



**Verified Carbon  
Standard**

# EGLENCE I-II HYDROELECTRIC POWER PLANT

## 1<sup>ST</sup> MONITORING REPORT

<b>Project Title</b>	Eglence I-II Hydroelectric Power Plant
<b>Version</b>	V4.0
<b>Report ID</b>	04
<b>Date of Issue</b>	29/09/2021
<b>Project ID</b>	1221
<b>Monitoring Period</b>	10/04/2013-31/12/2020
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# CONTENTS

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<b>1</b>	<b>PROJECT DETAILS .....</b>	<b>4</b>
1.1	Summary Description of the Implementation Status of the Project.....	4
1.2	Sectoral Scope and Project Type .....	6
1.3	Project Proponent .....	6
1.4	Other Entities Involved in the Project .....	7
1.5	Project Start Date.....	7
1.6	Project Crediting Period.....	7
1.7	Project Location .....	8
1.8	Title and Reference of Methodology.....	8
1.9	Participation under other GHG Programs .....	9
1.10	Other Forms of Credit .....	9
1.11	Sustainable Development.....	9
<b>2</b>	<b>SAFEGUARDS .....</b>	<b>10</b>
2.1	No Net Harm.....	10
2.2	Local Stakeholder Consultation.....	10
2.3	AFOLU-Specific Safeguards.....	10
<b>3</b>	<b>IMPLEMENTATION STATUS .....</b>	<b>11</b>
3.1	Implementation Status of the Project Activity .....	11
3.2	Deviations .....	11
3.2.1	Methodology Deviations .....	11
3.2.2	Project Description Deviations.....	11
3.3	Grouped Projects .....	11
<b>4</b>	<b>DATA AND PARAMETERS.....</b>	<b>11</b>
4.1	Data and Parameters Available at Validation .....	12
4.2	Data and Parameters Monitored .....	15
4.3	Monitoring Plan .....	19
<b>5</b>	<b>QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS .....</b>	<b>21</b>
5.1	Baseline Emissions.....	22

5.2	Project Emissions .....	23
5.3	Leakage .....	24
5.4	Net GHG Emission Reductions and Removals .....	24

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

The project activity, Eglence I-II HEPP, a run-off-river hydroelectric power plant, is located on the Eglence River, in the Mediterranean Region within the Karaisali district of Adana province. Eglence I-II consists of construction of a green field project with 70.98 MWm / 68.65 MWe of installed capacity comprising two weirs and two power houses (Upstream one is Eglence I and downstream one is Eglence II).

A regulator at a talweg elevation of 693.0 meters within the borders of Yenikoy district exists. The rising water is first taken to a sedimentation pool followed by a two-piece conveyance tunnel. There is a conduit between them. With the aid of a shaft, water is transferred to the Eglence I power house. The tail water coming out of Eglence I power station is transferred to the conveyance tunnel after which water is first transferred to a head pond and a penstock. Finally, water is transported to the Eglence II power house, founding on the right bank of the river. Each power house is comprised of three turbines. The installed capacity of Eglence I is 42.65 MWe, and the installed capacity of Eglence II is 26.00 MWe. There is no dam within the context of project activity.

The project is to generate approximately 205,299 MWh/year of electricity to supply the national grid. The average annual emission reduction of the project is estimated to be 114,065 tonnes of CO<sub>2</sub>. However, in this monitoring period, the project generated 164,677,24 MWh electricity per annum and therefore reduced 91,494 tonnes CO<sub>2</sub>/year, which indicates 20% less energy generation and emission reduction than expected. The project activity reduces greenhouse gases (GHGs) emissions that would have otherwise occurred in the absence of the project activity because electricity generation from fossil fuel sources is avoided.

The project milestones are provided in the table below:

Table 1. Project implementation milestones

Milestone	Date/ Explanation
Generation License (Final Amendment Date)	27/12/2007
Loan Agreement with the bank	07/07/2011
Construction Agreement- Investment decision date	14/12/2010
VCS Registration Date	25/12/2013
Commissioning of the Eglence-II HEPP	26/03/2013
Commissioning of the Eglence-I HEPP	04/06/2013
Project Start Date (confirmed through the Eglence II Commissioning date by validation)	10/04/2013
First Monitoring Period	10/04/2013 – 31/12/2020

Table 2. Project generation and emission reductions in the monitoring period

Expected annual generation	205,299 MWh
Generated electricity during monitoring period (92.7 months)	1,272,131.66 MWh during monitoring period and generated electricity for per annum for this monitoring period is 164,677.24. MWh
Generated net emission reductions during monitoring period	706,792 tonnes CO <sub>2</sub> during monitoring period and emission reduction per annum is 91,494 tonnes CO <sub>2</sub>  April-Dec 2013 vintage: 8,940 tonnes CO <sub>2</sub> Jan-Dec 2014 vintage: 57,604 tonnes CO <sub>2</sub> Jan-Dec 2015 vintage: 97,242 tonnes CO <sub>2</sub> Jan-Dec 2016 vintage: 54,832 tonnes CO <sub>2</sub> Jan-Dec 2017 vintage: 109,369 tonnes CO <sub>2</sub> Jan-Dec 2018 vintage: 117,636 tonnes CO <sub>2</sub> Jan-Dec 2019 vintage: 129,055 tonnes CO <sub>2</sub> Jan-Dec 2020 vintage: 132,114 tonnes CO <sub>2</sub>

Table 3. Technical Properties of Eglence I-II HEPP

<b>LOCATION</b>	Eglence River, within the boundaries of Adana province
<b>DESIGN FLOW RATE</b>	17.4 M3/SEC
<b>LENGTH OF CONVEYANCE TUNNEL (Eglence I and II, respectively)</b>	5398.50 M / 1918.24 M
<b>TOTAL INSTALLED CAPACITY</b>	68.65 MW
<b>NUMBER OF UNITS</b>	3 EACH
<b>TURBINE CAPACITY (Eglence I and II, respectively)</b>	8.53+2x17.55 MWm / 8.25+2x17.20 MWe
<b>TURBINE TYPE</b>	FRANCIS TYPE  EĞLENCE I VERTICAL AXIS  EĞLENCE II HORIZONTAL AXIS
<b>TURBINE MODELS AND SERIAL NUMBERS</b>	Eğlence I:  Turbine 1: Flovel – 1112-05-02  Turbine 2: Flovel – 1112-05-01  Turbine 3: Flovel – 1112 – 06  Eğlence II:  Turbine 3: Flovel – 1112-04

	Turbine 1-2: Flovel – 1112-03 – 01 / 1112 – 03 -02
<b>ENERGY TRANSMISSION LINE</b>	154/34.5kV
<b>LENGTH OF PENSTOCK (Eglençe I and II, respectively)</b>	1146 M / 700 M
<b>DIAMETER OF PENSTOCK</b>	2.4 M
<b>AVERAGE ANNUAL POWER GENERATION</b>	205,299 MWh

The main goals of the Eglençe I-II HEPP project include;

- Using Turkey’s hydroelectric potential to meet the increasing demand for electricity and contributing toward the guarantee of Turkey’s energy security.
- Increase the share of run of river type HEPPs in the mix of electricity generation in Turkey, reduce dependency on imported fossil fuel and as a consequence provide a tangible reduction in GHG emissions.
- Contribute to economic development by creating direct and indirect job opportunities during the construction and operation phases.

## 1.2 Sectoral Scope and Project Type

This is a voluntary project, but it follows the CDM rules. The approved baseline and monitoring methodology for large-scale project activities ACM0002-Version.13.0: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” is applied.

Proposed project activity is categorized in the sectoral scope 1 “Energy Industry – Renewable - /Non-renewable Sources” according to the UNFCCC definition. Project is not a part of grouped project.

## 1.3 Project Proponent

<b>Organization name</b>	Egenda Ege Enerji Uretim A.S.
<b>Contact person</b>	Haşim Özbezek
<b>Title</b>	-
<b>Address</b>	Şehit Nevres Bulvarı, No:10, Kat:7 Deren Plaza Montrö / İZMİR TURKEY

Telephone	Tel: +90 232 463 98 11
Email	hasim.ozbezek@endaenerji.com.tr

## 1.4 Other Entities Involved in the Project

### Project Consultant

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

## 1.5 Project Start Date

Project start date: 10th April 2013 (The commissioning date of the Egence-II HEPP)

## 1.6 Project Crediting Period

The project crediting period is 10 years and renewable twice. .

VCS crediting period start date: 10th April 2013.

VCS crediting period end date: 09<sup>th</sup> April 2023



ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 06.01.0, and
- "Tool to calculate the emission factor for an electricity system", Version 02.01.0.

## 1.9 Participation under other GHG Programs

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

## 1.10 Other Forms of Credit

Project does not produce other forms of environmental credit.

## 1.11 Sustainable Development

The project helps Turkey to stimulate the commercial application of grid connected renewable energy technologies and markets. It also supports energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The project contributes to the reduction of GHGs, thereby reducing the effects of global climate change in the medium and long term. The project also contributes to economic and social development in the region. It contributes to reduction of local air pollutants damaging the quality of agriculture which will cause economic harm in the region. Additionally, the project provides job opportunities for local people in addition to road and potable water supports to locals. Therefore, the project has positive influences on sustainable development and contributes to UN sustainable development goals (SDG) 13, 8 and 7.

- Climate Action (SDG 13): Renewable energy power plants will contribute to "Emission Reductions or Removals and/or Adaptation to Climate Change" by reducing CO2 emissions caused by fossil fuel-fired power plants that are displaced due to the project activity. The project has been reduced CO2 emissions in an amount of 706,792 tonnes in the whole monitoring period.
- Decent Work and Economic Growth (SDG 8): The project will generate employment and income. The project has been created permanent job opportunity for 26 people (as 14 from Eğlence I and 12 from Eğlence II).
- Affordable and Clean Energy (SDG 7): Increasing the number and percentage of renewable energy power plants will provide substantial increase in the share of renewable energy in the global energy mix and ensure universal access to affordable, reliable and modern energy services. The project has generated 1,272,131.66 MWh in the whole monitoring period.

## 2 SAFEGUARDS

### 2.1 No Net Harm

There is no negative harm caused by the project implementation. Instead, it has several positive contributions both environmentally and socially. It used renewable energy, generates clean electricity and also provides job opportunities. The wastes that can be generated from the site are handled according to the national regulations.

One harm might be resulted from the domestic solid waste, wastewater and waste oil. However, all those wastes are handled according to the relevant regulation. Domestic solid wastes are kept at the site and collected by the municipality in regular periods. Domestic wastewater is, on the other hand, collected in a septic tank and disposed via sewage truck. Waste oil is disposed by the authorized disposal companies.

### 2.2 Local Stakeholder Consultation

Project is operational since 2013 and there is an ongoing communication with locals. Stakeholder consultation has been organized before project start date, details of which is given in PD. People around the region prefers face-to-face communication. Project manager is accessible by locals all the time. There is no problem encountered about the project/way of communication so far. If there is an input or grievance, locals can express them directly or via mukhtar.

Due to COVID-19 measures, a face- to-face site visit could not be held for project verification. Instead, an online meeting was conducted on 16/03/2021. The participants were site manager, villagers, mukhtar, project consultants and DOE. During the meeting, opinions of local people were asked and no grievance were received in this 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. In terms of regulation, staffs have been trained as per the requirements of their assignment and regulations. Trainings include occupational health and safety, working at height and dangerous work, working under high voltage. Details of the trainings organized for staff has been submitted to DOE.

### 2.3 AFOLU-Specific Safeguards

n/a

## 3 IMPLEMENTATION STATUS

### 3.1 Implementation Status of the Project Activity

The project has been in operation since 10/04/2013. Crediting period for the project will be 10 years. First crediting period is 10/04/2013-09/04/2023.

The project consultant has also been changed. Although it is stated as GAIA Carbon Finance (GAIA), the project was shifted to GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S. later.

### 3.2 Deviations

#### 3.2.1 Methodology Deviations

n/a

#### 3.2.2 Project Description Deviations

The source of the parameter “Quantity of net electricity delivered to the grid in year y” is given as “Market Financial Settlement Center (PMUM) records to be used in emission calculation figures. However, as PMUM system is not active anymore (PMUM to EPIAŞ took place on 12/03/2015)<sup>2</sup>, we have used EPIAS records for EG and ER calculations. The source for the cross-check of the amount of produced electricity is “Monthly Reports of OSF Forms” for each month.

The project consultant has also been changed. Although it is stated as GAIA Carbon Finance (GAIA), the project was shifted to GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S. during this verification period.

### 3.3 Grouped Projects

n/a

## 4 DATA AND PARAMETERS

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<sup>2</sup> <https://www.epias.com.tr/epias-kurumsal/tarihce/>

## 4.1 Data and Parameters Available at Validation

<b>Data / Parameter</b>	<b>FC<sub>i,y</sub></b>
<b>Data unit</b>	Ton (m <sup>3</sup> for Natural Gas)
<b>Description</b>	Amount of fossil fuel type i consumed in the project electricity system in year y
<b>Source of data</b>	Turkish Electricity Transmission Company (TEIAS) <a href="http://www.teias.gov.tr/istatistik2008/43.xls">http://www.teias.gov.tr/istatistik2008/43.xls</a> <a href="http://www.teias.gov.tr/istatistik2008/44.xls">http://www.teias.gov.tr/istatistik2008/44.xls</a>
<b>Value applied</b>	Please see Section 2.3
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available.
<b>Any comment:</b>	-

<b>Data / Parameter</b>	<b>NCV</b>																																			
<b>Data unit</b>	TJ/Ton (TJ/m <sup>3</sup> for Natural Gas)																																			
<b>Description</b>	Net calorific value of fossil fuel type																																			
<b>Source of data</b>	Turkish Electricity Transmission Company (TEIAS) <a href="http://www.teias.gov.tr/istatistik2008/45.xls">http://www.teias.gov.tr/istatistik2008/45.xls</a> <a href="http://www.teias.gov.tr/istatistik2008/46.xls">http://www.teias.gov.tr/istatistik2008/46.xls</a>																																			
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<b>Justification of choice of data or description of measurement methods and procedures applied</b>	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available.																																			
<b>Any comment:</b>	The conversion factor of 4.187 Joules/Cal is used.																																			

<b>Data / Parameter</b>	<b>EFCO<sub>2, i, y</sub></b>
<b>Data unit</b>	tCO <sub>2</sub> /GJ
<b>Description</b>	Default CO <sub>2</sub> emission factor of fossil fuel type i
<b>Source of data</b>	IPCC default values (as provided in Table 1.4, Chapter 1, Volume 2 (Energy), 2006 IPCC)

	Guidelines for National Greenhouse Gas Inventory) are used. Link: <a href="http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf">http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf</a>																																																																				
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<b>Justification of choice of data or description of measurement methods and procedures applied</b>	There is no information on the fuel specific default emission factor in Turkey. Hence, IPCC values have been used as per the "Tool to calculate the emission factor for an electricity system (version 02.01.0)".																																																																				
<b>Any comment:</b>	-																																																																				

<b>Data / Parameter</b>	<b>Electricity Imports</b>																							
<b>Data unit</b>	GWh																							
<b>Description</b>	Electricity imported to the Grid from other countries																							
<b>Source of data</b>	Turkish Electricity Transmission Company (TEIAS) <a href="http://www.teias.gov.tr/istatistik2008/23.xls">http://www.teias.gov.tr/istatistik2008/23.xls</a>																							
<b>Value applied</b>	<table border="1"> <thead> <tr> <th><b>Electricity generation (GWh)</b></th> <th>2007</th> <th>2008</th> <th>2009</th> </tr> </thead> <tbody> <tr> <td>Gross Electricity Production</td> <td>191.558,1</td> <td>198.418,0</td> <td>194.812,9</td> </tr> <tr> <td>Net Electricity Production</td> <td>183.339,7</td> <td>189.761,9</td> <td>186.619,3</td> </tr> <tr> <td>Net/Gross</td> <td>0,957</td> <td>0,956</td> <td>0,958</td> </tr> <tr> <td>Net Electricity Production from</td> <td>148.333,3</td> <td>156.768,3</td> <td>150.323,4</td> </tr> </tbody> </table>	<b>Electricity generation (GWh)</b>	2007	2008	2009	Gross Electricity Production	191.558,1	198.418,0	194.812,9	Net Electricity Production	183.339,7	189.761,9	186.619,3	Net/Gross	0,957	0,956	0,958	Net Electricity Production from	148.333,3	156.768,3	150.323,4			
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	Thermal Sources			
	Net Electricity Production incl. Mobile producers	148.333,3	156.768,3	150.323,4
	Imports	864	789	812
	Net Generated + Imports	149.197,6	157.557,7	151.135,4
	<b>Justification of choice of data or description of measurement methods and procedures applied</b>	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available.		
<b>Any comment:</b>				

<b>Data / Parameter</b>	<b>Capacity additions</b>
<b>Data unit</b>	Name of the plant; Installed capacity (MW); Fuel type; Commissioning date.
<b>Description</b>	Set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently.
<b>Source of data</b>	<p>Turkish Electricity Transmission Company (TEIAS) Generation units put into operation in 2004, 2005, 2006, 2007 and 2008. The Annex 2 of TEIAS Capacity Projection Reports for years 2008, 2007, 2006, 2005 and 2004 are applied for the capacity additions:</p> <p><a href="http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202005.pdf">http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202005.pdf</a> for year 2004.</p> <p><a href="http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf">http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf</a> for year 2005.</p> <p><a href="http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf">http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf</a> for year 2006</p> <p><a href="http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf">http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf</a> for year 2007</p> <p><a href="http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf">http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf</a> for year 2008</p>
<b>Value applied</b>	38.9 TWh which is 20 percent of the overall generation of 194.8 TWh.
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available.
<b>Any comment:</b>	

<b>Data / Parameter</b>	<b>EFgrid,CMy</b>
<b>Data unit</b>	tCO2/MWh
<b>Description</b>	Baseline emission factor: the combined emission factor of the project grid system
<b>Source of data</b>	Validated VCS Project Description (Version 6) of the Project.
<b>Value applied</b>	0.5556
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	"Tool to calculate the emission factor for an electricity system"
<b>Purpose of Data</b>	Baseline emission calculation
<b>Comments</b>	EFgrid,CMy value (0.5556 tCO2/MWh) is valid for the duration of the crediting period which is between 10/04/2013 and 10/04/2023

## 4.2 Data and Parameters Monitored

<b>Data / Parameter</b>	<b>EGfacility, y</b>	
<b>Data unit</b>	MWh	
<b>Description</b>	Quantity of net electricity delivered to the grid in year y.	
<b>Source of data</b>	EPIAS records and meter reading records-OSF forms	
<b>Description of measurement methods and procedures to be applied</b>	The produced and consumed electricity is continuously measured by the main and check meters attached to the power plant. This continuous measurement is recorded in a monthly basis. EPIAS records and meter reading records provides the exact electricity generation of the facility and the imports from the grid. EPIAS data are used for the quantity of net electricity delivered to the grid, and it has been cross checked with the meter reading records (OSF forms).	
<b>Frequency of monitoring/recording</b>	Continuous measurement and at least monthly recording	
<b>Value monitored</b>	For 92.7 months period, total generation has been 1,272,131.66 MWh. Average annually generation corresponds to 164,677.24 MWh.	
<b>Monitoring equipment</b>	Electric meters	
	<b>Egience I</b>	<b>Egience II</b>
<b>Brand</b>	ITRON	

	<b>Model</b>	SL761B071	
	<b>Standard/Class</b>	0.5s	
	<b>Serial Number</b>	Main: 65000771 Back-up: 65000770	Main: 65000772 Back-up: 65000773
<b>QA/QC procedures to be applied</b>	<p>Cross check measurements results with records for sold electricity. Calibration of the meters are valid for 10 years based on related regulation<sup>3</sup>. In addition to the meters which is used for billing purposes, records taken by meters using at project site is used for comparison. The meters also comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit. Maintenance and calibration of the metering devices are made by TEIAS. If there is a noticeable difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment is done before waiting for the periodical maintenance. In cases where electricity meters are regulated (e.g. the electricity is supplied to the electric grid), the electricity meter is subject to regular maintenance and testing in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements. The calibration of meters, including the frequency of calibration, should be done in accordance with national standards or requirements set by the meter supplier or requirements set by the grid operators. The accuracy class of the meters should be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.</p> <p>According to the test reports of meters, the meters of Eglence I HEPP were tested by TEIAS on 24/04/2015 and the meters of Eglence II HEPP were tested by TEIAS on 16/10/2018.</p>		
<b>Purpose of the data</b>	Baseline Emission Calculations		
<b>Calculation method</b>	EGFacility,y= EGexport,y- EGimport,y		
<b>Comments</b>	-		

<b>Data / Parameter</b>	<b>CapPJ</b>
<b>Data unit</b>	MW
<b>Description</b>	Installed capacity of the Eglence-I hydro power plant after the implementation of the project activity
<b>Source of data</b>	Project site
<b>Description of measurement methods and procedures to be applied</b>	Supplier information on the equipment

<sup>3</sup> [https://www.kayseri.bel.tr/uploads/yonetmelikler/olcu\\_ve\\_olcu\\_aletleri\\_muayne\\_yonetmeligi.pdf](https://www.kayseri.bel.tr/uploads/yonetmelikler/olcu_ve_olcu_aletleri_muayne_yonetmeligi.pdf)

<b>Frequency of monitoring/recording</b>	Yearly
<b>Value monitored</b>	42.65 MW
<b>Monitoring equipment</b>	N/A
<b>QA/QC procedures to be applied</b>	Supplier information on the related equipment and the existence of the equipment can be checked. Also this information can be checked from EPDK.
<b>Purpose of the data</b>	Baseline Emission Calculations
<b>Calculation method</b>	N/A
<b>Comments</b>	No change on the installed capacity with respect to project generation license

<b>Data / Parameter</b>	<b>CapPJ</b>
<b>Data unit</b>	MW
<b>Description</b>	Installed capacity of the Eglence-II hydro power plant after the implementation of the project activity
<b>Source of data</b>	Project site
<b>Description of measurement methods and procedures to be applied</b>	Supplier information on the equipment
<b>Frequency of monitoring/recording</b>	Yearly
<b>Value monitored</b>	26.00 MW
<b>Monitoring equipment</b>	N/A
<b>QA/QC procedures to be applied</b>	Supplier information on the related equipment and the existence of the equipment can be checked. Also this information can be checked from EPDK.
<b>Purpose of the data</b>	Baseline Emission Calculations
<b>Calculation method</b>	N/A
<b>Comments</b>	No change on the installed capacity with respect to project generation license

<b>Data / Parameter</b>	<b>APJ</b>
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<b>Data unit</b>	m <sup>2</sup>
<b>Description</b>	Area of the reservoir measured in the surface of the water for Eglence-I HEPP, after the implementation of the project activity, when the reservoir is full
<b>Source of data</b>	Project site
<b>Description of measurement methods and procedures to be applied</b>	Topographical surveys, GPS readings
<b>Frequency of monitoring/recording</b>	Yearly
<b>Value monitored</b>	Eglence I: 63,269.84 m <sup>2</sup>
<b>Monitoring equipment</b>	-
<b>QA/QC procedures to be applied</b>	The readings will be done during the period when the water flow is high to have the largest reservoir area
<b>Purpose of the data</b>	Project emission calculations
<b>Calculation method</b>	-
<b>Comments</b>	Maximum area is already calculated and confirmed through technical drawings. Annual measurements are not expected to be higher than this value.

<b>Data / Parameter</b>	<b>APJ</b>
<b>Data unit</b>	m <sup>2</sup>
<b>Description</b>	Area of the reservoir measured in the surface of the water for Eglence-II HEPP, after the implementation of the project activity, when the reservoir is full
<b>Source of data</b>	Project site
<b>Description of measurement methods and procedures to be applied</b>	Topographical surveys, GPS readings
<b>Frequency of monitoring/recording</b>	Yearly
<b>Value monitored</b>	Eglence II: 14,603.79 m <sup>2</sup>
<b>Monitoring equipment</b>	-

<b>QA/QC procedures to be applied</b>	The readings will be done during the period when the water flow is high to have the largest reservoir area
<b>Purpose of the data</b>	Project emission calculations
<b>Calculation method</b>	-
<b>Comments</b>	Maximum area has already been calculated and confirmed through technical drawings. Annual measurements are not expected to be higher than this value.

### 4.3 Monitoring Plan

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed Project within the crediting period is complete, consistent, clear and accurate.

There are three sets of data to be monitored during the project activity; quantity of net electricity delivered to the grid, installed capacity of the project after the implementation, and area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full. The generated electricity were measured continuously and reported in a monthly basis. During the monitoring period, EPIAS (former PMUM records) and meter reading records (OSF forms) were presented to the DOE, together with the calculation details. The installed capacity has not changed in the monitoring period. The maximum reservoir area has been defined in the project documents with the confirmation through technical drawings. There is no possibility that the reservoir level can exceed this level since the excess water will flow from spillway when the water level exceed maximum operating level.

In order to demonstrate the emission reduction, the required data is the net electricity delivered to the grid by the project activity. TEIAS has started to extract generation data from the facilities remotely through the EPIAS (previously PMUM system) which forms the basis for the billing. There is already an electricity meter installation and these records provided the data for the monthly invoicing to TEIAS. During the monitoring period EPIAS records were used as the source of calculation of electricity generation and emission reductions. Facility meter reading protocols-OSF forms and EPIAS records were compared for cross-check.

Net electricity generation was recorded by both TEIAS and project owners for billing purpose. Power Plant Manager was responsible for the electricity generated, gathering all relevant data and keeping the records. The procedures to collect data were in line with the TEIAS requirements and rules. Should nonconformity was identified; the plant manager was responsible for communication with TEIAS and undertaking the corrective action in line with the TEIAS procedures and rules if it fell under the authority of the plant manager. However, this might need the involvement of TEIAS as well as the project owners were not allowed to make changes or fixes on the meters. Thus, in case of non-conformity, the plant manager will report it instantly to TEIAS.

Generation data collected during crediting period was submitted to GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S. who is responsible for calculating the emission reduction subject to

verification. Generation data was used to prepare monitoring reports which were used to determine the vintage from the project activity. These reports were submitted to the duly authorized and appointed Designated Operational Entity 'DOE' before each verification period.

VER Team Members is expected to include the following staff of the HEPP:

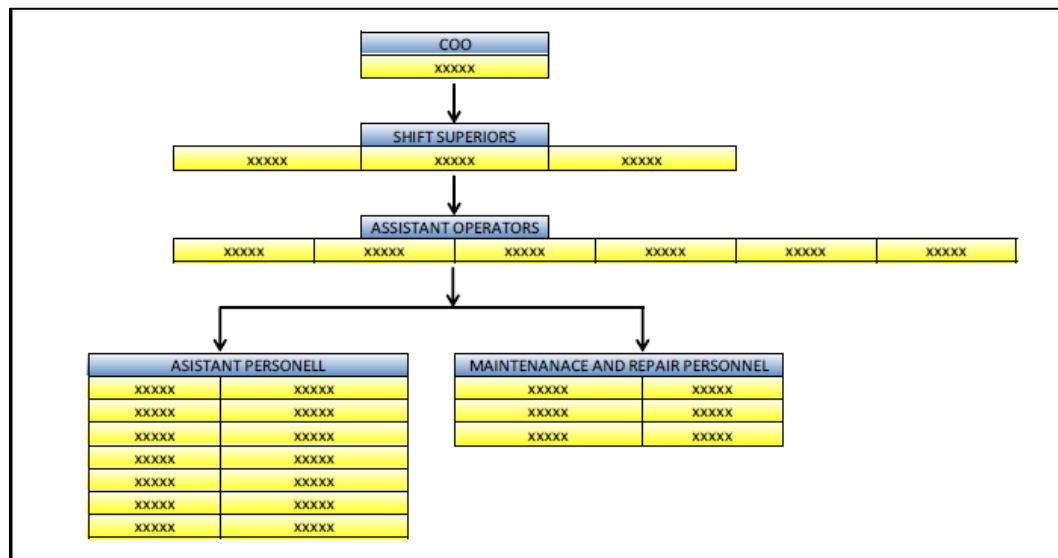
**Plant Engineers (Electrical and mechanical):** Responsible for the specific actions required by the monitoring plan; control of the electricity supplied to the grid and imported from the grid with TEIAS, and of devices.

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

**Operations Manager:** the VER coordinator, responsible for developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures.

**GTE KARBON SURDURULEBILIR ENERJI EGT. DAN. VE TIC. A.S.:** Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Each period, the monitoring report is submitted to DOE for the verification. The report covers the monitoring of grid-connected power generation, check report; report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc. All data collected as part of monitoring is archived electronically and kept at least for 2 years after the end of the last crediting period. The company establishes a dedicated maintenance system to ensure the data availability for the required period.



**Figure 2. Site Organizational Chart**

There are two meters attached to the power plant for measurement of the generated electricity. One of the meters is main meter and the other is back-up meter. The role of the second meter is to check if the main meter measures the generated electricity accurately. Generation data were recorded by

these main and back-up metering devices continuously. EPIAS data is obtained remotely by TEIAS and includes grid loss. Meter reading records and EPIAS data are used for cross-check. The internal consumption of the facility was subtracted from the gross generation.

Serial numbers of the main meters and back-up meters for Egłence I-II HEPP are tabulated below. First index protocol date of the Egłence II HEPP meters was 03/03/2013. The meters in Egłence I HEPP were commissioned on 20/04/2013. According to the test reports of meters, the meters of Egłence I HEPP were tested by TEIAS on 24/04/2015 and the meters of Egłence II HEPP were tested by TEIAS on 16/10/2018. Those meter info is given in Table 4.

**Table 4. Meter Properties**

	<b>Egłence I</b>	<b>Egłence II</b>
<b>Brand</b>	ITRON	
<b>Model</b>	SL761B071	
<b>Standard/Class</b>	0.5s	
<b>Serial Number</b>	Main: 65000771 Back-up: 65000770	Main: 65000772 Back-up: 65000773

The meters exist were also changed on 22/05/2021. Although it is not done during this monitoring period, the info of the existing meters are given below.

**Table 5. Meter Properties**

	<b>Egłence I</b>	<b>Egłence II</b>
<b>Brand</b>	EMH	
<b>Model</b>	LZQJ-XC	
<b>Standard/Class</b>	0.5s	
<b>Serial Number</b>	Main: 9798953 Back-up: 9798954	Main: 9798955 Back-up: 9798956

Calibration of the metering devices has been made by TEIAS and sealed before the commissioning of the power plant. The installed meters are in line with the regulations.

26 people are working in the project in total. Egłence I employs 14 staff while Egłence II employs 12.

## 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 5.1 Baseline Emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:

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

$EF_y$  = Combined Margin CO<sub>2</sub> emission factor (tCO<sub>2</sub>/MWh), which is 0.5556 tCO<sub>2</sub>/MWh in the VCS PDD.

<b>EG<sub>y</sub></b>	<b>Net Generation (MWh)</b>	1,272,131.66
<b>EF<sub>y</sub></b>	<b>Emission Factor (tCO<sub>2</sub>/GWh)</b>	555.6
<b>BE<sub>y</sub></b>	<b>Gross Total Emission Reduction (tCO<sub>2</sub>) During Monitoring Period</b>	706,792
<b>ER<sub>y</sub></b> Apr(10 <sup>th</sup> )-Dec 2013	<b>Emission reductions in 2013 (vintage)</b>	8,940
<b>ER<sub>y</sub></b> Jan-Dec 2014	<b>Emission reductions in 2014 (vintage)</b>	57,604
<b>ER<sub>y</sub></b> Jan-Dec 2015	<b>Emission reductions in 2015 (vintage)</b>	97,242
<b>ER<sub>y</sub></b> Jan-Dec 2016	<b>Emission reductions in 2016 (vintage)</b>	54,832
<b>ER<sub>y</sub></b> Jan-Dec 2017	<b>Emission reductions in 2017 (vintage)</b>	109,369
<b>ER<sub>y</sub></b> Jan-Dec 2018	<b>Emission reductions in 2018 (vintage)</b>	117,636
<b>ER<sub>y</sub></b> Jan-Dec 2019	<b>Emission reductions in 2019 (vintage)</b>	129,055
<b>ER<sub>y</sub></b> Jan-Dec 2020	<b>Emission reductions in 2020 (vintage)</b>	132,114

Spread sheet used for calculations have been provided. Efy has been calculated in VCS PDD. EGY has been calculated from EPIAS records and meter reading records-OSF forms are used for cross check.

## 5.2 Project Emissions

### *Emissions from the reservoir*

The choice of methodology ACM0002 / Version 13 0.0 is justified as the proposed project activity meets relevant applicability criteria:

- Eglence I-II HEPP Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources and which supplies electricity to a system that is supplied by at least one fossil fuel fired generating unit,
- The project activity results in a very small reservoir to balance the water flow to the power house (before the diversion weir). In addition, the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 / Version 13 0.0, is much greater than 4 W/m<sup>2</sup> as calculated in section 1.3 “Estimated amount of emission reductions over the crediting period including project size” of this PDD,
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available as “Description of how the baseline scenario is identified and description of the identified baseline scenario” of this PDD,
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity,
- The project involves construction of new units in a brand new plant, in other words the project does neither involve the addition of renewable energy generation units at an existing renewable power generation facility nor does it foresee to retrofit or modify an expired facility of renewable energy generation.

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \text{Equation (7)}$$

Where:

$PD$	=	Power density of the project activity (W/m <sup>2</sup> )
$Cap_{PJ}$	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
$Cap_{BL}$	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
$A_{PJ}$	=	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m <sup>2</sup> )
$A_{BL}$	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m <sup>2</sup> ). For new reservoirs, this value is zero

Where installed capacity is 68.65 MWe (42.65 MWe for Eđlence I and 26 MWe for Eđlence II) and the area of reservoir is 77,783.63 m<sup>2</sup> (63,269.84 m<sup>2</sup> for Eđlence I and 14,603.79 m<sup>2</sup> for Eđlence II). For new hydro power projects, CapBL and ABL is zero.

Therefore;

$$PD_{\text{Eđlence I}} = (42,650,000 - 0) / 63,269.84 - 0 = 674 \text{ W/m}^2$$

$$PD_{\text{Eđlence II}} = (26,000,000 - 0) / 14,603.79 - 0 = 1,780 \text{ W/m}^2$$

Since the power density of the project greater than 10 W/m<sup>2</sup>, project emissions from reservoir is accepted as zero.

### 5.3 Leakage

The approved PD takes project emissions as zero according to the ACM0002:

“Potential leakage emissions in the context of power sector projects are emissions that arise from the project activities such as power plant construction, fuel handling and land inundation. According to ACM0002 / Version 10, such emissions do not need to be taken into account.” Leakage is therefore considered as “0”.

### 5.4 Net GHG Emission Reductions and Removals

Total Emission Reduction has been determined as;

$$ER_y = BE_y - PE_y - LE_y$$

Where;

ER<sub>y</sub> = Emission reductions in year y (tCO<sub>2</sub>)

BE<sub>y</sub> = Baseline emissions in year y (tCO<sub>2</sub>)

PE<sub>y</sub> = Project Emissions in year y (tCO<sub>2</sub>)

LE<sub>y</sub> = Leakage emissions in year y (tCO<sub>2</sub>)

The project emissions and leakage is considered as “0”.

Thus, ER<sub>y</sub> = BE<sub>y</sub>

<b>EGy</b>	<b>Net Generation (MWh)</b>	1,272,131.66
<b>EFy</b>	<b>Emission Factor (tCO<sub>2</sub>/GWh)</b>	555.6
<b>BEy</b>	<b>Gross Total Emission Reduction (tCO<sub>2</sub>) During Monitoring Period</b>	706,792
<b>PEy</b>	<b>Project Emissions(tCO<sub>2</sub>)</b>	0
<b>LEy</b>	<b>Leakage Emissions</b>	0
<b>ERy</b>	<b>Net Emission Reduction (tCO<sub>2</sub>) During Monitoring Period</b>	706,792

Thus, the emission reduction (in tonnes CO<sub>2</sub>) for the years between April 2013 and December 2020 is calculated as given in table below.

**Table 5. Summary of Emission Reductions**

<b>Year</b>	<b>Baseline emissions or removals (tCO<sub>2</sub>e)</b>	<b>Project emissions or removals (tCO<sub>2</sub>e)</b>	<b>Leakage emissions (tCO<sub>2</sub>e)</b>	<b>Net GHG emission reductions or removals (tCO<sub>2</sub>e)</b>
2013 April-Dec	8,940	0	0	8,940
2014 Jan-Dec	57,604	0	0	57,604
2015 Jan-Dec	97,242	0	0	97,242
2016 Jan-Dec	54,832	0	0	54,832
2017 Jan-Dec	109,369	0	0	109,369
2018 Jan-Dec	117,636	0	0	117,636
2019 Jan-Dec	129,055	0	0	129,055
2020 Jan-Dec	132,114	0	0	132,114
<b>Total (92.7 months)</b>	<b>706,792</b>	<b>0</b>	<b>0</b>	<b>706,792</b>

Total emission reductions realized as 706,792 tCO<sub>2</sub> for this monitoring period. When the estimated electricity generation figure of the power plant for each year in the validated VCS PDD (205,299 MWh/yr) is considered, the total emission reductions should be approximately 881,582 tCO<sub>2</sub> (Table 6) for between the April 2013 and December 2020. The percent difference by considering the whole monitoring period is calculated as 20% for both emission reduction and electricity generation which means that the project reduced 20% less tCO<sub>2</sub> than expected (and 20% less electricity than expected).

Since, 2014 and 2016 years were dry, the realized figure is a bit lower than the estimated annual figure. Additionally, the flooding incidents occurred in Eglence-I in 2018 and Eglence-II in 2019, affected the generation of the facility for a while. Appraiser's reports for these incidents have been provided. This relatively low generation also led to lower emission reduction between April 2013 and December 2020, but there is no problem with the efficiency of the power plant.

**Table 6. Estimated Baseline Emission Reductions between 2013-2020**

Year	Net Electricity Supplied to the Grid (MWh)	Emission reductions (tCO <sub>2</sub> e)
2013*	149,615	83,127
2014	205,299	114,065
2015	205,299	114,065
2016	205,299	114,065
2017	205,299	114,065
2018	205,299	114,065
2019	205,299	114,065
2020	205,299	114,065
<b>Total</b>	<b>1,586,708</b>	<b>881,582</b>

\* Commissioning dates of Eglence-I and Eglence-II are different. Eglence-II has been commissioned at 10.04.2013 and after the 2 months Eglence-I has started to generation (13.06.2013).