

DARICA-1 99 MW HYDRO POWER PLANT PROJECT, TURKEY

Yapısan Elektrik Üretim Anonim Şirketi

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1 PROJECT DETAILS

1.1 Summary Description of Project

DARICA-1 99 MW Hydro Power Plant Project, Turkey (subsequently the “Project”) has 112.42 MW of total installed capacity and is located in Mesudiye district, Ordu province, Turkey (subsequently the “Host Country”). Yapısan Elektrik Üretim Anonim Şirketi (translation: Yapısan Power Generation Company Incorporated) is the project owner and developer (subsequently referred to as the “Project Developer”).

The generation capacity of the project was initially designed as 99 MW, however during the operation phase the capacity of the project was increased to 112.42 MW (2 x 56.21 MW turbines) and the generator capacity was increased to 110.32 MWe (2 x 55.16 MW)¹. Accordingly, the expected annual electricity generation was also increased to 410,000 MWh². This is accomplished with the manufacturer’s assistance, by adjusting the turbines to their maximum limits. To accommodate this increase, the electricity production license was renewed and the EIA was updated with an additional report submitted to Ordu Provincial Directorate of Environment and Forestry. The EIA exemption certificate was granted to the project, and the capacity increase completed. Please refer to Section 5.2 (below) for a discussion of how this change to the project design impacted the Project additionality.

The purpose of the Project is to export the generated electricity to the regional grid, thereby contributing to the Turkey’s electricity demand and rapidly growing economy. Since the Project generates electricity from renewable energy resources, it makes a significant contribution to climate protection. According to the validated PDD, the Project (at 99 MW capacity) was expected to generate ca. 327,690 MWh of electricity annually, and to reduce 209,722 tonnes of CO₂ emissions per year, by supplying renewable energy that would have been supplied by the existing power grid that generates electricity predominantly from fossil fuel powered thermal power plants.

Darica-1 HEPP is fed by the Karica Diversion Regulator which diverts the water used by the state owned Topçam HEPP upstream to Darica-1 HEPP. The water is conveyed from the Karica Regulator to the plant site by means of the transmission tunnel and penstock. The power generated is transmitted to the switchgear area (approximately 1.3 km upstream) by transformers and then is fed to the national grid. The process flow chart may be referred to in Figure 1 (below).

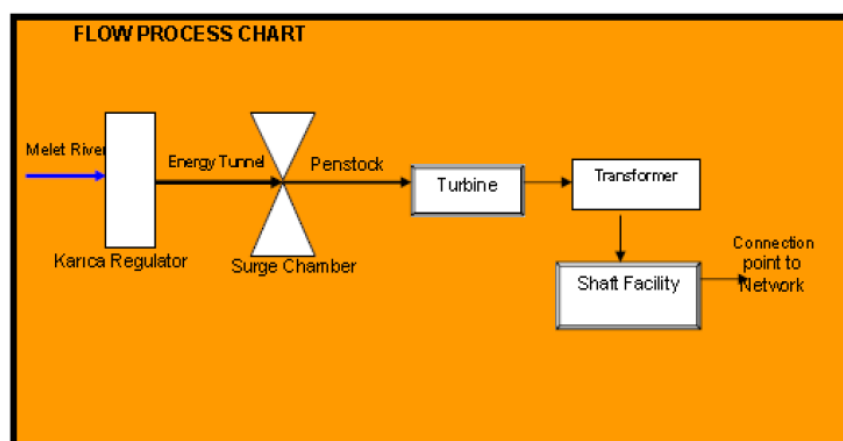


FIGURE 1 - Process flow chart

¹ The values listed are all per the electricity production license, whereas, each generator nameplate indicates 56,000 kVA at a 0.9 load factor, which corresponds to 50.4 MWe per generator, totalling 50.4 MWe x 2 = 100.8 MWe for the plant.

² Per updated 112.42 MW generation license.

The Project is constructed on the Melet River in the Mesudiye district, Ordu Province, 4 km Northeast of Topçam District, on the tail water downstream of the Topçam Hydroelectric Power Plant. The Melet River flows in a Northerly direction and has a length of ca. 165 km. The annual mean flow rate, fed by snow and rain water, is 27 m³/sec. The region has steep topography and the altitude of the catchment area extends to 1,469 meters. The river itself falls from 650 meters to 335 meters at the Project site.

Project construction commenced in April 2007, and the first turbine began operating on 10/10/2009. On 23/12/2009, the second turbine began operating, and the Project has been operational since.

This third monitoring period covers the 12 months from 01/01/2012 to 31/12/2012 (both days included). Total emission reductions achieved in this period are 175,228 tons of CO₂e.

1.2 Sectoral Scope and Project Type

Sectoral Scope: Energy (Renewable / Non-Renewable), Not a Grouped Project

1.3 Project Proponent

Yapısan Elektrik Üretim Anonim Şirketi is the project developer, owner and operator, and is responsible for gathering the Monitoring Data.

Organization:	Yapısan Elektrik Üretim Anonim Şirketi
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Represented by:	
Title:	Vice President
Salutation:	Mr.
Last name:	Bilgin
Middle name:	Tolga
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J.P. Morgan Ventures Energy Corporation is the buyer of the emission reductions and is responsible for writing the Monitoring Report and submitting to the DOE.

Organization:	J.P. Morgan Ventures Energy Corporation
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Street/P.O.Box:	Floor 3 (BS03-0300), 25 Bank Street, Canary Wharf
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1.4 Other Entities Involved in the Project

No other entities are involved in the project.

1.5 Project Start Date

10/10/2009

1.6 Project Crediting Period

According to the validated PDD, the expected commissioning date was defined as July 2009. Due to delays in implementing the project, the Monitoring Period has started on the 10th of October 2009.

Start: 10/10/2009

End: 09/10/2019

10-years fixed crediting period.

1.7 Project Location

The Power Plant is located on the Melet River in the Mesudiye District of Ordu Province (12 km Northeast of Topçam) in the Northern Black Sea region of Turkey.

The Turbine House has latitude 40° 43' 51 N and longitude 37° 51' 30 E.

1.8 Title and Reference of Methodology

"Consolidated baseline methodology for grid connected electricity generation from renewable sources" (ACM0002 version 7)

The above methodology is hereafter referred to as the "Baseline Methodology". The Baseline Methodology is used in conjunction with the approved monitoring methodology ACM0002 version 7 (subsequently referred to as "Monitoring Methodology").

The monitoring report also draws upon the:

- “Tool for assessment and demonstration of additionality”, Version 5.2
- “Tool to calculate the emission factor for an electricity system”, Version 01

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The Darica-1 HEPP started to generate and provide electricity to the Turkish National Grid on 10/10/2009 when the first turbine (49.5 MW power capacity) became operational. The second 49.5 MW turbine came into operation on 23/12/2009, and the HEPP has remained operational since.

On 17/06/2010 following the approval of EMRA³, the power plant capacity was increased to 112.42 MW (2 x 56.21 MW turbines) and the generator capacity was increased to 110.32 MW (2 x 55.16 MW). On 26/07/2011 the capacity increase was accepted by the Ministry of Energy and Natural Resources.

Despite the capacity change, the “Power Density” of the project activity remains greater than 4W/m², and the project is still eligible under ACM0002.

The new power density of the project based on designed reservoir area⁴ value is calculated as follows⁵:

$$\begin{array}{rcl} \text{Installed Capacity} & \div & \text{Reservoir Area} = \text{Power Density} \\ 100,800,000 \text{ W} & \div & 104,000 \text{ m}^2 = 969 \text{ W/m}^2 \end{array}$$

Since the project power density is very high (>10), CH₄ emissions are not considered among project emissions⁶.

The realised reservoir area is 114,800 m² and the power density calculated according to that value is:

$$\begin{array}{rcl} \text{Installed Capacity} & \div & \text{Reservoir Area} = \text{Power Density} \\ 100,800,000 \text{ W} & \div & 114,800 \text{ m}^2 = 878 \text{ W/m}^2 \end{array}$$

The realised power density is ca. 9.4% less than estimated. Despite this change, the power density is much higher than 10 (and 4) W/m², and the project is eligible and not expected to emit significant amounts of CH₄.

During the monitoring period, there was no event or situation that occurred, which may impact the applicability of the methodology. Maintenance and repairs that occurred during this monitoring period are summarised in Table 1 (below).

Date	Equipment details	Maintenance Period
04/01/2012	Unit 1 Transformer Main Panel Heater	Breakdown

³ Energy Market Regulatory Authority

⁴ Reservoir Area per technical specifications of EIA (as approved by the Ministry of Environment and Forestry).

⁵ Based on the conservative generator capacity value – refer to footnote 1.

⁶ Please refer to pg.9 of the validated PDD.

27/02/2012	Unit 1 Adjustment Blade	Weekly
09/03/2012	Transformer Fire Extinguishing System	As required
12/04/2012	Open substation grounding cables	As required
20/04/2012	Regulator 16A Fuse	As required
15/05/2012	Regulator Garbage Collection Machine	Revision
18/06/2012	Crane External Cable	Breakdown
06/07/2012	Oil Leakage in Unit II Brake Block No.4	Cleaning
06/08/2012	Fire Pump in Power House	Breakdown
19/09/2012	Unit 1 No.5 Adjustment Blade	Revision
25/09/2012	Unit 1 Pressurised Oil Tank Cooling System	Cleaning
01/12/2012	Oil Leakage in Unit I Turbine Bearing	Repair
29/12/2012	Power House Ventilation Device	Breakdown

TABLE 1 - Major Maintenance and Repair events during the third monitoring period

2.2 Project Description Deviations

For the parameter EG_y (Net Electricity generated and delivered to the grid by the power plant in year y), the monitoring plan in the validated PDD implies the use of "Metering devices measuring the electricity generated at the exit of the plant and cross checked with invoices prepared for billing the transmission company". However due to a regulatory change the invoices no longer contain data regarding the quantity of electricity produced. Therefore in lieu of the invoices, the data output of the official Market Financial Reconciliation Center (MFRC/PMUM) is utilised. The MFRC/PMUM⁷ is a unit within TEİAŞ⁸ that is responsible for the financial settlement system (on this and other grid-connected privately held power facilities in Turkey) by calculating amounts payable/receivable for market participants via a complex mechanism.

The electricity generated is metered by TEİAŞ by two meters placed on the switchgear station, where the plant is connected to national grid. Those meters provide official data which is read and recorded monthly by TEİAŞ officers for invoicing (as of January 2012, this data recording is done automatically and processed by MFRC/PMUM (Market Finance Reconciliation Centre). Till December 2011, an authorized person from TEİAŞ was coming to the project site to read the main meters and back up meters at the end of each month; and accordingly create a protocol which clearly stated the net electricity generation and plant's energy consumption values. Starting from January 2012, the meter data is recorded electronically. This new system is called OSOS (Automatic Meter Reading System). In this system, TEİAŞ is not coming to the site to read the meters but has a remote connection to the main meter which is still sealed at the project site. However, every month (till July 2012) project owner's representative went to TEİAŞ at the end of the month to take the originally signed hard copy of the meter protocol.

⁷ <http://pmum.teias.gov.tr/UzlasmaWeb/>

⁸ www.teias.gov.tr

However, starting from August 2012, TEİAŞ no longer provide any originally signed hard copy but provides access to OSOS database from where the monthly generation details can be located. Thus duly signed hard copies of the monthly meter protocols till the end of July 2012 and the screenshots of OSOS (Automatic Meter Reading System) which shows the monthly meter records from August 2012 are used to substantiate the electricity generation by the project activity.

2.3 Grouped Project

Not Applicable

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	$FC_{i,y}$
Data unit:	m ³ or tonnes
Description:	Amount of fossil fuel type i consumed by the Project electricity system
Source of data:	TEİAŞ web page (www.teias.gov.tr)
Value applied:	See baseline calculation
Purpose of the data:	Baseline emissions
Any comment:	Data is published by the transmission company (TEİAŞ) annually. It will be used once for the crediting period

Data Unit / Parameter:	$NCV_{i,y}$
Data unit:	TJ/kt
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data:	Calculated for Turkish grid using TEİAŞ data (www.teias.gov.tr)
Value applied:	Depends on fossil fuel type. Please refer to PDD (e.g. hard coal, imported coal, lignite, fuel oil, diesel oil, LPG, naptha, or natural gas)
Purpose of the data:	Baseline emissions
Any comment:	Applied in the calculation of the simple OM, where fuel consumption data is available for all power plants.

Data Unit / Parameter:	$EFCO_{2\ i, y}$
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor of fossil fuel type i in year y
Source of data:	2006 IPCC Guidelines for National Greenhouse Inventories
Value applied:	Between 0.0543 and 0.0946 depending on type of fuel – defined in PDD.

Purpose of the data:	Baseline emissions
Any comment:	Applied in the calculation of the simple OM, where fuel consumption data is available for all power plants.

Data Unit / Parameter:	EFCO _{2y}
Data unit:	tCO ₂ /t
Description:	CO ₂ emission factor of fossil fuel type i in year y
Source of data:	2006 IPCC Guidelines for National Greenhouse Inventories
Value applied:	3.239 tonnes CO ₂ per tonne fuel
Purpose of the data:	Project emissions
Any comment:	Fossil fuel used in Standby generator

3.2 Data and Parameters Monitored

Data Unit / Parameter:	EGy
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the power plant in year y
Source of data:	TEİAŞ installed electricity meters
Description of measurement methods and procedures to be applied:	Measured and recorded with the Monitoring Equipment detailed herein
Frequency of monitoring/recording:	Continuous
Value monitored:	273,799.39 MWh
Monitoring equipment:	- TR-1: Main Electricity Meter 1 (bi-directional) Make & model: Elster A1500-W043 Serial #: 361509 Official code: 11047 Accuracy Class: 0.2s Last calibrated: 06/02/2008 Valid till: 05/02/2018 - Back-up Electricity Meter (bi-directional) Make & model: Elster A1500-W043 Serial #: 361510 Accuracy Class: 0.2s Last calibrated: 06/02/2008 Valid till: 05/02/2018 - TR-2: Main Electricity Meter 2 (bi-directional) Make & model: Elster A1500-W043 Serial #: 364713 Accuracy Class: 0.2s Official code: 11048

	Last calibrated: 02/04/2008 Valid till: 01/04/2018 Back-up Electricity Meter (bi-directional) Make & model: Elster A1500-W043 Serial #: 364714 Accuracy Class: 0.2s Last calibrated: 02/04/2008 Valid until: 01/04/2018 Line diagram illustrating meters' positions is provided in Annex-1.
QA/QC procedures to be applied:	Two main bi-directional electricity meters are backed up by two auxiliary bi-directional meters. The maintenance and calibration of the meters has also been undertaken by TEİAŞ who ensure the accuracy and quality of the measurements. In accordance with Article 9 (b) of the "Inspection of Measurement and Measuring Equipments Regulation"⁹, published in Turkish Official Gazette dated 24/07/1994 and No. 22000, the maintenance and calibration of meters should be undertaken every 10 years. If the difference between the readings of the main meter(s) and auxiliary meter(s) exceeds 0.2%, maintenance and calibration will be undertaken before waiting for the calibration period to end.
Calculation method:	N/A
Any comment:	

Data Unit / Parameter:	PE _{FC,j,y}
Data unit:	tCO ₂ /yr
Description:	CO ₂ emissions from fossil fuel combustion in process j during the year y
Source of data:	As per the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion"
Description of measurement methods and procedures to be applied:	Onsite logs and measurements
Frequency of monitoring/recording:	Continuous
Value monitored:	3.20 tCO ₂
Monitoring equipment:	Site Log Book
QA/QC procedures to be applied:	As per the "Tool to calculate project or leakage"

⁹ <http://www.mevzuat.adalet.gov.tr/html/21179.html>

	CO ₂ emissions from fossil fuel combustion"
Calculation method:	As per the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion"
Any comment:	

Data Unit / Parameter:	FC _{i,y}
Data unit:	tonne diesel/yr
Description:	Mass or volume unit per year (tonne diesel/yr)
Source of data:	1. (a) Auxiliary diesel generator consumption is recorded, and the annual volume of fuel consumed is summed and (conservatively) rounded up to the nearest whole litre; OR (b) Auxiliary diesel generator operating hours are recorded, and annual operating hours summed and (conservatively) rounded up to the nearest whole hour. Total hours are multiplied by diesel fuel consumption (31 L at 50% load factor) as described in the ACQ 350 AKSA Diesel generator specs sheet; For conservativeness, the higher value between (a) and (b) above is employed in the Project emissions calculations. 2. Mass is calculated based on the following formula: • $M = dV$ where: • $M = \text{Mass [kg]}$ • $d = \text{average density of diesel fuel (0.845 kg/L}^{10})$ • $V = \text{Volume [litres, L]}$ The Mass [kg] is converted to tonnes (by dividing by 1,000).
Description of measurement methods and procedures to be applied:	As per source of data above
Frequency of monitoring/recording:	When generator is used
Value monitored:	1169.41 L of diesel usage 1169.41 L x 0.845 kg/L = 988.15 kg = 0.988 tonnes Diesel Fuel
Monitoring equipment:	Onsite logs and measurements
QA/QC procedures to be applied:	Calculated amount is cross-checked against Project on-site log books and the fuel invoice.

¹⁰ <http://www.tupras.com.tr/detailpage.en.php?strProductKey=403&IRedirectPageID=1145>

Calculation method:	As per the "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion"
Any comment:	

Data Unit / Parameter:	NCV _{i, y}
Data unit:	GJ per mass or volume unit (GJ/tonne)
Description:	Weighted average net calorific value of fuel type i in year y
Source of data:	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Description of measurement methods and procedures to be applied:	Default values are used
Frequency of monitoring/recording:	Default values are used
Value monitored:	43.3 GJ/tonne (default value used for calculations - does not change throughout monitoring period)
Monitoring equipment:	Default IPCC value is used. Any future revision of the IPCC Guidelines will be taken into account
QA/QC procedures to be applied:	Not Applicable as default value of the IPCC guidelines is utilised
Calculation method:	Not Applicable as default value of the IPCC guidelines is utilised
Any comment:	Applicable as option B of the Methodological tool "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion" (Version 02) is chosen.

Data Unit / Parameter:	EF _{CO₂, i, y}
Data unit:	kgCO ₂ /GJ
Description:	Weighted average CO ₂ emission factor of fuel type i in year y
Source of data:	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Description of measurement methods and procedures to be applied:	Default values are used
Frequency of monitoring/recording:	When generator is used
Value monitored:	74.80 kgCO ₂ /GJ (default value used for calculations - does not change throughout the

	monitoring period)
Monitoring equipment:	Default IPCC value is used. Any future revision of the IPCC Guidelines will be taken into account
QA/QC procedures to be applied:	Not Applicable as default value of the IPCC guidelines is utilised
Calculation method:	Not Applicable as default value of the IPCC guidelines is utilised
Any comment:	Applicable as option B of the Methodological tool "Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion" (Version 02) is chosen.

Data Unit / Parameter:	CapPJ
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Generator nameplate(s)
Description of measurement methods and procedures to be applied:	Installed Capacity of generators
Frequency of monitoring/recording:	Yearly recording
Value monitored:	100,800,000 W
Monitoring equipment:	Installed capacity of generators from nameplate
QA/QC procedures to be applied:	Amount indicated in the licence is cross-checked against relevant technical specification. Nameplate observed on site.
Calculation method:	The individual generator capacities are calculated per product of nameplate values for rated output and power factor. The result for one generator is added to the result for the second generator (which is identical).
Any comment:	

Data Unit / Parameter:	APJ
Data unit:	m ²
Description:	Area of the reservoir measured on the surface of the water after the implementation of the project activity when the reservoir is full.
Source of data:	Monitored and measured
Description of measurement methods and procedures to be applied:	The area on the map is measured using a millimetre paper, determining the approximate area with respect to the scale.
Frequency of monitoring/recording:	Once at the initial verification

Value monitored:	114,800 m ²
Monitoring equipment:	Mapping
QA/QC procedures to be applied:	-
Calculation method:	The area on the map is measured using a millimetre paper, determining the approximate area with respect to the scale.
Any comment:	-

3.3 Description of the Monitoring Plan

The Monitoring methodology applied to the Project is ACM0002 version 7, “Approved consolidated baseline and monitoring methodology for grid connected electricity generation from renewable resources”

The amount of net electricity generated by the plants is monitored in order to demonstrate the emission reductions. In addition, fuel consumption by the auxiliary equipment (i.e. diesel generator) is also considered in the calculations. Monthly generation data is measured and recorded by both TEİAŞ and the Project Manager. Data is recorded in an Excel workbook and kept in electronic and paper form, both at the project site and at the Project Developer’s Head Office in Ankara.

The annual Project emission reductions are calculated by multiplying the net electricity generated and combined margin emission factor. The process of verification of the Project will be followed up by JP Morgan Ventures Energy Corporation.

The Plant Manager is responsible for maintenance of credible, transparent, and adequate data estimation, measurement, collection, and tracking systems of the net electricity generation of the plant. Such records are provided to the selected DOE to verify project performance, as part of the verification process.

Emission reductions by the project activity are calculated using electricity generated by Darıca-1 HPP. This electricity displaces the power generated by other plants in the grid. An Excel spreadsheet is used to calculate emission reductions from the renewable electricity generated.

Gross and net electricity production is measured, recorded monthly through two high precision bi-directional measuring devices sealed and controlled by TEİAŞ, and recorded in the Excel workbook. TEİAŞ is the electricity distribution company and electricity buyer. The preceding is per TEİAŞ regulations.

The electricity generation is electronically recorded by the two main bi-directional meters and two back-up bi-directional meters that belong to TEİAŞ. Official data is obtained from the control room meters, and is remotely read by an authorised person (assigned by TEİAŞ) at the end of each month. The data of automatic meter reading system forms the basis for monthly invoicing to TEİAŞ.

In accordance with Article 9 (b) of the “Inspection of Measurement and Measuring Equipments Regulation” which was published in Turkish Official Gazette dated 24/07/1994 and No. 22000, the maintenance and calibration of meters should be undertaken every 10 years.

In the event that the accuracy of metering devices is less than 0.2%, a test is carried by TEİAŞ officers, and if required, the calibration and maintenance of the meters is carried out by TEİAŞ. If the accuracy passes the 0.2% range the meters are re-calibrated. Other than this, under normal conditions the calibration is repeated every 10 years. The calibration, type of the meters allowed to be used in power plants, and their accuracy class (which is 0.2S) are determined by the communiqué on the Electricity

Meters declared by EMRA (Electricity Market Regulatory Agency). According to this communiqué the electricity meters have to be in compliance with the IEC-EN 60687 Standard.

Electricity produced is sold to TEİAŞ using a system called PMUM/MFRC¹¹. Under this system, TEİAŞ reconciles demand and supply, and buys electricity from the producers. At the end of the month the electricity sold from each power plant of Yapısan Elektrik Üretim A.Ş. is summed up under one monthly invoice. Therefore, the invoices do not exhibit the monthly electricity production data by the Darıca-1 HPP alone. However, monthly PMUM data can be used to cross-check electricity production data.

The Project stand-by generator's fuel consumption is monitored by volume of fuel consumed which is recorded in the Project on-site log books with the fuel invoice. The amount utilised in tonnes is calculated by multiplying the litres used and density of the fuel declared by the TUPRAŞ refinery (the sole distributor of standard diesel fuel in Turkey). This data is compared with the sampled plant daily electricity consumption values, and shows that the estimate is conservative. Emissions from the generator are calculated by multiplying the annual fuel consumption with the NCV and EF values for diesel. This is used to calculate the project emissions, which do not include CH₄ emissions from the reservoir, since the Project's power density is ca. a hundred times larger than 10. Hence CH₄ emissions from the reservoir are negligible (as per p. 9 of the validated PDD).

The Plant Manager is responsible for electricity generation in the plant, and is assisted by mechanical and electrical engineers as seen in Figure 4 (below). All relevant data is recorded by the Plant Manager on a monthly basis. Data (in electronic and paper form) is kept by the Project owner, both at the project site and at the Head Office in Ankara for two years following the completion of the crediting period.

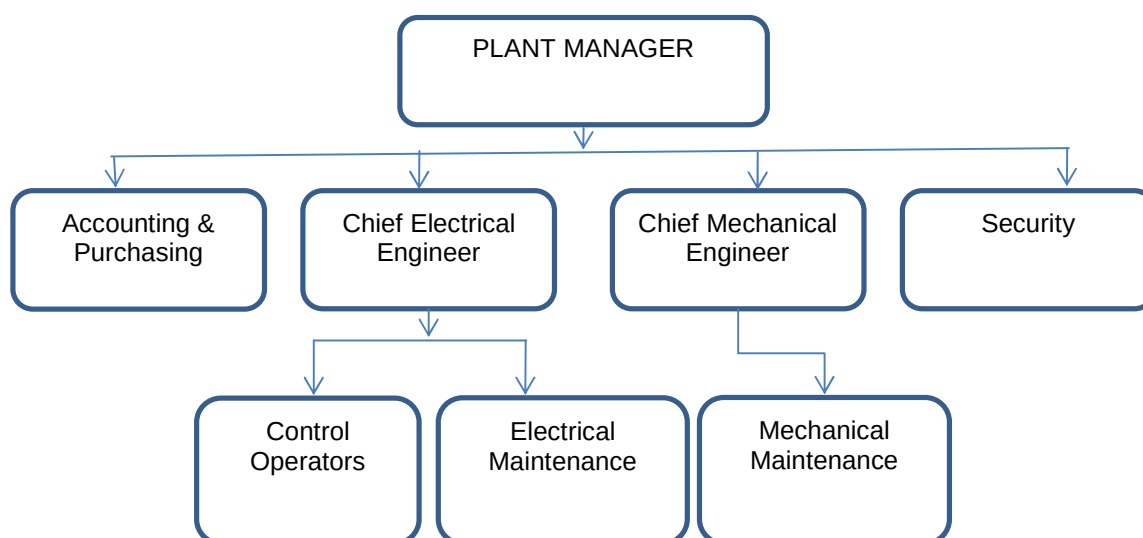


FIGURE 2 - Organisational Chart

The single line diagram that exhibits the location of the main and back-up electricity meters is provided in Annex 1 of this report.

¹¹ Piyasa Mali Uzlaştırma Merkezi (PMUM) / Market Financial Reconciliation Center (MFRC)

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

$$EF_{\text{grid, OMSimple, } y} = 0.655 \text{ tCO}_2/\text{MWh} \quad EF_{\text{grid, BM, } y} = 0.624 \text{ tCO}_2/\text{MWh}$$

$$EF_{\text{grid, CM, } y} = [0.5 * 0.655] + [0.5 * 0.624] = \mathbf{0.640 \text{ tCO}_2/\text{MWh}}$$

Baseline emissions are calculated by multiplying the net electricity produced by the combined margin emission factor calculated above ($EF_{\text{grid, CM}}$). Baseline emissions are calculated according to the following formula:

$$BE = EG_y * EF_{\text{grid, CM}}$$

Where:

BE Baseline Emissions [tCO₂e]

EG_y Electricity Generated [MWh]

EF_{grid, CM} Combined Margin Emission Factor [tCO₂e/MWh]

Table 8 (below) shows the Baseline Emissions calculations as a result of the renewable energy supplied to the grid.

Year	Months	A - Gross Electricity Generation [MWh]	B - Plant's Electricity Consumption [MWh]	C - Net Electricity Generation [MWh] = A-B
2012	January	6,535.05	88.29	6,446.76
	February	6,140.69	89.58	6,051.11
	March	10,836.48	91.79	10,744.69
	April	52,119.95	21.03	52,098.92
	May	61,595.31	11.13	61,584.19
	June	44,147.83	30.59	44,117.24
	July	27,842.84	49.19	27,793.65
	August	13,428.90	80.53	13,348.36
	September	15,954.96	59.96	15,895.00
	October	3,287.53	77.35	3,210.19
	November	15,233.01	74.59	15,158.41
	December	17,427.88	77.00	17,350.88
TOTAL		274,550.43	751.04	273,799.39
Grid Emission factor ($EF_{grid, CM}$)				0.640 tCO ₂ /MWh
Baseline Emissions BE = $EG_y * EF_{grid, CM}$				175231.61 tCO ₂

TABLE 2 – Baseline Emissions calculated per $BE = EG_y * EF_{grid, CM}$

4.2 Project Emissions

An auxiliary diesel generator operates occasionally in the event of electricity cut off. Project emissions are calculated based on the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion” (Version 02). Project emissions are calculated based on the following formula:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y}$$

Where:

- $PE_{FC,j,y}$ CO₂ emissions from fossil fuel combustion in process j during year y [tCO₂/yr]
- $FC_{i,j,y}$ Quantity of fuel type i combusted in process j during year y [mass or volume unit/yr]
- $COEF_{i,y}$ CO₂ emission coefficient of fuel type i in year y [tCO₂/mass or volume unit]
- i Fuel types combusted in process j during year y

The CO₂ emission coefficient COEF_{i,y} is calculated based on Option B of the “Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, Version 02. Since there is no available data related to Option A (chemical composition of fossil fuel type *i*), Option B is applied.

Option B: The CO₂ emission coefficient COEF_{i, y} is calculated based on net calorific value and CO₂ emission factor of the fuel type *i*¹², as follows:

$$\text{COEF}_{i,y} = \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,y}$$

COEF_{i,y} CO₂ emission coefficient of fuel type *i* in year *y* [tCO₂/mass or volume unit]

NCV_{i,y} Weighted average net calorific value of the fuel type *i* in year *y* [GJ/mass or volume unit]

EF_{CO₂,i,y} Weighted average CO₂ emission factor of fuel type *i* in year *y* [tCO₂/GJ]

i Fuel types combusted in process *i* during the year *y*

Project Emissions are therefore:

Parameter	Value	Unit	Explanation
Diesel consumption as per option (a)	677	L	Project on-site log book
Hours of operation of diesel genset	37.72	hrs	Project on-site log book
Rate of diesel consumption per hour by the genset	31	L/hr	ACQ 350 AKSA Diesel generator specs sheet
Diesel consumption as per option (b)	1169.41	L	Calculated
Total Diesel Consumption (Maximum from Option (a) , (b)	1169.41	L	Calculated
Density of Diesel	0.845	kg/L	Per technical specifications of the diesel fuel provided to the market by the refineries of Turkey owned by a single company TUPRAŞ ¹³
M = dV	988.15	kg	Mass of Diesel used
FC _{i, j, y}	0.988	tonne	Calculated
NCV _{i, y}	43.3	GJ/tonne	IPCC
EF _{CO₂,i, y}	74.8	kgCO ₂ /GJ	IPCC
COEF _{i, y}	3.239	tCO ₂ /tonne	Calculated
PE	3,200	kgCO ₂ e	Calculated
PE	3.20	tCO ₂ e	Calculated

TABLE 9 – Calculation of Project Emissions

¹² “*i*” is Diesel Fuel in this case.

¹³ <http://www.tupras.com.tr/detailpage.en.php?strProductKey=403&RedirectPageID=1145>

4.3 Leakage

There is no leakage related to the project activity.

4.4 Summary of GHG Emission Reductions and Removals

Net emission reductions achieved by the project activity during monitoring period are calculated by subtracting the leakage emissions and project emissions from the baseline emissions (calculated in Table 8 of section E.1):

$$\begin{aligned}
 \text{ER} &= \text{BE} - \text{LE} - \text{PE} \\
 &= 175,231.61 \text{ tCO}_2\text{e} - 0 \text{ kgCO}_2\text{e} - 3.20 \text{ tCO}_2\text{e} \\
 &= 175,228.40 \text{ tCO}_2\text{e} \text{ which rounds down to} \\
 &= 175,228 \text{ tCO}_2\text{e}
 \end{aligned}$$

5 ADDITIONAL INFORMATION

5.1 Emissions Reduction Higher than PDD

This section includes a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations per the registered CDM-PDD.

The Project is expected to generate ca. 327,690 MWh of electricity annually, and to reduce 209,722 tonnes of CO₂ emissions per year. This estimation was based on:

- Installed capacity of 99 MW; and
- Annual electricity production data estimated considering most likely river flow data and calculations made per feasibility report.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period (Total Emission Reductions)
Emission Reductions expected (tCO ₂ e) for 12 months (01/01/2012 – 31/12/2012)	209,722 tCO ₂ e	175,228 tCO ₂ e

Due to low rainfall during the third monitoring period, the project produced approximately 16% less electricity than estimated in the PDD *without considering the capacity increase*. Therefore the ERs were also less than the PDD estimate, as they are calculated based on net electricity production over the third monitoring period.

5.2 Built Capacity larger than Designed: Effect on Additionality

There has been no change in the project implementation and design during this monitoring period. Changes to the project capacity, prior to the current monitoring period, have already been validated, approved and verified by VCS. Thus, this section is not applicable.

5.3 Further Action Request (FARs) from the Second Verification Report

FAR 1: It is recommended to modify the monitoring arrangement of auxiliary diesel consumption as per the methodology “tool to calculate project or leakage CO₂ emissions from fossil fuel combustion.”

The consumption of auxiliary diesel generator is monitored by volume of fuel consumed to comply with the ***“tool to calculate project or leakage CO₂ emissions from fossil fuel combustion.”***

ANNEX-1

OFFICIALLY APPROVED LINE DIAGRAM OF THE PROJECT ACTIVITY

FORM NO: K.03.01

İLETİM SİSTEMİNE YÜKSELİM SEVİYESİNDEN BAĞLI ÜRETİM TESİSLERİNİN SAYAÇLARININ BAĞLANTI
NOKTALARINI GÖSTEREN TEK HAT ŞEMASI

