ALKUMRU HYDROELECTRIC POWER PLANT PROJECT

Document Prepared by Ekobil Environmental Services and Consulting Ltd.

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Alkumru Hydroelectric Power Plant (Alkumru HPP from this point onward) project constructed at the Eastern Anatolia Geographical district of Turkey over the Botan River that is one of the major tributaries of the Tigris. The purpose of the project is electricity production using the energy of Botan River as a renewable resource. Therefore, the electricity is produced without causing airborne pollutants or Green House Gas (GHG) emissions. The construction and operation of the Alkumru Hydro Electric Power Plant (HPP) are delaying the addition of conventional thermal power plants to the Turkish National Electricity Grid.

The Alkumru HPP is producing electricity by utilizing the energy of the Botan River, a major tributary to River Tigris. Energy produced using the head difference between the 647 m maximum water level and 541.80 m tail water levels. During the design phase of the project, there were different scenarios regarding the project and installed power capacity. Based on the Electricity Studies Institution's report dated 1991, the Alkumru HPP is initially proposed to be developed with 222 MW capacity and with an annual energy production capacity of 812.48 GWh, and after completion of the upstream Çetin and Pervari Hydroelectric Power plants the annual electricity production was envisaged to be 817.26 GWh.

Later, in a different scenario in design phase with a minor design change the and an adjustment in the turbines the project owner revealed that with the same amount of water flow, the project capacity could be increased to 261.27 MW and the annual electricity production is calculated to be 875.84 GWh. With these conditions project owner also presented a fish passage project so that the fish populations are not effected from the dam blocking the river, and it is agreed to release 14m^3/s of water at all times to the river bed to support aquatic life. However, the design of the project turbines are realized not to be suitable to release the required amount of water, therefore an other addition is made at the tail water part of the project and a new horizontal Francis turbine with 14.250 MWe capacity was added to the project which created the final version of the project.

In the last and implemented scenario, there are total of 4 units in the project. First and second unit were commissioned in 10/03/2011 which is also the start date of the project. Third unit was commissioned in 12/04/2011. Last unit was commissioned in 17/01/2014 and the project is fully installed from then. There are 3×87.09 MWe units and 1×14.25 MWe unit in

the project. Each unit has one main and one control meter. In total there are 8 two-way electricity measurement meters.

The Alkumru HPP have a reservoir area of 10.99 km^2 and a dam that is designed to be clay cored, sand, gravel rock filled. The project activity is constructed between the 611.80 minimum operation elevation and 647 m maximum operation elevation.

During the current monitoring period (01/10/2020 to 31/12/2021), the Alkumru project produced a total amount of 309,207.75 tCO_2 of emission reductions and the total electricity production was 605,438.72 MWh based on the data and Turkey's Combined Margin Emission Factor of 0.4929.

The Major milestones at the project development history can be summarized as shown in the following table (Table 1):

Table 1:Major Milestones of the Project

Date	Milestones	Reference
October 2006	Feasibility Study Report	Feasibility Study Report
10 Sep. 2007	Water Usage Agreement signed with DSI	Water Usage Agreement
Sep. 27, 2007	Electricity Production License issued by Energy Market Regulatory Authority (EMRA) and the license modification	EMRA License
Jan, 2008	Project granted EIA Affirmative certification	EIA Affirmative certification
Aug 15, 2008	Construction Started	Memorandum by Limak Insaat (owner: Limak Hidroelektrik / contractor: Limak Insaat)
Dec 18, 2008	Signing of the E&M contract	The E&M contract
June 19, 2009	TEIAS system connection agreements signed	TEIAS Connection agreement
Aug 19, 2009	The start of the construction of the TEIAS electricity transmission line	The subcontractor agreement for construction of the transmission line
April 13, 2010	EMRA Approved capacity upgrade	The updated special terms of license agreement
May 17, 2010	Water Usage Agreement Updated.	DSI agreement amendment

Dec. 14, 2010	TEIAS system agreements signed	TEIAS system usage agreement
16 Dec. 2010	Expropriation Moderation and Information Meeting 1 Held in the Project site	Summary of Expropriation by the Company Lawyers
Dec. 22, 2010	The completion of the construction of the TEIAS electricity transmission line and the preliminary acceptance by the Ministry of Energy	Substantial completion protocol-transmission line
Mar. 10, 2011	The provisional acceptance of the Dam and the HEPP for two units and the start of the electricity generation	Alkumru Provisional acceptance protocol for units 1 and 2
April 12, 2011	The preliminary acceptance of the Dam and the HEPP for the third unit	Alkumru Preliminary acceptance protocol for unit 3
12 May 2011	Expropriation Moderation and Information Meeting 2 Held in the Project site	Summary of Expropriation by the Company Lawyers
Oct. 1, 2012	Feasibility report finalized	FSR
Oct. 12, 2012	Ministry of Environment approved the design upgrade	Environment and Urban Planning Correspondence with Ministry of
Jan 17,2014	The preliminary acceptance of the Dam and the HEPP for the fourt unit	Alkumru Preliminary acceptance protocol for units 4

1.2 Sectoral Scope and Project Type

The project category is Sectoral Scope 1: Energy industries (renewable-/non -renewable sources). The project type is grid connected electricity generation from renewable sources. The project is a non-grouped, stand-alone project.

1.3 Project Proponent

Organization name	Limak Hidroelektrik Santral Yatırımları Anonim Sirketi
Contact person	Fatih Baydar
Title	Deputy Manager /Budget and Pricing, Limak Energy Trade,
Address	Hafta Sokak No:9 GOP 06700 Ankara,Turkey
Telephone	+90 533 051 68 77
Email	fbaydar@limak.com.tr

1.4 Other Entities Involved in the Project

Organization name	Ekobil Environmental Services and Consulting Ltd[1]
Role in the project	Preparation of the Project Description Document
Contact person	Dr. Aslı Sezer Özçelik
Title	Carbon Manager
Address	Ahlatlıbel Mahallesi 1839 sokak no.56 Çankaya 06805 Ankara-Turkey
Telephone	+903124891338
Email	info@ekobil.com

1.5 Project Start Date

Project start date is: 10th of March, 2011.

1.6 Project Crediting Period

The first project crediting period is 10 years: 10.03.2011 to 09.03.2021 (both dates inclusive). The crediting period is renewable twice.

Since the project is in the renewable period the new crediting period is again 10 years: from 10/03/2021– 09/03/2031 (both days inclusive).

1.7 Project Location

The Project Activity is located on the Botan River in the Eastern Anatolia region of Turkey, within the Siirt city borders. It is located between the elevations of 647 m and 541.80 m between 42º05'04''–42º05'54'' East latitudes and 37°57'0''–37°57'46'' North latitudes (Figure 2).

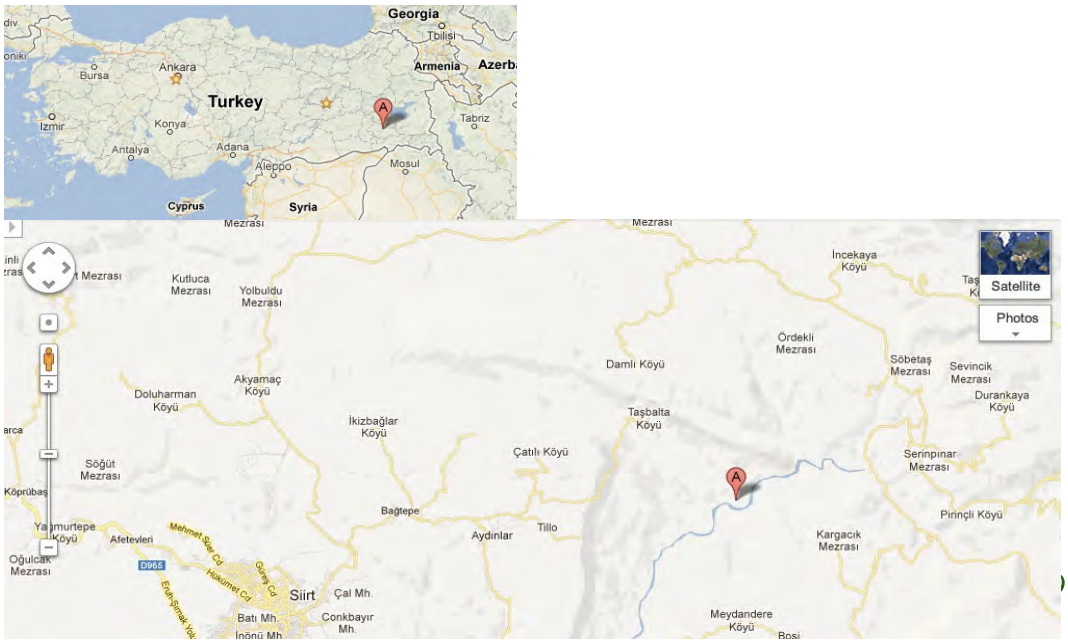
The Following (Table 3) gives the coordinates of the Alkumru HPP Dam location and Power house location.

Table 2:Coordinates of the Weir and Power House

	Latitude	Longitude
Dam	37°57'36.94"N	42° 5'34.94"E
Powerhouse	37°57'25.24"N	42° 5'30.08"E

[1] RegisteredtotheAnkaraChamberofTrade,withthefullnameof"EkobilÇevreHizmetleriDanışmanlıkEğt.Tar.Hayv.Mad.İnş. İth.İhr.Tur.veTic.Ltd.Şti."

Figure 2:Project Location



1.8 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilised:

Approved consolidated baseline and monitoring methodology ACM0002 “Large-scale consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 20.0

Related Tools:

‘’Tool for the demonstration and assessment of additionality” (Version 05.2.1)

‘’Tool to calculate the emission factor for an electricity system” (Version 07.0).

“Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 03.0.1)

1.9 Participation under other GHG Programs

The project has not participated in any other GHG Programs.

1.10 Other Forms of Credit

- Emission Trading Programs and Other Binding Limits: The project is neither eligible nor participating to any other form of emission program.
- Other Forms of Environmental Credit: The program is eligible to create I-REC aspect certificates however we didn’t seek or applied to the I-REC registry, during this monitoring period.

1.11 Sustainable Development Contributions

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

The project aims to generate electricity by using hydroelectric power to supply the increasing national electricity demand in a cleaner and sustainable manner. It reduces the air pollution caused by the grid-connected power plants, which are mostly fossil fuel fired.

The following is a list of the project's contribution to the UN SDG:

SDG-7 on access to affordable, reliable, and sustainable energy, as the project is not relying on imported fossil fuels.

SDG-8 is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.

SDG-13 on urgent action to combat climate change, as the project is replacing the fossil fuel based national grid and it is producing emission reductions.

Table 3: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	increase substantially the share of renewable energy in the global energy mix	Implemented activities to increase	No further changes this monitoring period	Generating electricity from hydropower energy does not result in emissions of pollutants into the atmosphere with zero residuals that carry adverse impacts on soil, water etc.
2)	8.5	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	Implemented activities to increase	Employment opportunities for local people and and equal pay for work of equal value	The local workers are given priority during the hiring for plant operation. The project created employment in the region.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to decrease	Regular emissions from conventional electricity generation such as sulphur dioxide, nitrogen oxide and particulates does not occur in this case.	The project has produced total amount of 309,207,00 tCO_2e of emission reduction.

2 SAFEGUARDS

2.1 No Net Harm

The project has positive impact of the project to the social, economic and environmental situation is mentioned as:"...to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The specific benefits of the project are:

- Reducing greenhouse gas emissions in Turkey compared to the business-as-usual scenario,
- Helping stimulate private sector participation in hydro power industry in Turkey,
- Creating employment during the construction and the operation phase of the plant,
- Helping to reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,
- Helping to diminish Turkey's increasing energy deficit,
- Helping local people to make efficient agriculture by increasing the irrigation water.
- Diversify the electricity generation portfolio and reduce dependency on import of other energy sources."

2.2 Local Stakeholder Consultation

For the project activity a local stakeholders consultation meeting was held in Aydınlar town of Siirt Province, on October 25th, 2007, at 11:00 am, in the Public Educational Center Meeting Hall of Aydınlar Town, Siirt.

The meeting was announced at the bulletin boards of the governor house, municipality and at the village boards of Taşlı Village (via its muhtar Osman Çarp), Meydanderesi village (via its muhtar Ali Nur) Kılbasan Village (via its muhtar İzzettin Aygün), and Taşbalta Village (via Yılmaz Alanç). On the day of the meeting, Limak Hidroelektrik Santral Yatırımları A.Ş. has sent mini-busses to the villages and helped the stakeholders reach to the meeting hall.

The consultant company that prepared the EIA report, moderated the meeting and provided information about the project and its environmental impacts to the local stakeholders and answered their questions.

In general most of the questions were related to the expropriation process and the amount of compensation money. None of the attendants mentioned any doubts about the negative impacts of the project to the surrounding environment. Both the project owner company representatives and the environmental consultants answered these questions emphasizing

that the expropriation process would be conducted in line with the host country rules and regulations.

The following is a translation of the meeting minutes:

Minutes of the Local Stake holder Consultation Meeting

The stakeholder consultation meeting was realized on 25th of October, 2007, at 11:00 o'clock at the public education centre of the Aydınlar Town of Siirt, with the presence of the people listed attached to this document.

During the meeting the spokesman of Selin İnş. Müh. Müş Ltd. Mr. Orkun Sarıfakıoğlu, have provided detailed information to the public about the planned project and its possible impacts to the environment. The information is provided in the form of a slide show and narration.

The contribution of the project to the economy of the country, to the province and town is explained and it is emphasized that the project implementers will keep their undertakings that are outlined within the context of the environmental impact assessment report. It is also mentioned that the possible environmental impacts were expected to occur mainly during the construction phase but no impact was expected for the operation phase.

Bedri Adar from Hürmüz village (An employee of the Park Elektrik) mentioned that there was work going on in their land, added that the village was stranded at the moment due to some sociological reasons, but the village inhabitants would come back and those that have their lands and those that does not have their lands registered due to zoning problems could find themselves downtrodden. He also mentioned lands tat belonged to their village was being used, and he added that he would like to see the employee to be chosen from the neighbouring villages during the construction and operation phases.

Orkun Sarıfakıoğlu (Selin Ltd) explained that in such projects the cadastral survey officers of the government would be organizing the expropriation, and it would not be possible to occupy anybody's land without paying any compensation. He also explained that it was Limak A.Ş.'s company policy and priority to recruit employees from the surrounding towns and villages as long as they could find the appropriate persons to satisfy the needs.

The Akyayla Village inhabitant M.Salih Akgün asked if there would be any water tunnel related work on- going prior to expropriation.

Orkun Sarıfakıoğlu explained that the expropriation would start after the construction and would be an on going process that would be advancing part by part.

Seydan Altunç from Siirt Special Provincial Authority (SPA) asked the amount of sediments that the water would carry to the reservoir and the impact of the dam 50 years later.

It is explained that DSI was planning precautions to extend the life span of the Dam, establishment of the upstream weirs were planned. Upon an other question by Seydan Altunç,

related to the materials that would be collected at the end of the life of the project activity, it is explained that it would be under the command and control of the DSI.

Murat Özdemir asked about the debt of the reservoir, and he is answered that the depth of the reservoir lake was 134 m.

The village head (muhtar) of Şirvan Taşlı village, Osman Can, asked the extent of the project area and to what degree their village would be affected.

Orkun Sarıfakıoğlu explained that all the relevant villagers and their inhabitants would be enlightened about the details of the expropriation, by the cadastral survey officers.

Aydınlar Mayor, Muhsin Çelebi, expressed his gratitude to those that are involved in this project and his wishes for the success of the project. He added that as the municipality they would do their best to support the project and their only request was that the project management would consider helping unemployed.

Taşbalta Village head (Muhtar) Yılmaz Alanç asked the extent of impact related to their village and he asked from where he could get information. It is explained to him that for the forested areas Forestry Management could provide information and about the expropriation it was possible to get information from the cadastral offices.

Upon the question from Yılmaz Alanç related to the possibility of explosions affecting the settlements, it is explained that the drillings and surveys related to potential rock quarries were performed 1200 m away from settlements and it was very likely that those quarries were not suitable. As soon as complete results would be obtained, more information of the exact place, capacity and possibility to affect settlements would be provided to the village heads.

The audience is also informed that any kind of explosion would be performed under the control of the gendarme forces, and public would be informed, by announcements.

M. Salih Aygün asked weather it was possible to make use of the earth movers that belonged to the villagers.

It is explained that, if Limak would need, it would be possible to lease these vehicles, but the situation would be better clarified when the construction would start.

The town's Gendarme Commander Yener Güvercin, asked the possibility of the project activity to affect the climate and the vegetation (especially impact to the agricultural products such as pistachio and hackberry) .

It is explained that no harm to the existing vegetation and crop was expected, however, it was also possible that the reservoir lake would attract more wildlife and it would be possible to grow up crops that was not possible to grow in the area.

M.Salih Akgün asked if the project would affect the 50,000 young pistachio trees that were planted near the project area. It is explained that no negative impact was expected.

It is asked if there were new road constructions it is explained that a steel bridge would be constructed in addition to this the Dam crest would also be used as a road.

The National Education Town representation manager Mr. Sedat Özveren asked the life span of the project it is answered that it was 50 years.

Provincial Manager for Public Health Murat Özdemir asked about the studies done and allowed limits related to potential dust emissions that may happen due to explosions in the quarries and during the transportation of the materials. The impacts that are envisaged and the precautions to minimize dust is explained, and it is also mentioned that the mitigation measures could be reshaped based on the impacts. Bedri Adar asked who would take part in the security of the construction worksite. It is explained that those recruitments would be coordinated by the town GendarmeForces.

The questions asked can be grouped as expropriation related questions, employment opportunity related questions and environmental impact assessment related questions. The expropriation issues are followed up by an other series of meetings And one to one interaction with stakeholders. Regarding the employment issues there was temporary jobs created for the local inhabitants and the environmental impacts are studied and the project was granted all of its environmental permits.

On-going communication with local stakeholders:

The avenue for local stakeholders to remain in contact with the Project owners about any comments and questions is open via in-person visits to the Project site or via telephone. The local mukhtar also acts as the Messenger about the locals' comments about the Project activity. Locals are also made aware of the online form available on www.ekobil.com[2] as an alternative avenue of providing feedback on projects.

2.3 AFOLU-Specific Safeguards

The project is a non-AFOLU project

[2] Communication is available through the "Contact Us" tab on www.ekobil.com .

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project start date is 10 March 2011. Since that date, there is no special event that may have impact on monitoring of GHG emission reductions. The following table summarizes the project milestones:

Table 3: Significant dates for the project monitoring period:

Date	Milestone
14.12.2012	Final Validation Report
10.03.2011	Date of commissioning of the plant Unit 1 and 2 became operational
12.04.2011	Third Unit became operational
13.06.2008	Factory Calibration date of meters
19 to 22.01.2011	Test of Meters prior to project commissioning
12.06.2018	End of Calibration validity
30.11.2013	End of the first monitoring period
17.01.2014	The fourth unit became operational

3.2 Deviations

3.2.1 Methodology Deviations

The UNFCCC methodology of ACM0002 Version 20.0 and its related tools have been applied without any deviations.

3.2.2 Project Description Deviations

As was mentioned in the first Monitoring report, the measurement point and measurement descriptions of the internal consumption data (EGPP-self consumption, y) that is used to calculate net electricity generation is deviated from the monitoring plan envisaged and presented in the validated Project Description. Details of this deviation and how the internal consumption is accounted for is explained in section 2.5 at the related parameter ($EG_{PP\text{-self consumption}, y}$) in the validated PD.

No further deviations from the previous monitoring period.

3.3 Grouped Projects

The project is a non-grouped, stand-alone project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data	The calculation of the variable is outlined in Section 3.1; Steps 3 and 4 (pg. 26) of the first validated Project Description document (ver 2.1) dated 10/12/2012. And data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[3]
Value applied	0.65613 (for 1st crediting period) and 0.7258 (2nd crediting period)
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,OM,y}$ for the 1st crediting period was calculated using Version 02.2.1 of TOOL 7:"Tool to calculate the emission factor for an electricity system". The $EF_{grid,OM,y}$ for the 2nd crediting period was calculated and published by Turkish Ministry of Energy and Natural Resources on 06/10/2021 using Version 06.0 of TOOL 7:"Tool to calculate the emission factor for an electricity system".
Purpose of Data	Calculation of $EF_{grid,CM,y}$ for the dates of the monitoring period that fall within the first ((01/10/2020 to 09/03/2021) and second crediting period (10/03/2021 to 31/12/2021).
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Building margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system"

[3] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[4]
Value applied	0.4153
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,BM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources using Version 06.0 of TOOL 7:"Tool to calculate the emission factor for an electricity system".
Purpose of Data	Calculation of $EF_{grid,CM,y}$ for the dates of the monitoring period that fall within the second crediting period (10/03/2021 to 31/12/2021).
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Building margin CO_2 emission factor for grid connected power generation in year *y* calculated using the "Tool to calculate the emission factor for an electricity system"
Source of data	The calculation of the variable is outlined in Section 3.1; Step 5 (pg. 29) of the first validated Project Description document (ver 2.1) dated 10/12/2012.
Value applied	0.42357
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,BM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources using Version 02.2.1 of TOOL 7:"Tool to calculate the emission factor for an electricity system".
Purpose of Data	Calculation of $EF_{grid,CM,y}$ for the dates of the monitoring period that fall within the first crediting period (01/10/2020 to 09/03/2021).
Comments	-

Data / Parameter	$EF_{grid,CM,y}$

[4] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Data unit	tCO_2/MWh
Description	Combined margin Emission Factor of Turkey
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[5]
Value applied	0.4929
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,CM,y}$ was calculated using the published databy Turkish Ministry of Energy and Natural Resources. Calculated data of $EF_{grid,OM,y}$and $EF_{grid,OM,y}$were used.
Purpose of Data	Calculation of baseline emission (BE_y) for the dates of the monitoring period that fall within the second crediting period (10/03/2021 to 31/12/2021).
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin Emission Factor of Turkey
Source of data	The calculation of the variable is outlined in Section 3.1; Step 6 (pg. 30) of the first validated Project Description document (ver 2.1) dated 10/12/2012.
Value applied	0.53985
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,CM,y}$ was calculated using the published databy Turkish Ministry of Energy and Natural Resources. Calculated data of $EF_{grid,OM,y}$ and $EF_{grid,OM,y}$were used.
Purpose of Data	Calculation of Baseline Emission (BE_y) for the dates of the monitoring period that fall within the first crediting period (01/10/2020 to 09/03/2021).
Comments	-

[5]https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

4.2 Data and Parameters Monitored

Data / Parameter	Cap_{PJ}
Data unit	MWh
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 to be applied	Turbine Supplier information on the equipment
Frequency of monitoring/recording	Yearly
Value applied	275,520.000
Monitoring equipment	*N/A*
QA/QC procedures to be applied	Supplier information on the related equipment and existence of the equipment are checked
Purpose of data	Data is used to calculate baseline emission.
Calculation method	*N/A*
Comments	-

Data / Parameter	A_{PJ}
Data unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site
Description of measurement methods and procedures to be applied	The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area determined using the same graphic, Presented in Annex 3.

Frequency of monitoring/recording	*Once during each monitoring period*
Value applied	10,990,000
Monitoring equipment	*N/A*
QA/QC procedures to be applied	The depth readings will be done on daily basis from
Purpose of data	Data to be used for the calculation of Project Emissions.
Calculation method	N/A
Comments	N/A

Data / Parameter	$EG_{PP\text{-}Import,\ y}$
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the Grid, in year y
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity imported from the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	737.73
Monitoring equipment	Calibrated between 2020-2030 EMH-LZQJ-XC 0.2 S 9798692-Measures generation by turbine I(main) 9798693-Measures generation by turbine I(control) 9798694- Measures generation by turbine II(main) 9798695- Measures generation by turbine II(control) 9798696- Measures generation by turbine III (main) 9798697- Measures generation by turbine III(control) 9798698- Measures generation by turbine IV (main) 9798699- Measures generation by turbine IV(control)

	All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class 005 indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Meter readings will be cross checked with the PMUM/MFRC data obtained from the screen shots of the MFRAC System.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	$EG_{PP\text{-}export,\ y}$
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 will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	606,176.45
Monitoring equipment	Calibrated between 2020-2030 EMH-LZQJ-XC 0.2 S 9798692-Measures generation by turbine I(main) 9798693-Measures generation by turbine I(control) 9798694- Measures generation by turbine II(main) 9798695- Measures generation by turbine II(control) 9798696- Measures generation by turbine III (main) 9798697- Measures generation by turbine III(control) 9798698- Measures generation by turbine IV (main) 9798699- Measures generation by turbine IV(control)

	All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of Class 005 indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Measurements are carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are 0.2S, that is to say should be within the ±0.2% (±0.002) range. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	$EG_{PP\text{-}net,\ y}$
Data unit	MWh
Description	Quantity of the net electricity supplied to the grid by the power plant, in year y
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	605.438,72
Monitoring equipment	Calibrated between 2020-2030 EMH-LZQJ-XC 0.2 S 9798692-Measures generation by turbine I(main) 9798693-Measures generation by turbine I(control)

	9798694- Measures generation by turbine II(main) 9798695- Measures generation by turbine II(control) 9798696- Measures generation by turbine III (main) 9798697- Measures generation by turbine III(control) 9798698- Measures generation by turbine IV (main) 9798699- Measures generation by turbine IV(control) All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market. They have an accuracy class of 0.2S indicating an accuracy range of 0.2%.
QA/QC procedures to be applied	Measurements are carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are 0.2S, that is to say should be within the ±0.2% (±0.002) range. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of data	Data will be used to calculate emission reduction calculations.
Calculation method	$EG_{PP\text{-}net,\ y} = EG_{PP\text{-}export,\ y} - EG_{PP\text{-}import,\ y}$
Comments	-

4.3 Monitoring Plan

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 archival of complete and reliable data that is needed to ensure reliable and accurate measurements of actual emission reductions.

Data to be monitored

Given that the emission factor is calculated on an ex-ante basis, the first data to be monitored is the electricity net supplied to the grid. This parameter is obtained indirectly as a subtraction of electricity imported from electricity exported to the grid.

The second data to be monitored is the installed capacity of the Project Activity. Using the SCADA system installed capacity will be measured automatically.

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 3.

Monitoring procedures

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 9):

Table 4:Responsibilities of VER Team

Position	Responsibility
Alkumru HPP Manager	Day to day operation of the Alkumru HPP, Compliance of the project activity with the host country rules and regulations Coordination of the data collection and recording for the VCS monitoring report.
Chief Electrical Engineer	Day to day follow up of electrical equipment Recording and monitoring of the electricity generation data
Accounts Manager	Data keeping for power sales Keeping the track record of PMUM/MFRC data
Chief Mechanical Engineer	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

The power generation meter readings are performed by using the main metering devices and the back-up metering devices that are used for accuracy checks only. Data from metering devices will be recorded by TEİAŞ on monthly agreed protocols and will form the basis for invoicing. In addition to the readings of the three metering devices, generation data of the Alkumru HPP can be cross checked, via the TEİAŞ – PMUM web site (http://pmum.teias.gov.tr) which is accessible by a password available to the electricity generation companies. The monthly screen shot print outs of the PMUM data will be available to the verifying DOE during the verification process for cross checking. Electricity generation data at the Market Financial Reconciliation Centre (MFRC/PMUM)

web page will exhibit the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from PMUM web site needs to be multiplied by the transmission loss factor of the grid.

The internal consumption data will be recorded by one TEDAS meter, and a meter that belongs to the project owner, The difference between this two gives the net internal consumption value which is than used to determine the net amount of electricity supplied to the grid. The internal consumption will be recorded this way until the commissioning of the 4th turbine that will be constructed to utilize the energy of the water discharged to support life in the river. As soon as the construction site will be removed the internal consumption will be recorded by two of the meters that measure the electricity export.

Monitoring equipment

Electricity meters

The main and back-up electricity meters are bi-directional for quantifying the electricity delivered by the Project Activity to the grid.The meters are be in compliance with the standards of the Turkish Standards Institute and will have obtained a "Type and System Approval" certificate from the Ministry of Trade and Industry. In case there are modifications to the standards, the modified standard shall be valid; and in casea valid standard is cancelled or abolished, the new standard shall be valid. The standards that will be used are TS-620 EN 60044-1 and TS718 IEC60044.2 for main and back-up meters, respectively. The sensitivity of the main and secondary meters are CI = 0.2 for active and reactive energy. The meters shall be factory calibrated by the manufacturer before installation. Records of the meter (type, made, model and calibration documentation) will be retained in the quality control system.

Data collecting and recording

*The net electricity generation by the project activity.*Based on the baseline scenario presented above, this amount of electricity would have been produced by the Turkish NationalGrid.

The electricity produced will be sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by three main meters and three Back-up meters

A.Main Electricity Meters(calibrated between 2010-2020):

a.Unit 1 Main Meter: ELSTER A 1500: Serial Number: 00419607

b.Unit 2 Main Meter: ELSTER A 1500: Serial Number: 00419609

c.Unit 3 Main Meter: ELSTER A 1500: Serial Number: 00419611

d. Unit 4 Main Meter: ELSTER A 1500: Serial Number: 00480673

B.Back-up Electricity Meters:(calibrated between 2010-2020):

a.Unit 1 Back-up Meter: ELSTER A 1500: Serial Number: 00419608

b.Unit 2 Back-up Meter: ELSTER A 1500: Serial Number: 00419610

c.Unit 3 Back-up Meter: ELSTER A 1500: Serial Number: 00419612

d. Unit 4 Back-up Meter: ELSTER A 1500: Serial Number: 00480672

C. Electricity Meters dedicated to follow up internal consumption only: (Calibrated on 29.01.2010):

a.Unit 1 Internal Consumption Meter: ELSTER A 1500: Serial Number: 00401585

b.Unit 3Internal Consumption Meter: ELSTER A 1500: Serial Number: 00401584

c.Unit 4Internal Consumption Meter: ELSTER A 1500: Serial Number: 00401587

A.Main Electricity Meters (calibrated between 2020-2030)

a.Unit 1 Main Meter: EMH LZQJ-XC Serial Number: 9798692

b.Unit 2 Main Meter: EMH LZQJ-XC: Serial Number:9798694

c.Unit 3 Main Meter: EMH LZQJ-XC: Serial Number: 9798696

d. Unit 4 Main Meter: EMH LZQJ-XC: Serial Number: 9798698

B.Back-up Electricity Meters:(calibrated between 2010-2020):

a.Unit 1 Back-up Meter: EMH LZQJ-XC: Serial Number: 9798693

b.Unit 2 Back-up Meter: EMH LZQJ-XC: Serial Number:9798695

c.Unit 3 Back-up Meter: EMH LZQJ-XC: Serial Number: 9798697

d. Unit 4 Back-up Meter: EMH LZQJ-XC: Serial Number: 9798699

These meters are placed at the Alkumru powerhouse where the power plant gets connected to the Turkish national grid. Those meters provide official data, which are read and recorded monthly by TEİAŞ officers for invoicing. TEİAŞ also conducts the calibration and maintenance of these meters and thus, ensures the accuracy and quality of the measurements. The quality standards that the meters need to comply is "The ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S)" The calibration of the meters is done and the meters will be checked continuously if there is a difference of 0.2 % in the readings of the main and the back-up meters, the calibration is repeated. At the end of each month, the monthly generation is read remotely and e-mailed to the owner. In case of failure of the main meter, the control meter is used to determine the invoiced generation amount. These readings can be on site as well as remotely by the systems that will be put in place by the grid owner TEIAS. The net electricity produced ($EG_{PP\text{-}net,y}$) in year y is calculated by subtracting the total electricity consumed by the hydroelectric power plant ($EG_{PP\text{-}selfconsumption,y}$) , from the gross electricity generation ($EG_{PP\text{-}gross,y}$) . After obtaining the net electricity production value, the emission reductions will be calculated by multiplying the net electricity with the Ex-ante Combined Margin Emission Factor calculated above.

Measuring Installed Capacity

By means of the SCADA system established in the plant all kinds of technical parameters related with turbines and generators including installed capacity will be measured and stored in the system on real time basis. The installed capacity of the plant will be measured from SCADA once a year while the plant is operated with full load and the related data will be stored as per the monitoring program.

Measuring Reservoir Area

The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 3 of the validated PD .

Data management

At the end of each month, electricity supplied to the grid will be entered into an electronic spread sheet. The data to be measured for installed capacity and reservoir area will be

entered into an electronic spread sheet at the end of each year. The electronic files will be backed up on both hard drives and on a Compact Disc (CD).

Quality Control and Assurance (QC/QA)

All of the main and back-up meters are owned and installed by the grid operator, TEIAS. The Calibrations of the electricity meters are valid for the next 10 years after calibration,

The grid operator's Metering Officer should be notified of any failure of one of the meters. TEIAS is the only one entity, authorized to deal with fixing, calibrating, or changing the meters, which will be done either by the grid operator or by a company authorized by the grid operator. The Project Owner will keep electricity sale and purchase records, to which the recorded data will be compared.

All written documentation such as maps, drawings, the EIA and the Feasibility study, will be stored and will be made available to the verifier so that the reliability of the information may be checked.

All data records will be kept for at least 2 years from the last project credited year.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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

Where:

BE_y = Baseline emissions in year y (tCO_2/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 project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO2 emissions factor in year y (tCO_2/MWh)And

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/y)

The Combined margin CO_2 emissions factor in year y (tCO_2 /MWh), EFgrid,CM,y, has two fixed values determined ex- ante for the duration of the monitoring period, as the monitoring period falls within two crediting periods.

		A-Gross Electricity Production	B-Self Electricity Consumption	C-Net electricity production C=A-B	Baseline Emissions = $EG_{PP-net,y}$ * EF_{CM}
	Symbol	$EG_{PP-export, y}$	$EG_{PP-import, y}$	$EG_{PP-net, y}$	BE_y
YEAR	Units	MWh	MWh	MWh	tCO_2e
2020	October	17,516.30	1.81	17,514.49	9,455.20
	November	24,007.05	48.68	23,958.37	12,933.93
	December	20,901.90	36.89	20,865.01	11,263.98
Total in 2020		62,425.25	87.38	62,337.87	33,653.10
2021	January	37,754.19	16.12	37,738.07	20,372.90
	February	129,699.05	19.76	129,649.29	70,007.36
	March[6]	52,579.81	141.78	52,438.03	25,846.70
	April	69,112.03	106.70	69,005.33	34,012.73
	May	22,303.77	28.61	22,275.16	10,979.43
	June	40,366.40	6.15	40,360.25	19,893.57
	July	78,546.51	20.93	78,525.58	38,705.26
	August	72,129.04	13.99	72,115.05	35,545.51
	September	29,978.38	124.85	29,853.53	14,714.80
	October	7,854.50	102.73	7,751.77	3,820.85
	November	3,337.52	68.62	3,268.90	1,611.24
	December	90.00	0.11	89.89	44.31
Total in 2021		543,751.20	650.35	543,100.85	275,554.65
Grand Total		606,176.45	737.73	605,438.72	309,207.75

The value of EFgrid,CM,y for the first crediting period is 0.53985 tCO_2e/MWh; and the value of EMgrid,CM,y for the second crediting period is 0.4929 tCO_2e /MWh.

[6] The month of March falls onto two creditin periods (1st crediting period: 10/03/2011-09/03/2021; 2nd crediting period: 10/03/2021-09/03/2031). Therefore, respective emission factors that have been fixed ex ante for the two crediting periods are applied separately. Although first nine days of March fall within the 1st crediting period, the emission factor for the 2nd crediting period (0.4929) is applied in line with the conservative approach.

The baseline emissions will be calculated in accordance with these values, where net electricity production that falls within the first crediting period will be multiplied with the emission factor of 0.53985 (a); and the remaining net electricity production will be multiplied by the emission factor of 0.4929 (b). These two values will later be summed up (a+b) to present the grand total of baseline emissions for the monitoring period. The baseline emissions for March 2021 is calculated with the 2nd crediting period's emission factor even though the first nine days fall within the 1st crediting period, to ensure a conservative approach.

5.2 Project Emissions

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

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

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

Since the Acm0002 Ver. 20.0 para 38 states that if the power density of the Project activity is greater than 10 W/m2;

PEHP.y = 0, and the Project has a power density of 25.07 W/m2 which calculation is available below.

During this monitoring period the maximum lake level is observed to be 650 m, rounding up this value gives a maximum water level of 650 m at this level reservoir lake covers an aerial extent of 10,990,000 m^2 . The project capacity during the monitoring period was 275,520,000 W therefore the power density of the project calculates as (275,520,000 /10,990,000=25.07 W/m^2) which is;

>10 W/m^2

Therefore;

$PEHP,y = 0$

Where:

$PEHP,y$ Project emissions from water reservoirs (tCO_2e/yr)

Although there are auxiliary diesel generators installed within the project boundary, the emissions from these have been deemed negligible as per the ACM0002 (version 20.0.0) methodology.

5.3 Leakage

The main emissions potentially giving rise to leakage are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). However according to ACM0002 Version 20.0 para 53, these emission sources can be neglected, therefore $LE_y = 0$. Hence,there are no leakage emissions related to project activity.

5.4 Net GHG Emission Reductions and Removals

Emission reductions are calculates as follows:

ER_y = Emission reductions in year y (tCO_2e/yr)

BE_y = Baseline emissions in year y (tCO_2e/yr)
(Please refer section 5.1)

PE_y = Project emissions in year y (tCO_2e/yr)
(Please refer section 5.2)

LE_y = Leakage in year y (tCO_2e/yr)
(Please refer section 5.3)

Hence,

$ER_y = BE_y - PE_y$

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(from 01.10.2020 to 31.12.2020)	*33,653*	*0*	*0*	*33,653*
2021(from 01.01.2021 to 31.12.2021)	*275,554*	*0*	*0*	*275,554*
Total	*309,207*	*0*	*0*	*309,207*