boyabat HPP can be found ER excel of the project.

5.3 Leakage

No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

[16] https://cdm.unfccc.int/UserManagement/FileStorage/AG07ZJQ3EXD42LT5YV9HR16M8KINPO

[17] Default emission factor for emissions from reservoirs EB23

5.4 Estimated Net GHG Emission Reductions and Removals

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
29-November -2022 to 31-December-2022	57,175	11,945	0	45,230
2023	632,392	132,120	0	500,272
2024	632,392	132,120	0	500,272
2025	632,392	132,120	0	500,272
2026	632,392	132,120	0	500,272
2027	632,392	132,120	0	500,272
2028	632,392	132,120	0	500,272
2029	632,392	132,120	0	500,272
2030	632,392	132,120	0	500,272
2031	632,392	132,120	0	500,272
01/01/2032-28/11/2032	575,217	120,175	0	455,042
Total	**6,323,920**	**1,321,200**	**0**	**5,002,720**

6 MONITORING

6.1 Data and Parameters Available at Validation

Crediting Period 1:

Data / Parameter	$FC_{i,y}$
Data unit	Volume Unit (cubic meter)
Description	Amount of fuel i consumed by relevant power plants in Turkey in years, 2010, 2011, 2012.
Source of data	Official publications at the Turkish Electricity Transmission Company (TEIAŞ) Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/yakıt48-53/49.xls)
Value applied:	Please see Annex 2-Table-1 in PDD
Justification of choice of data or description of measurement methods and	Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

Birim(Unit):Ton/Gaz(gas) 10³ m³

			2010	2011	2012
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	Taşkömürü	*Hard Coal*	1,563,792	1,700,458	1,254,622
	Linyit	*Lignite*	50,123,941	54,558,282	48,859,540
	TOPLAM	*TOTAL*	**51,687,733**	**56,258,740**	**50,114,162**
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	16,864	27,098	28,127
		Yrd. Yakıt *Auxiliary Fuel*	105,073	118,439	139,239
		TOPLAM *TOTAL*	**121,937**	**145,537**	**167,366**
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	4	0	0
		Yrd. Yakıt *Auxiliary Fuel*	18,901	13,984	60,370
		TOPLAM *TOTAL*	**18,905**	**13,984**	**60,370**
	TOPLAM	*TOTAL*	**140,842**	**159,521**	**227,736**
	Doğal Gaz	*Natural Gas*	4,493,275	4,173,420	4,427,602
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	Fuel-Oil	*Fuel Oil*	0	0	0
	Motorin	*Diesel Oil*	0	0	0
	TOPLAM	*TOTAL*	**0**	**0**	**0**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	5,855,911	8,873,976	11,003,840
	Linyit	*Lignite*	6,565,451	6,949,028	6,882,923
	TOPLAM	*TOTAL*	**12,421,362**	**15,823,004**	**17,886,763**
	Fuel-Oil	*Fuel Oil*	769,845	386,071	397,430
	Motorin	*Diesel Oil*	1,449	1,063	116,009
	LPG	*LPG*	0	0	0
	Nafta	*Naphta*	13,140	0	0
	TOPLAM	*TOTAL*	**784,434**	**387,134**	**513,439**
	Doğal Gaz	*Natural Gas*	17,290,139	18,631,167	18,662,519
TÜRKİYE *TURKEY*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	7,419,703	10,574,434	12,258,462
	Linyit	*Lignite*	56,689,392	61,507,310	55,742,463
	TOPLAM	*TOTAL*	**64,109,095**	**72,081,744**	**68,000,925**
	Fuel-Oil	*Fuel Oil*	891,782	531,608	564,796
	Motorin	*Diesel Oil*	20,354	15,047	176,379
	LPG	*LPG*	0	0	0
	Nafta	*Naphta*	13,140	0	0
	TOPLAM	*TOTAL*	**925,276**	**546,655**	**741,175**
	Doğal Gaz	*Natural Gas*	**21,783,414**	**22,804,587**	**23,090,121**

procedures applied	
Purpose of Data	Data used for the calculation of EFgrid,OM,Simple,y
Comments	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/Mass or Volume Unit
Description	Net Calorific Values for fossil fuel type i in year, for the years 2010, 2011 and 2012
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 (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/ yakıt48-53/49.xls http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/yakıt48-53/51.xls)
Value applied:	Please see Annex-2-Table-5 in PDD

NET CALORIFIC VALUES OF FUELS CONSUMED IN THE THERMAL POWER PLANTS

Unit: TJ/KT

			2010	2011	2012
EÜAŞ VE BAĞLI ORTAKLIKLARI EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Taşkömürü	Hard Coal	13.36	13.57	13.56
	Linyit	Lignite	6.76	7.01	6.72
	TOPLAM	TOTAL	6.96	7.21	6.85
	Fuel-Oil Fuel Oil	Asıl Yakıt Main Fuel	40.30	40.27	40.00
		Yrd. Yakıt Auxiliary Fuel	40.19	40.19	40.19
		TOPLAM TOTAL	40.21	40.21	40.16
	Motorin Diesel Oil	Asıl Yakıt Main Fuel	1.00	0.00	0.00
		Yrd. Yakıt Auxiliary Fuel	43.12	43.17	43.11
		TOPLAM TOTAL	43.12	43.17	43.11
	TOPLAM	TOTAL	40.60	40.47	40.94
	Doğal Gaz	Natural Gas	34.81	34.73	34.72
MOBİL SANTRALLAR MOBILE POWER PLANTS	Fuel-Oil	Fuel Oil	0.00	0.00	0.00
	Motorin	Diesel Oil	0.00	0.00	0.00
	TOPLAM	TOTAL	0.00	0.00	0.00
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	24.71	24.56	25.57
	Linyit	Lignite	9.94	9.55	9.26
	TOPLAM	TOTAL	16.90	17.97	19.25
	Fuel-Oil	Fuel Oil	40.23	42.10	42.34
	Motorin	Diesel Oil	42.66	42.85	45.55
	LPG	LPG	1.00	0.00	0.00
	Nafta	Naphta	33.50	0.00	0.00
	TOPLAM	TOTAL	40.13	42.10	43.07
	Doğal Gaz	Natural Gas	38.05	37.63	37.48
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	22.32	22.79	24.34
	Linyit	Lignite	7.13	7.30	7.03
	TOPLAM	TOTAL	8.89	9.57	10.15
	Fuel-Oil	Fuel Oil	40.23	41.58	41.70
	Motorin	Diesel Oil	43.09	43.15	44.71
	LPG	LPG	0.00	0.00	0.00
	Nafta	Naphta	33.50	0.00	0.00
	TOPLAM	TOTAL	40.20	41.63	42.41
	Doğal Gaz	Natural Gas	37.38	37.10	36.95

Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y.}$
Comments	As data on the NCV is not published directly on the TEİAŞ website, this data is calculated using the heating values of fuels and the volume or mass of fuels consumed for each year

Data / Parameter	$EF_{CO2,i,y}$
Data unit	tCO2/GJ
Description	CO2 emission factor of fossil fuel type i in year y
Source of data	IPCC default values at the lower 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
Value applied:	Please see Annex 2-Table-2 in PDD.
Justification of choice of data or description of measurement methods and procedures applied	According to the "Tool to calculate the emission factor for an electricity system" version 04.0.0 , if values provided by the fuel supplier of the power plants in invoices or regional or national average defaults values are not available the IPCC default values at the lower limit of uncertainty must be used.
Purpose of Data	Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$
Comments	-

Fuel·Type:¤	EF·(tCO2/TJ)¤	Fuel·Type:¤	EF·(tCO2/TJ)¤
Coal¤	92.80¤	LPG¤	61.60¤
Lignite¤	90.90¤	Naphtha¤	69.30¤
Fuel·Oil¤	75.50¤	Natural·Gas¤	54.30¤
Diesel¤	72.60¤	Bitumen¤	73.00¤

Data / Parameter	EGy
Data unit	MWh

Description	Net electricity generated in the project electricity system in other words, net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y
Source of data	Turkish Electricity Transmission Company Web Site http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23- 47)/34(84-12).xls
Value applied:	Please see Annex 2-Table 3 and Table 4 in PDD.

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES
(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)

Birim(Unit): Tcal

			2010	2011	2012
EÜAŞ VE BAĞLI ORTAKLIKLARI	Taşkömürü	Hard Coal	4,990	5,511	4,062
	Linyit	Lignite	80,967	91,352	78,369
	TOPLAM	Total	85,957	96,863	82,431
	Fuel-Oil Fuel Oil	Asıl Yakıt Main Fuel	162	261	269
		Yrd. Yakıt Auxiliary Fuel	1,009	1,137	1,337
		TOPLAM TOTAL	1,171	1,398	1,605
EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Motorin Diesel Oil	Asıl Yakıt Main Fuel	0	0	0
		Yrd. Yakıt Auxiliary Fuel	195	144	622
		TOPLAM TOTAL	195	144	622
	TOPLAM	TOTAL	1,366	1,542	2,227
	Doğal Gaz	Natural Gas	37,354	34,621	36,773
	TOPLAM	TOTAL	124,676	133,026	121,431
MOBİL SANTRALLAR MOBIL POWER PLANTS	Fuel-Oil	Fuel Oil	0	0	0
	Motorin	Diesel Oil			
	TOPLAM	TOTAL	0	0	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	34,556	52,056	67,208
	Linyit	Lignite	15,584	15,857	15,218
	TOPLAM	Total	50,141	67,914	82,426
	Fuel-Oil	Fuel Oil	7,398	3,882	4,019
	Motorin	Diesel Oil	15	11	1,262
	Lpg	Lpg	0	0	0
	Nafta	Naphta	105	0	0
	TOPLAM	TOTAL	7,518	3,893	5,281
	Doğal Gaz	Natural Gas	157,134	167,443	166,993
	TOPLAM	TOTAL	207,275	235,357	249,419
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	39,546	57,567	71,270
	Linyit	Lignite	96,551	107,210	93,587
	TOPLAM	Total	136,097	164,777	164,857
	Fuel-Oil	Fuel Oil	8,569	5,280	5,625
	Motorin	Diesel Oil	209	155	1,884
	Lpg	Lpg	0	0	0
	Nafta	Naphta	105	0	0
	TOPLAM	TOTAL	8,884	5,435	7,508
	Doğal Gaz	Natural Gas	194,487	202,064	203,766
	TOPLAM	TOTAL	339,468	372,276	376,132

Bölüm Sonu (Sonraki Sayfa)

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES
(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)
1cal = 4,1868 Joule

Birim(Unit): Gjoule

			2010	2011	2012
EÜAŞ VE BAĞLI ORTAKLIKLARI	Taşkömürü	Hard Coal	20,892,383	23,074,208	17,008,733
	Linyit	Lignite	338,990,622	382,472,805	328,113,617
	TOPLAM	Total	359,883,005	405,547,013	345,122,349
	Fuel-Oil Fuel Oil	Asıl Yakıt Main Fuel	679,656	1,091,289	1,125,052
		Yrd. Yakıt Auxiliary Fuel	4,223,229	4,760,433	5,596,475
		TOPLAM TOTAL	4,902,885	5,851,723	6,721,526
EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Motorin Diesel Oil	Asıl Yakıt Main Fuel	159	0	0
		Yrd. Yakıt Auxiliary Fuel	815,082	603,737	2,602,536
		TOPLAM TOTAL	815,241	603,737	2,602,536
	TOPLAM	TOTAL	5,718,126	6,455,459	9,324,062
	Doğal Gaz	Natural Gas	156,392,061	144,950,365	153,961,954
	TOPLAM	TOTAL	521,993,192	556,952,838	508,408,366
MOBİL SANTRALLAR MOBIL POWER PLANTS	Fuel-Oil	Fuel Oil	0	0	0
	Motorin	Diesel Oil	0	0	0
	TOPLAM	TOTAL	0	0	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	144,680,890	217,948,438	281,385,144
	Linyit	Lignite	65,249,084	66,392,055	63,714,919
	TOPLAM	Total	209,929,975	284,340,493	345,100,063
	Fuel-Oil	Fuel Oil	30,974,336	16,254,037	16,828,236
	Motorin	Diesel Oil	61,818	45,552	5,283,909
	Lpg	Lpg	0	0	0
	Nafta	Naphta	440,154	0	0
	TOPLAM	TOTAL	31,476,308	16,299,589	22,112,145
	Doğal Gaz	Natural Gas	657,887,178	701,051,608	699,167,092
	TOPLAM	TOTAL	867,817,153	985,392,101	1,044,267,155
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	165,573,274	241,022,646	298,393,877
	Linyit	Lignite	404,239,706	448,864,860	391,828,536
	TOPLAM	Total	569,812,980	689,887,506	690,222,413
	Fuel-Oil	Fuel Oil	35,877,221	22,105,760	23,549,762
	Motorin	Diesel Oil	877,059	649,289	7,886,445
	Lpg	Lpg	0	0	0
	Nafta	Naphta	440,154	0	0
	TOPLAM	TOTAL	37,194,434	22,755,049	31,436,207
	Doğal Gaz	Natural Gas	814,279,239	846,001,974	853,129,046
	TOPLAM	TOTAL	1,421,286,653	1,558,644,529	1,574,787,666

Justification of choice of data or description of measureme	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.

nt methods and procedures applied	
Purpose of Data	Data used for the calculation of EFgrid,OM,Simple,y
Comments	-

Data / Parameter	$EG_{m,y}$
Data unit	MWh
Description	Net electricity generated and delivered to the grid by power unit m in year y
Source of data	Turkish Electricity Transmission Company Web Site (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 201027, 201128 and 201229
Value applied:	Please see Annex 2-Table 8 in PDD
Justification of choice of data or description of measurement methods and procedures applied	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Purpose of Data	Data used for the calculation of EFgrid,BM,y
Comments	-

Unit Name	Capacity (MW)	Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
Enerji Sa (Bandirma)	1,000.00	7,540.00	7,540.00	Private	Natural Gas	7-Oct-10
Uğur Enerji Ür. Tic.Ve San. A.Ş. (Ilave)	12.00	100.86	100.86	Private	Natural Gas	7-Oct-10
Ziyaret Res (Ziyaret Res Elek.)(Ilave)	22.50	0.00	0.00	Private	Wind	13-Oct-10
Kahta I Hes (Erdemyildiz Elek. Üret.)	7.12	0.00	0.00	Private	Hydro	14-Oct-10
Rotor Elektrik (Gökcedag Res) (Ilave)	2.50	0.00	0.00	Private	Wind	15-Oct-10
Azmak Ii Reg. Ve Hes (Düzeltme)	-18.07	0.00	0.00	Private	Hydro	25-Oct-10
Itc Adana Biokütle Sant. (Düzeltme)	0.00	0.00	0.00	Private	LFG	25-Oct-10
Enerji Sa (Bandirma) (Düzeltme)	-69.20	0.00	0.00	Private	Natural Gas	25-Oct-10
Uluabat Kuvvet Tüneli Ve Hes	48.51	0.00	0.00	Private	Hydro	27-Oct-10
Sahinuyu Ii Hes (Ang Enerji Elk.)	7.35	21.00	12.00	Private	Hydro	28-Oct-10
Eren Enerji Elektrik Ür. A.Ş. (Ilave)	600.00	4,005.88	4,005.88	Private	Coal	1-Nov-10
Burç Bendi Ve Hes (Akkur Enerji)	27.33	0.00	0.00	Private	Hydro	4-Nov-10
Karadeniz El (Uzundere-1 Hes)(Ilave)	31.08	82.44	46.46	Private	Hydro	7-Nov-10
Güzelcay-Ii Hes (Ik Elektrik Enerji)	4.96	26.33	14.70	Private	Hydro	11-Nov-10
Murgul Bakir (C.Kaya) (Ilave)	19.60	40.50	31.59	Private	Hydro	11-Nov-10
Kuyucak Res (Alize Enerji Üret.)	8.00	0.00	0.00	Private	Wind	11-Nov-10
Soma Res (Bilgin Wind San.)(Ilave)	30.00	0.00	0.00	Private	Wind	11-Nov-10
Uluabat Kuvvet Tüneli Ve Hes (Ilave)	48.51	0.00	0.00	Private	Hydro	25-Nov-10
Marmara Pamuklu Menyucat (Ilave)	26.19	203.45	203.45	Autoproducer	Natural Gas	25-Nov-10
Evtolaz Gida San.Ve Tic. A.Ş. (Ilave)	0.33	3.00	3.00	Autoproducer	Biogas	26-Nov-10
Egemen 1 Hes (Enersis Elektrik)	8.82	0.00	0.00	Private	Hydro	26-Nov-10
Readi̇ye 1 Hes (Turkon Mng Elekt.)	15.68	0.00	0.00	Private	Hydro	26-Nov-10
Aliağa Çakmaktepe Enerji (Ilave)	69.84	557.92	557.92	Private	Natural Gas	26-Nov-10
Yedigöze Hes (Yedigöze Elektrik)	155.33	474.00	268.00	Private	Hydro	2-Dec-10
Sönmez Enerji Üretim (Uşak) (Ilave)	2.56	19.77	19.77	Private	Natural Gas	7-Dec-10
AK-ENERJ (UŞAK OSB)(Uşak Ak En.)	-15.24	0.00	0.00	Private	Natural Gas	9-Dec-10
Ak-Enerji(Dg+N) (Deba-Denizli)	-15.60	0.00	0.00	Private	Natural Gas	9-Dec-10

Data / Parameter	$\eta_{m,y}$
Data unit	-
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	The default values provided at the Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 04.0.0)" are used
Value applied:	Please see Annex 1 of the "Tool to calculate emission factor for an electricity sector (Version 04.0.0)"
Justification of choice of data or description of measurement methods and procedures applied	According to the "tool to calculate emission factor for an electricity system if documented manufacturer's specifications or data from the utility, the dispatch centre or official records are not available then the default values given in Annex 1 of the tool shall be used. The first two options are not available for the power plants supplying the Turkish grid, therefore the default values are used.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	-

Grid power plant		
Generation technology	Old units (before and in 2000)	New units (after 2000)
Coal	-	-
Subcritical	37%	39%
Supercritical	-	45%
Ultra-supercritical	-	50%
IGCC	-	50%
FBS	35.5%	-
CFBS	36.5%	40%
PFBS	-	41.5%
Oil	-	-
Steam turbine	37.5%	39%
Open cycle	30%	39.5%
Combined cycle	46%	46%
Naural gas	-	-
Steam turbine	37.5%	37.5%
Open cycle	30%	39.5%
Combined cycle	46%	60%

Crediting Period 2:

Data / Parameter	**$EF_{grid,BM,y}$**
Data unit	tCO_2/MWh
Description	For the emission BM factor, that were used to calculate estimated emission reductions, publication of Turkish Ministry

	of Energy and Natural Resources which is indicating Turkey's National Electric Grid Emission Factor for the year of 2020 was used. Publication includes calculated Emission Factor values that are Operating Margin (OM), Growth Based Margin (Build Margin-BM) and Combined Margin (CM) Emission Factors, for the relevant year with usage of the CDM's Clean Development Methodology Tool 07-V07.0.
Source of data	Please see: https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru
Value applied:	0.3680
Justification of choice of data or description of measurement methods and procedures applied	Ministry of Energy and Natural Resources makes available the official data in Turkey. The latest data available during this document preparation was for 2020. Please see section 4.1 for further description of measurement methods.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	For the combined margin CO_2 emission factor that were used to calculate estimated emission reductions, publication of Turkish Ministry of Energy and Natural Resources which is indicating Turkey's National Electric Grid Emission Factor for the year of 2020 was used.
Source of data	Please see: https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru
Value applied:	0.7424
Justification of choice of data or description of measurement methods and procedures applied	The baseline emissions are the product of electrical energy baseline expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

	Please see section 4.1 for further description of measurement methods.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	For the combined margin CO_2 emission factor that were used to calculate estimated emission reductions, publication of Turkish Ministry of Energy and Natural Resources which is indicating Turkey's National Electric Grid Emission Factor for the year of 2020 was used.
Source of data	Please see: https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru
Value applied:	0.4616 (this value will be used for second crediting period)
Justification of choice of data or description of measurement methods and procedures applied	The baseline emissions are the product of electrical energy baseline expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor. Please see section 4.1 for further description of measurement methods.
Purpose of Data	Calculation of baseline emissions
Comments	-

6.2 Data and Parameters Monitored

For CP 1:

Data / Parameter	EF_{Res}
Data unit	kgCO2e/MWh
Description	Default emission factor for emissions from reservoirs
Source of data	Decision by EB 23

Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	Default value has been used.
Value applied:	90 kgCO2e/MWh
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculating Project emissions.
Calculation method	N/A
Comments	-

Data / Parameter	$EG_{PP\text{-self consumption, y}}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the Grid for self
Source of data	The Primary source of data will be the main TEIAS bi-directional meter readings recorded remotely on the main meter monthly protocols and accessible via the EPIAS web site/ The secondary source of data will be the back-up TEIAS bi-directional meters. But these are only recorded in case when the main meter malfunctions.
Description of measurement methods and procedures applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The internal consumption data is the sum of the amount of electricity recorded to be imported from the grid by these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid. The meter readings are accessible via an Automatic Meter Reading Software remotely by the project owner, via a software, and data is automatically recorded to the EPIAS servers to be obtained as monthly screen

	outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording	Recorded continuously, read remotely by TEIAS, and accessible monthly via the EPIAS web site , Reported annually on the Monitoring Report.
Value applied:	11,234.88 MWh
Monitoring equipment	As defined in the official TEIAS invoice the Meter Brand Type is ELSTER A1500 Main Electricity U1: ELSTER A 1500 Serial Number: 00452660 Main Electricity U2: ELSTER A 1500 Serial Number: 00452662 Main Electricity U3: ELSTER A 1500 Serial Number: 00452664Back-up Electricity U1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-2, the readings are not recorded or kept otherwise) Back-up Electricity U3:ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-3, the readings are not recorded or kept otherwise) The initial test of these meters performed by TEIAS on 03/12/2012. *The meters changed on 11-March-2021 with EMH brand meters. The new serial numbers are; Main Electricity U1:10013199 Main Electricity U2:10013201 Main Electricity U3:10013203 Back-up Electricity Electricity U1:10013200 Back-up Electricity Electricity U2:10013202 Back-up Electricity Electricity U3:10013204 New meters test report date is 11/03/2021

	All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class0,2S indicating an accuracy range of ±0.2%
QA/QC procedures applied	According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '[18] (Communiqué): '*The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained* ***"Type and System Approval" certificate from the Ministry of Trade and Industry.'*** Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters. Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'[19] (Regulation) of Ministry states that: ' *b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done* ***every 10 years****.'* Therefore, periodic calibration of the meters will be done every 10 years. Also, according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three-phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. EPİAŞ data is used as a main source, and cross-check is done by using the TEİAŞ receipts.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	Cap_{PJ}
Data unit	W

[18] Please see, https://www.epdk.gov.tr/Detay/DownloadDocument?id=+6B2PMv4N4A=

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

Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures applied	Determined via the turbine plates
Frequency of monitoring/recording	Yearly
Value applied:	N/A
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	N/A
Calculation method	N/A
Comments	N/A

Data / Parameter	$EG_{PP\text{-}GrossProduction,\ y}$
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the Grid, in year y
Source of data	The Primary source of data is the main TEIAS bi-directional meter readings recorded remotely on the main meter monthly protocols and accessible via the EPIAS web site. The secondary source of data will be the back-up TEIAS bi-directional meters. But these are only recorded incase when the main meter malfunctions.
Description of measurement methods and procedures applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The gross production data is the sum of the amount of electricity recorded to be exported to the grid via these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the gross and the net electricity supplied to the grid. The meter readings are accessible via an Automatic Meter Reading

	Software remotely by the project owner, via a software, and data is automatically recorded to the EPIAS servers to be obtained as monthly screen outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording	Recorded continuously, read remotely by TEIAS, and accessible monthly via the OSOS and EPIAS Records , Reported annually on the Monitoring Report.
Value applied:	12,86,967.88 MWh
Monitoring equipment	As defined in the official TEIAS invoice the Meter Brand Type is ELSTER A1500 Main Electricity U1: ELSTER A 1500 Serial Number: 00452660 Main Electricity U2: ELSTER A 1500 Serial Number: 00452662 Main Electricity U3: ELSTER A 1500 Serial Number: 00452664 Back-up Electricity U1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-2, the readings are not recorded or kept otherwise) Back-up Electricity U3:ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-3, the readings are not recorded or kept otherwise) The initial test of these meters performed by TEIAS on 03/12/2012. *The meters changed on 11-March-2021 with EMH brand meters. The new serial numbers are; Main Electricity U1:10013199 Main Electricity U2:10013201 Main Electricity U3:10013203 Back-up Electricity Electricity U1:10013200 Back-up Electricity Electricity U2:10013202 Back-up Electricity Electricity U3:10013204

	New meters test report date is 11/03/2021 All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class0.2s indicating an accuracy range of ±0.2%
QA/QC procedures applied	According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '[20] (Communiqué): '*The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained* ***"Type and System Approval" certificate from the Ministry of Trade and Industry.'*** Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters. Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'[21] (Regulation) of Ministry states that: ' *b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done* ***every 10 years****.'* Therefore, periodic calibration of the meters will be done every 10 years. Also, according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three-phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. EPİAŞ data is used as a main source, and cross-check is done by using the TEİAŞ receipts.
Purpose of data	To calculate project emissions
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	A_{PJ}

[20] Please see, https://www.epdk.gov.tr/Detay/DownloadDocument?id=+6B2PMv4N4A=

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

Data unit	m^2
Description	Area of the single 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 procedures applied	Indirectly determined using the Volume Area Depth curve presented in Annex-1. The Water level data is determined via the Water Level Measurement that consist of 5 transmitters for: - 1x Head Water - 3x Head Water after Trash Rack - 1x Tail Water Transmitter Type: - Rittmeyer MPB - Submersible Pressure Transmitter 4-20mA 2-wire[35] The measured depth is than recorded via the SCADA system, and presented as an excel sheet to the carbon consultant.
Frequency of monitoring/recording	Yearly
Value applied:	-
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	-
Calculation method	-
Comments	Maximum depth is considered to calculate the power density.

For CP 2:

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr

Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	The data from the Electricity Meters are the basis for the settlement notification of EPIAS. Data are gathered electronically from the meters by TEIAS and stored in secured website of EPIAS, which is accessible to project developer with a private password. For monitoring, the monthly settlement notification of EPIAS shall be used as source of data.
Description of measurement methods and procedures applied	Regarding the electricity meters: two meters are placed (one main and one reserve) at the TEIAS substation. These meters are sealed by TEIAS and intervention by project proponent is not possible. The fact that two meters are installed in a redundant manner keeps the uncertainty level of the only parameter for baseline calculation low. High data quality of this parameter is in the interest of not only the emission reduction monitoring, but also paramount for the business relation between the plant operator and the electricity buyers.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement, and at least monthly recording
Value applied:	1,370,000 MWh/year
Monitoring equipment	As defined in the official TEIAS invoice the Meter Brand Type is ELSTER A1500 Main Electricity U1: ELSTER A 1500 Serial Number: 00452660 Main Electricity U2: ELSTER A 1500 Serial Number: 00452662 Main Electricity U3: ELSTER A 1500 Serial Number: 00452664 Back-up Electricity U1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-2, the readings are not recorded or kept otherwise) Back-up Electricity U3:ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-3, the readings are not recorded or kept otherwise) The initial test of these meters performed by TEIAS on 03/12/2012.

	*The meters changed on 11/03/2021 with EMH brand meters. The new serial numbers are; Main Electricity Meter U1:10013199 Main Electricity Meter U2:10013201 Main Electricity Meter U3:10013203 Back-up Electricity: Meter U1:10013200 Back-up Electricity Meter U2:10013202 Back-up Electricity Meter U3:10013204 First index date of these meters are on 11/03/2021 All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class0.5S indicating an accuracy range of ±0.5%
QA/QC procedures applied	According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '[22] (Communiqué): '*The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained **"Type and System Approval" certificate from the Ministry of Trade and Industry.'*** Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters. Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'[23] (Regulation) of Ministry states that: ' *b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done **every 10 years**.'* Therefore, periodic calibration of the meters will be done every 10 years. Also, according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three-phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. EPİAŞ data is used as a main source, and cross-check is done by using the TEİAŞ receipts.

[22] Please see, https://www.epdk.gov.tr/Detay/DownloadDocument?id=+6B2PMv4N4A=

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

Purpose of data	To exhibit renewable electricity generation performance the plant.
Calculation method	Regarding the electricity meters: two meters are placed (one main and one reserve) at the Boyabat HPP which meters the electricity transferred to TEİAŞ substation. These meters are sealed by TEIAS and intervention by project proponent is not possible. The fact that two meters are installed in a redundant manner keeps the uncertainty level of the only parameter for baseline calculation low. High data quality of this parameter is not only in the interest of the emission reduction monitoring, but paramount for the business relation between the plant operator and the electricity buyers. Measured hourly and readings monthly. Monthly settlement notifications of EPİAŞ consist hourly electricity production and withdrawn from the grid. Since the meters are reading electricity supplied to the system and withdrawn from the system separately, the net electricity amount supplied to the grid is calculated by electricity supplied minus electricity withdrawn which is be taken from monthly settlement notifications. Thus, with this procedure is monitored sufficient and no extra Monitoring has to be implemented.
Comments	-

Data / Parameter	EF_{Res}
Data unit	kgCO2e/MWh
Description	Default emission factor for emissions from reservoirs
Source of data	Decision by EB 23
Description of measurement methods and procedures applied	Default value has been used.
Frequency of monitoring/recording	Default value has been used.
Value applied:	90 kg CO2e/MWh
Monitoring equipment	N/A

QA/QC procedures applied	N/A
Purpose of data	Calculating Project emissions.
Calculation method	N/A
Comments	-

Data / Parameter	$EG_{PP\text{-}GrossProduction,\ y}$
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the Grid, in year y
Source of data	EPIAS records have been used for EG and ER calculations. The source for the cross-check of the amount of produced electricity is TEIAS receipts for each month.
Description of measurement methods and procedures applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The gross production data is the sum of the amount of electricity recorded to be exported to the grid via these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the gross and the net electricity supplied to the grid. The meter readings are accessible via an Automatic Meter Reading Software remotely by the project owner, via a software, and data is automatically recorded to the EPIAS servers to be obtained as monthly screen outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording	Recorded continuously, read remotely by TEIAS, and accessible monthly via the OSOS and EPIAS Records , Reported annually on the Monitoring Report.
Value applied:	1,370,000 MWh/y
Monitoring equipment	As defined in the official TEIAS invoice the Meter Brand Type is ELSTER A1500 Main Electricity U1: ELSTER A 1500 Serial Number: 00452660 Main Electricity U2: ELSTER A 1500 Serial Number: 00452662

	Main Electricity U3: ELSTER A 1500 Serial Number: 00452664 Back-up Electricity U1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-2, the readings are not recorded or kept otherwise) Back-up Electricity U3: ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-3, the readings are not recorded or kept otherwise) The initial test of these meters performed by TEIAS on 03-December -2012. *The meters changed on 11-March -2021 with EMH brand meters. The new serial numbers are; Main Electricity U1:10013199 Main Electricity U2:10013201 Main Electricity U3:10013203 Back-up Electricity Meter U1:10013200 Back-up Electricity Meter U2:10013202 Back-up Electricity Meter U3:10013204 New meters test report date is 11/03/2021 All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class0.2S indicating an accuracy range of ±0.2%
QA/QC procedures applied	According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '24 (Communiqué): 'The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained "Type and System Approval" certificate from the Ministry of Trade and Industry.' Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters.

[24] Please see, https://www.epdk.gov.tr/Detay/DownloadDocument?id=+6B2PMv4N4A=

	Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'25 (Regulation) of Ministry states that: ‘ b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done every 10 years.’ Therefore, periodic calibration of the meters will be done every 10 years. Also, according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three-phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. EPİAŞ data is used as a main source, and cross-check is done by using the TEİAŞ receipts.
Purpose of data	To calculate project emissions
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	$EG_{PP\text{-self consumption, y}}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the Grid for self consumption in year y
Source of data	EPIAS records have been used for EG and ER calculations. The source for the cross-check of the amount of produced electricity is TEIAS receipts for each month.
Description of measurement methods and procedures applied	Measurements are to be made by electricity meters that belong to the grid operator, TEIAŞ. There are three meters that record the electricity coming over three different lines identified as U1 ANA, U2 Ana and U3 Ana. The internal consumption data is the sum of the amount of electricity recorded to be imported from the grid by these three main meters. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid. The

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

	meter readings are accessible via an Automatic Meter Reading Software remotely by the project owner, via a software, and data is automatically recorded to the EPIAS servers to be obtained as monthly screen outputs. Only the main meter readings are accessible but there are back up meters to ensure data recording in case of main meter failure.
Frequency of monitoring/recording	Recorded continuously, read remotely by TEIAS, and accessible monthly via the EPIAS web site , Reported annually on the Monitoring Report.
Value applied:	Estimated Gross electricity generation: 1,468,000 MWh/y Estimated Net electricity generation: 1,370,000 MWh/y **Estimated Quantity of electricity imported by the power plant from the Grid=98,000 MWh/y**
Monitoring equipment	As defined in the official TEIAS invoice the Meter Brand Type is ELSTER A1500 Main Electricity U1: ELSTER A 1500 Serial Number: 00452660 Main Electricity U2: ELSTER A 1500 Serial Number: 00452662 Main Electricity U3: ELSTER A 1500 Serial Number: 00452664Back-up Electricity U1: ELSTER A 1500 Serial Number: 00452661 (data is only obtained if there is a failure in the main meter-1, the readings are not recorded or kept otherwise) Back-up Electricity U2: ELSTER A 1500 Serial Number: 00452663 (data is only obtained if there is a failure in the main meter-2, the readings are not recorded or kept otherwise) Back-up Electricity U3: ELSTER A 1500 Serial Number: 00452665 (data is only obtained if there is a failure in the main meter-3, the readings are not recorded or kept otherwise) The initial test of these meters performed by TEIAS on 03/12/2012. *The meters changed on 11/03/2021 with EMH brand meters. The new serial numbers are; Main Electricity U1:10013199 Main Electricity U2:10013201 Main Electricity U3:10013203

	Back-up Electricity Electricity U1:10013200 Back-up Electricity Electricity U2:10013202 Back-up Electricity Electricity U3:10013204 New meters test report date is 11/03/2021 All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class0,2S indicating an accuracy range of ±0.2%
QA/QC procedures applied	According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '[26] (Communiqué): '*The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained* ***"Type and System Approval" certificate from the Ministry of Trade and Industry.'*** Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters. Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'[27] (Regulation) of Ministry states that: ' *b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done* ***every 10 years****.'* Therefore, periodic calibration of the meters will be done every 10 years. Also, according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three-phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. EPİAŞ data is used as a main source, and cross-check is done by using the TEİAŞ receipts.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

[26] Please see, https://www.epdk.gov.tr/Detay/DownloadDocument?id=+6B2PMv4N4A=

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

Data / Parameter	A_{PJ}
Data unit	m^2
Description	Area of the single 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 procedures applied	Indirectly determined using the Volume Area Depth curve presented in Annex-1. The Water level data is determined via the Water Level Measurement that consist of 5 transmitters for: - 1x Head Water - 3x Head Water after Trash Rack - 1x Tail Water Transmitter Type: - Rittmeyer MPB - Submersible Pressure Transmitter 4-20mA 2-wire The measured depth is than recorded via the SCADA system, and presented as an excel sheet to the carbon consultant.
Frequency of monitoring/recording	Yearly
Value applied:	65,400,000 m^2 [28]
Monitoring equipment	Pressure transmitter
QA/QC procedures applied	-
Purpose of data	To calculate project emissions
Calculation method	-
Comments	Maximum depth is considered to calculate the power density.

[28] Registered PD and verification process documents

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	Generation License
Description of measurement methods and procedures applied	N/A
Frequency of monitoring/recording	
Value applied:	513,000,000 We / 528,000,000 Wm
Monitoring equipment	N/A
QA/QC procedures applied	N/A
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

6.3 Monitoring Plan

The monitoring plan mainly involves proper preparation of a spreadsheet and reporting of it. Monitoring carried out with the help of a spreadsheet and supporting documentation. All data used for the monitoring plan archived electronically and backed up regularly. These data kept for the full crediting period and a further two years after the end of the crediting period or the last issuance of carbon credits, whichever occurs later.

According to the Turkish Law and Regulations, the methods of monitoring the net electricity fed to the grid and quality control and assures are explained below:

Monitoring data is collected in accordance with the agreement done between the project owner and Turkish Electricity Distribution Company which provides the infrastructure for the connection to the national grid.

Connection Agreement has signed on 20/05/2019 with TEIAS Electricity Authorised Distribution Company. System usage agreement has signed on 05/04/2019 with TEİAŞ. The metering system

is defined in the agreement as two groups: main meter and back-up meter. The design of the metering system is checked and approved by TEIAS before commissioning of the plant. The technical specifications of the power meters should be in line with Measure and Metering Devices Regulation by Ministry of Industry and Trade. In addition, the Communiqué for Power Meters announced by Energy Market Regulations Authority (EMRA) requires all meters to be in line with either Turkish Standards Institution or International Electrotechnical Commissions Standards. The meters are placed at the point the electricity is fed to the grid and sealed on behalf of the both parties. This prevents any intervention and assures the accuracy and quality of the measurements. All requirements and specifications of the meters done according to Communique on the counter to be used in the Electricity Market by Energy Market Regulatory Authority on 22.04.2011.

There is not any specific internal auditing and non-conformities procedures regarding to VCS verification or validation. Test and calibration of the meters is under TEIAS responsibility.

Each project activity has a certain amount of self-electricity consumption. Similar to energy generation, energy consumption is also recorded and accounted for the invoicing. The electricity consumption of the project mostly be covered by the Project's own electricity generation and the remaining power is the one which is measured and fed to the transmission line. In cases when the Project's own power generation is not high enough to cover its own consumption, electricity from the grid is used. This usage is measured also by the two measurement devices.

Data is stored electronically, during the crediting period and at least two years after the last issuance of credits for the project activity in the concerning crediting period. The Project Participant is responsible for storage of data received from the measuring devices.

The water level at the reservoir lake is monitored to directly calculate the reservoir area. The reservoir area value is then used to check if the power density of the project activity is greater than 4 m^2/W. After measuring the water level the data is recorded at every 15 minutes, and sampled daily. At the end of each monitoring period the maximum water level is obtained from the recorded data, and that number is utilized to calculate maximum aerial extent of the reservoir lake as shown in Annex1.

Further Explanation about Measuring the Water Level::

The water level is measured via pressure gauges. The features of the pressure gauges are as follows:

Features:

- Two Wire technique
- Piezoresistive sensing element
- Output signal 4-20 mA
- Pressure type Gauge, Absolute
- Accuracy ±0.1 % FS
- Calibration in bar / psi / mWC

- Standard DIN measuring ranges between 0 ...100 mbar and 0 ...25 bar or selection of measuring ranges in psi or mWC
- Adjustable within 1 : 4 of the nominal pressure range
- Temperature compensated within -10°C ... +50°C [+14°F ... +122°F] or -25°C ... +85°C [-13°F ... +185°F

Electricity generation data for the November of 2022 has been specified with ratio of 28 days to whole month (30 days) for the monitoring period in the first crediting period because the last day of monitoring period is 28 November 2022. This way is valid for both EPIAS data (main data) and TEIAS data (crosscheck data).

Single line diagram of Boyabat HPP can be seen in below Figure.

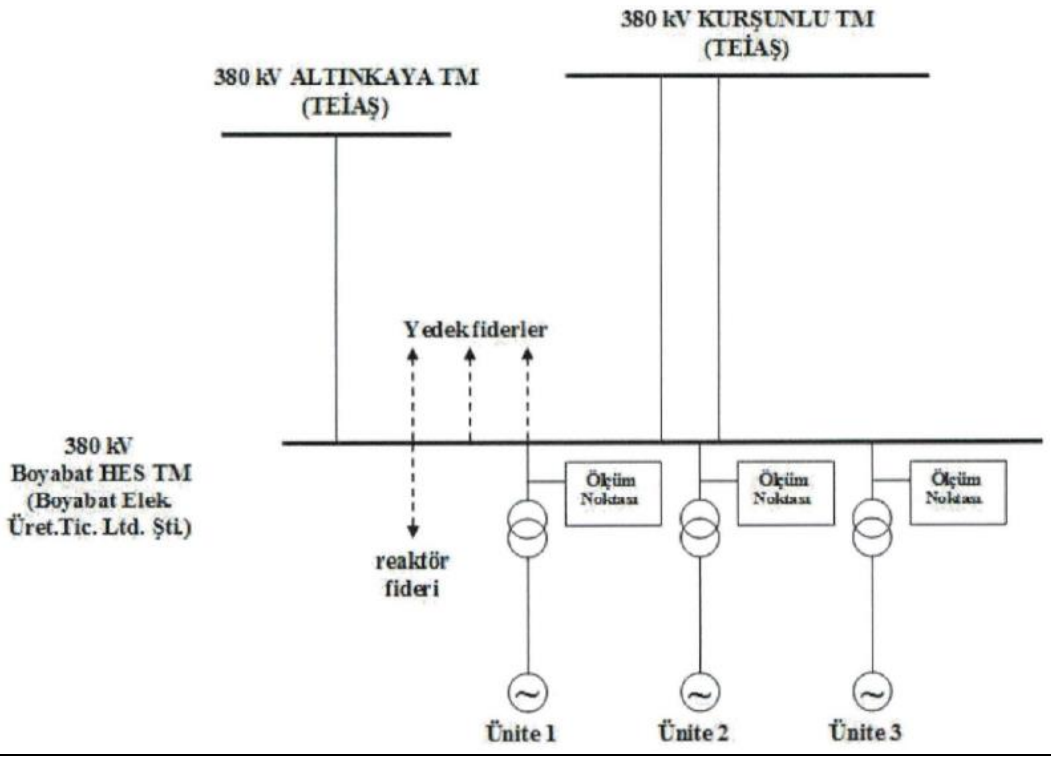


Figure 5 Line diagram of Boyabat HEPP

Objectives of the monitoring program

The Monitoring plan is developed to ensure that the Project Activity is well organized from the start in terms of the collection and archiving of complete and reliable data that is needed to ensure reliable and accurate measurements of actual emission reductions.

Who will be performing the monitoring

The monitoring will be conducted by the Verified Emission Reduction (VER) Monitoring Team. The VER Team Members, and their position and duties for the monitoring is outlined in the following table.

Table 6 Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Boyabat HPP Manager	Day to day operation of the Boyabat HPP, Compliance of the project activity with the host country rulesand regulations Coordination of the data collection and recording for the monitoring report.
Chief Electrical Technician	Day to day follow up of electrical equipment Recording and monitoring of the electricity generation data viathe meters located at the Boyabat SwitchYard Making regular checks of the consistency of the back up meters to ensure the operation of the main meters. Preparation and update of BOYABAT HPP_Operation Reports
Accounts Manager	Data keeping for power sales Extracting the main meter readings (main meter monthly protocols) from the EPIAS website with the help of the account credentials assigned to the project owner.
Chief Mechanical Technician	Day to day operation of the power plant Keeping records of malfunctions and repairs
Carbon Consultant	Emission reduction calculations Scripting of the periodic monitoring report Follow up of the verification process

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

For CP 1:

Data / Parameter	EF_{Res}
Data unit	kgCO2e/MWh
Description	Default emission factor for emissions from reservoirs
Value applied:	90 kgCO2e/MWh

Comments	-

Data / Parameter	$EG_{PP\text{-}self\ consumption,\ y}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the Grid for self
Value applied:	11,234.88 MWh

Vintage		Electricity consumption from the grid (MWh)
01-May-2020	31-December-2020	3,136
01-January-2021	31-December-2021	4,262
01- January-2022	28-Novermber-2022	3,836
Total		**11,234**

Comments	-

Data / Parameter	Cap_{PJ}
Data unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Value applied:	N/A
Comments	N/A

Data / Parameter	$EG_{PP\text{-}GrossProduction,\ y}$
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the Grid, in year y
Value applied:	**12,86,967.88 MWh**

Vintage		Electricity supplied to the grid (MWh)
01-May-2020	31-December-2020	378,602.48

	01-January-2021	31-December-2021	562,233.73
	01-January-2022	28-November-2022	346,131.67
	Total		**12,86,967.88**
Comments	-		

Data / Parameter	A_{PJ}
Data unit	m^2
Description	Area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Value applied:	-
Comments	Maximum depth is considered to calculate the power density.

There haven't been any change on project's design and characteristics. However, the other entity involved in the project as carbon consultant was Ekobil Environmental Services and Consulting Ltd. in the project description and it's been changed as Rüzgar Danışmanlık Ltd. Şti. at the time of this verification process as indicated in the monitoring report. Re Carbon Ltd. hereby confirms that the change in the other entity involved in the project as carbon consultant has no impact on the project to be in compliance with the VCS rules and requirements and has no impact on the applicability of the methodology, additionality and the appropriateness of the baseline scenario. Carbon consultant is Life İklim ve Enerji LTD. ŞTI. during third verification and revalidation process of the project Secondly, all data in emission reductions table are checked with EPİAŞ records as the main source and crosschecked with TEAIS meter reading protocol (OSOS) records. The main source of data has been defined as PMUM records during the initial monitoring period but PMUM has been replaced by EPIAS system as of 01/09/2015 in Turkey as confirmed by the local knowledge of the verification team and Re Carbon Ltd. hereby confirms that this change has no impact on the applicability of the methodology, additionality and the appropriateness of the baseline scenario. Finally, $EG_{PP\text{-}selfconsumptionTEDAŞ,y}$ parameter hasn't been monitored seperately in this monitoring period because this consumption is measured along with currently available three main and three back-up meters instead of the electricity meter with serial number 60023357 available during the initial verification process. Re Carbon Ltd. hereby confirms that the change in the monitoring practices of $EG_{PP\text{-}selfconsumptionTEDAŞ,y}$ parameter has no impact on the project to be in compliance with the VCS rules and requirements and has no impact on the applicability of the methodology, additionality and the appropriateness of the baseline scenario.

Above mentioned deviation was approved by VVB during previous verification of Monitoring period i.e., 01 August 2014 and 30 April 2020. The above permanent changes does not have any impact on project design, baseline, scale of project, additionally & monitoring practices as at site except common metering

7.2 Baseline Emissions

Used Formulas:

The total emission reductions can be calculated with the results of the below described equations. The emission reduction is equal to the baseline emissions minus project emissions and leakage emissions. Leakage emissions in this project are negligible. There are no project emissions in this kind of project. The general equation is as follows:

Emission reductions

Baseline emissions are calculated as per ACM0002 Version 21 formula 1:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (1)$$

Where:

BE_y : Baseline emissions in year y (tCO_2/yr).

$EG_{PJ,y}$: Quantitity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$: Combined margin CO_2 emission factor for grid connected power generation in year y and validated value tCO_2/MWh.

Because the Project is a greenfield renewable energy power plant;

$EG_{PJ,y} = EG_{facility,y}$

Emission reductions achieved by the project activity are calculated as per formula 2 of ACM0002.:

$$ER_y = BE_y - PE_y \quad (2)$$

Where:

ER_y : Emission reductions in year y (tCO_2/yr).

BE_y : Baseline emissions in year y (tCO_2/yr).

PE_y : Project emissions in year y (tCO_2/yr); validated value = 0.

$$BEy = EG_{facility,y} * EF_{grid,CM,y} = 1{,}286{,}967 \text{ MWh} * 0.514 \text{ } tCO_2/MWh = 661{,}501 \text{ } tCO_2$$

0.514 tCO_2/MWh is the emission factor of the first crediting period. Since this monitoring period belongs to the first crediting period, this emission factor is used in this section when calculation of emission reduction.

7.3 Project Emissions

Project emission has been determined through ACM0002 Version 21 Section 5.4.3 During this monitoring period the maximum reservoir area is observed to be 65,400,000 m^2 (see Annex 1 for details). Therefore, the power density calculates as follows 513,000,000 W /65,400,000 m^2=7.844 W/m^2.

Since power density (7.844 W/m2) is >4 W/m2 but < 10 W/m2 the project emissions need to be calculated.

The reservoir related project emissions can be calculated according to the following formula:[29]

$PE_{HP,y}$= (EF_{Res} X TEGy) / 1000

Where:

- $PE_{HP,y}$: Project emissions from water reservoirs (t CO2e/yr)

- EF_{Res}: Default emission factor for emissions from reservoirs of hydro power plants in year y (kg CO2e/MWh) (Which is 90 kg CO2e/MWh[30])

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

Total Project emissions= (90 X 1,298,203) / 1000 =116,838 t CO2e

For detailed monthly basis project emission calculation of Boyabat HPP can be found ER excel of the project.

7.4 Leakage

No leakage needs to be considered.

7.5 Net GHG Emission Reductions and Removals

Emission reductions achieved by the project activity are calculated as per formula of ACM0002 Version 20:

$$ER_y = BE_y - PE_y$$

Where:

ER_y : Emission reductions in year y (tCO_2/yr).

BE_y : Baseline emissions in year y (tCO_2/yr).

PE_y : Project emissions in year y (tCO_2/yr); validated value

$$BEy = EG_{facility,y} * EF_{grid,CM,y}$$

[29] https://cdm.unfccc.int/UserManagement/FileStorage/AG07ZJQ3EXD42LT5YV9HR16M8KINPO

[30] Default emission factor for emissions from reservoirs EB23

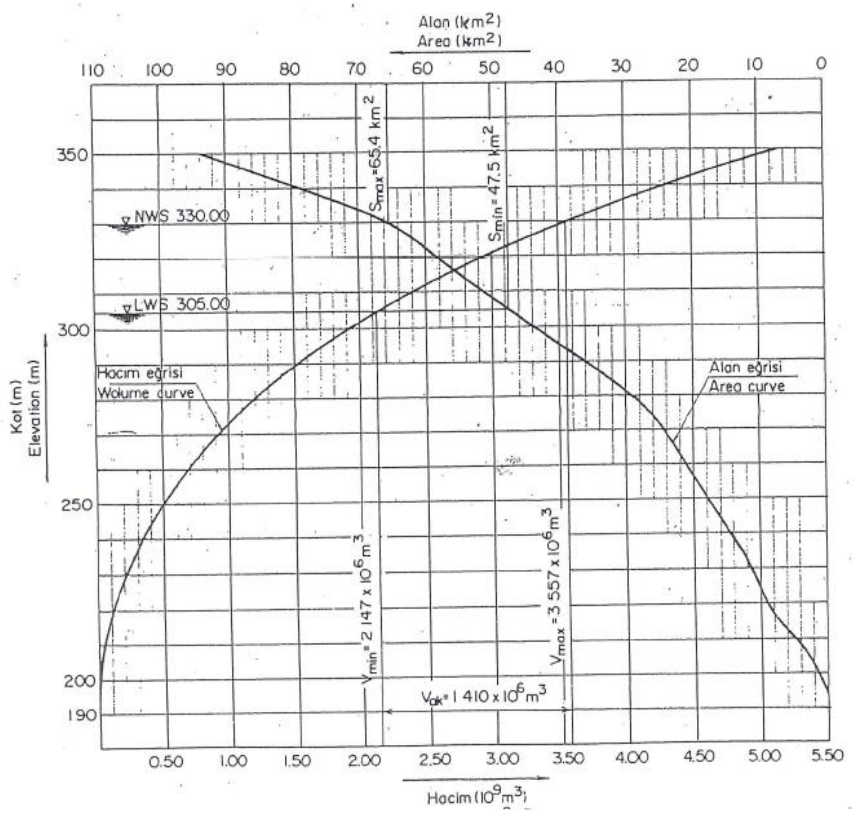
With an actual annual project electricity generation of amounts which was given in the Appendix 1 of this report, and $EF_{grid,CM,y}$ given as 0.514 tCO_2/MWh[31] , net GHG emission reductions/removals are:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2020 (01-May-2020—31-December 2020)	194,601	34,357	0.00	160,244
2021 (01 January 2021-31 December 2021)	288,988	50,985	0.00	238,003
2022 (01 January 2022—28-November 2022)	177,911	31,498	0.00	146,413
Total	**661,501**	**116,840**	**0.00**	**544,660**

Ex-ante emissions reductions /removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
389,907	160,244	58%	This is caused through seasonal conditions. (Amount of rainfall)
580,882	238,003	59%	This is caused through seasonal conditions. (Amount of rainfall)
528,364	146,413	72%	This is caused through seasonal conditions. (Amount of rainfall)

[31] 0.514 tCO_2/MWh is the emission factor of the first crediting period. Since this monitoring period belongs to the first crediting period, this emission factor is used in this section when calculation of emission reduction.

APPENDIX 1: RESERVOIR AREA



Kot E.L. (m)	Hacim Capacity (10^6 m^3)	Alan Area (km^2)
194	–	.0
200	4	1.5
210	36	4.7
220	104	9.0
230	208	11.6
240	339	14.6
250	500.	17.7
260	694	21.1
270	922	24.4
280	1 190	29.2
290	1 517	36.3
300	1 918	43.8
310	2 393	51.2
320	2 940	58.2
330	3 557	65.4
340	4 277	78.6
350	5 137	93.4

APPENDIX 2: THE LEGAL FRAMEWORK OF THE HOST COUNTRY THAT BINDS THE PROJECT ACTIVITY

Turkish Environmental Legislation

The Environmental Law (No. 2872), which was published in Turkish Official Gazette No. 18132 dated August 11, 1983 and revised in Turkish Official Gazette No. 26167 dated May 13, 2006 (Law No. 5491) provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre- operation phases. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations. Those that pertain to development and operation of renewable energy projects are the following:

- Environmental Impact Assessment Regulation, Official Gazette No. 26939 dated July 17, 2008.
- Water Pollution Control Regulation, Official Gazette No. 25687 dated December 31, 2004 and revised in Official Gazette No. 26786 dated February 13, 2008;
- Regulation on Construction of Cesspits where there is no Wastewater Collection System, Official Gazette No. 13783 dated March 13, 1971;
- Hazardous Chemicals Regulation, Official Gazette No.21634 dated July 11, 1993 and revised in Official Gazette No. 27092 dated December 26, 2008;
- Regulation on General Principles of Waste Management, Official Gazette No. 26927 dated July 5, 2008;
- Hazardous Wastes Control Regulation, Official Gazette No. 25755 dated March 14, 2005;
- Waste Oil Control Regulation, Official Gazette No. 26952 dated July 30, 2008 and revised Official Gazette No. 27304 dated July 31, 2009;
- Vegetative Waste Oil Control Regulation, Official Gazette No. 25791 dated April 19, 2005; and revised Official Gazette No. 27305 dated July 31, 2009
- Solid Waste Control Regulation, Official Gazette No. 20814 dated March 14, 1991 and revised in Official Gazette No. 25777 dated April 5, 2005;
- Medical Waste Control Regulation, Official Gazette No. 25883 dated July 22, 2005;
- Environmental Audit Regulation, Official Gazette No. 27061 dated November 21, 2008;

- Packaging Waste Control Regulation, Official Gazette No. 26562 dated June 24, 2007 and revised in Official Gazette No. 27046 dated November 6, 2008; and

- Waste Batteries and Accumulators Control Regulation, Official Gazette No. 25569 dated August 31, 2004 and revised in Official Gazette No. 25744 dated March 03, 2005;

- The Excavation, Construction and Demolition Waste Control Regulation, Official Gazette No. 25406 dated March 18, 2004;

- Soil Pollution Control Regulation, Official Gazette No. 25831 dated May 31, 2005;

- Regulation Related to Workplace Opening and Operation Permits, Official Gazette No. 25902 dated August 10, 2005 and revised in Official Gazette No. 26492 dated April 13, 2007;

- Industrial Air Pollution Control Regulation, Official Gazette No.27277 dated July 3, 2009

- Air Quality Assessment and Management Regulation, Official Gazette No. 26898 dated June 6, 2008 and revised in Official Gazette No. 27219 and dated May 5, 2009;

- Air Pollution Control Regulation For Heating Sources, Official Gazette No. 25699 dated January 13, 2005 and revised in Official Gazette No. 27134 dated February 07, 2009;

- Exhaust Gases Emission Control Regulation, Official Gazette No. 27190 dated April 04, 2009; and

- Regulation on Protection of Wetlands, Official Gazette No. 25818 dated May 17, 2005.

- In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the proposed project. The project will comply with the 4857 numbered Labour Law and its regulations stated below:

- Occupational Health and Safety Statute, Official Gazette No. 14765 dated April 11, 1974;

- Health and Safety Regulation for Construction Works, Official Gazette No. 25325 dated December 23, 2003;

- Regulation on Health and Safety Regarding Temporary Works, Official Gazette No. 25463 dated May 15, 2004.

Other regulations that the project will comply with can be listed as follows:

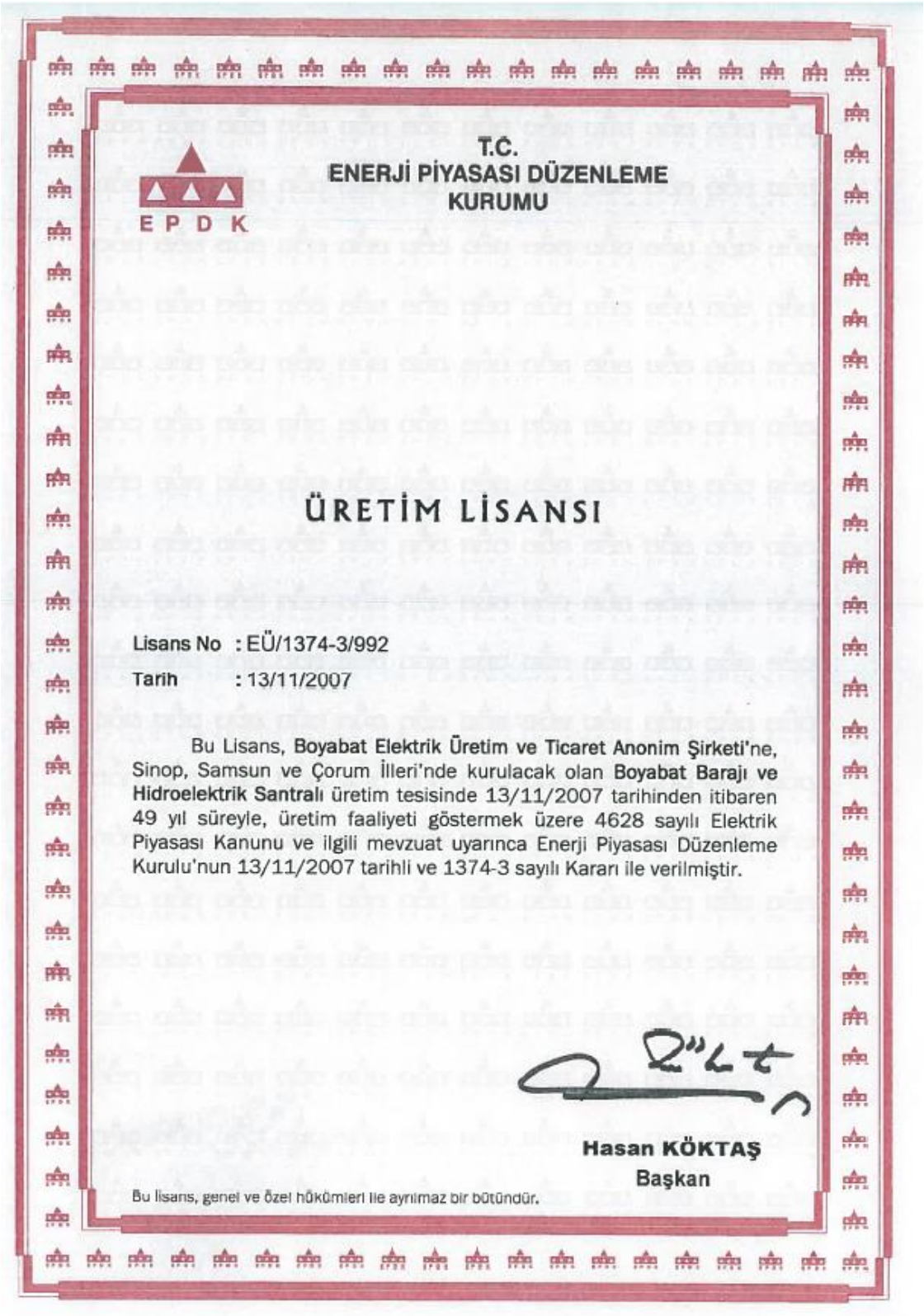
- 5346 numbered Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy;

- Regulation on Protection and Usage of Agricultural Lands, Official Gazette No. 25766 dated March 25, 2005;

- 2863 numbered Law on Protection of Cultural and Natural Heritage (revised by 5226 numbered Law);

- 4342 numbered Pasture Law;
- 6831 numbered Forestry Law (amended by 5192 numbered Revision in Forestry Law);
- Regulation on Buildings located on the Disaster Areas, Official Gazette No. 26582 dated July 14, 2007;.

APPENDIX 3: < GENERATION LICENSE >



T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

EPDK

ÜRETİM LİSANSI

Lisans No : EÜ/1374-3/992

Tarih : 13/11/2007

Bu Lisans, **Boyabat Elektrik Üretim ve Ticaret Anonim Şirketi**'ne, Sinop, Samsun ve Çorum İlleri'nde kurulacak olan **Boyabat Barajı ve Hidroelektrik Santralı** üretim tesisinde 13/11/2007 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 13/11/2007 tarihli ve 1374-3 sayılı Kararı ile verilmiştir.

Hasan KÖKTAŞ
Başkan

Bu lisans, genel ve özel hükümleri ile ayrılmaz bir bütündür.