

DARICA-1 99 MW Hydro Power Plant Project, Turkey

Document prepared by Burcu Kılıç
on behalf of 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 (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 Karıca Diversion Regulator which diverts the water used by the state owned Topçam HEPP upstream to Darica-1 HEPP. The water is conveyed from the Karıca 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).

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.

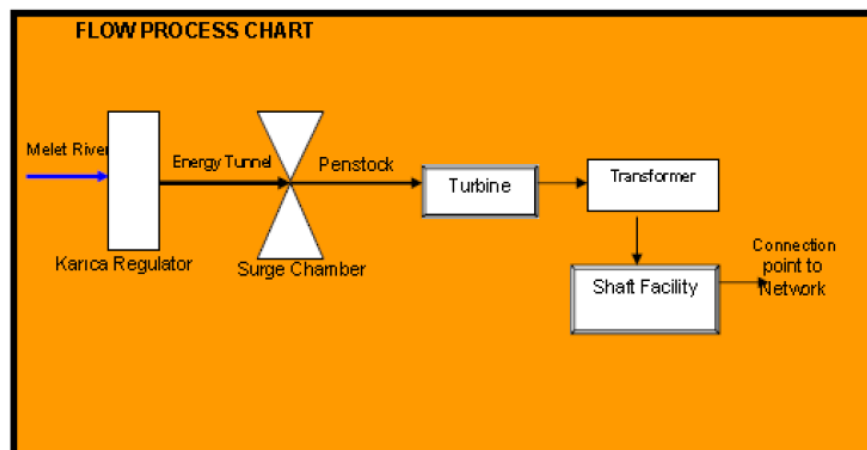


FIGURE 1 - Process flow chart

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 second monitoring period covers the 13 months from 01/12/2010 to 31/12/2011 (both days included). Total emission reductions achieved in this period are 182,360 tonnes 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 are responsible for gathering the Monitoring Data.

Organization:	Yapısan Elektrik Üretim Anonim Şirketi
Street / P.O. Box:	Kuleli Sokak
Building:	87
City:	Ankara
Postfix / ZIP:	06700
Country:	TURKEY
Telephone:	+90 312 446 30 23
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E-mail:	contact@bilgin.com.tr
URL:	www.bilgin.com.tr
Represented by:	
Title:	Manager
Salutation:	Mr.
Last name:	Bilgin
Middle name:	Tolga
First name:	
Personal e-mail:	tolga@bilgin.com.tr

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
Street/P.O.Box:	20-28 Moorgate
City:	London
Postfix/ZIP:	EC2R 6DA
Country:	UK
Telephone:	+44 207 777 2000
FAX:	+44 207 777 9155
E-Mail:	environmental.markets@jpmorgan.com
Represented by:	ClimateCare
Title:	Director
Last Name:	Morton
First Name:	Tom
Mobile:	+254 728 218 183
Personal E-Mail:	tom.morton@climatecare.org

1.4 Other Entities Involved in the Project

No other entities involved.

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-year 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:

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.

$$\text{Installed Capacity} \div \text{Reservoir Area} = \text{Power Density}$$

$$100,800,000 \text{ W} \div 104,000 \text{ m}^2 = 969 \text{ W/m}^2$$

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:

$$\text{Installed Capacity} \div \text{Reservoir Area} = \text{Power Density}$$

$$100,800,000 \text{ W} \div 114,800 \text{ m}^2 = 878 \text{ W/m}^2$$

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 second monitoring period are summarised in Table 1 (below).

Date	Equipment details	Maintenance Period
07/01/2011	Unit 1 Excitation Brush	6 months
20/01/2011	Unit 2 Speed Control (2MEY30) System 2Cx02 cable group	As required
07/02/2011	Indoor lifting crane	Weekly
04/03/2011	Topçam valve's generator revision	As required
22/03/2011	Unit 1-2 Excitation boards, filters, & excitation transformers	Weekly
25/03/2011	154 kV Outdoor Sub-station (building, sub-station, & battery redressor)	Weekly
28/03/2011	Unit 1 Stator winding	Assisting in Voith Hydro's maintenance
29/05/2011	Unit II Metal Clad Room dehumidification device	As required
06/06/2011	100+10 tonnes heavy tonnage overhead crane	Weekly
21/07/2011	Unit 1 Generator oil tank	General
30/07/2011	Excitation Brush	As required
12/09/2011	Plant 110V DC redressor, battery group, & mobile crane	Weekly
19/09/2011	Plant diesel generator	As required

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

17/11/2011	Unit 1 Warmer (stator)	As required
21/11/2011	13.8kV Bus coupler CB circuit breaker group	Breakdown
25/11/2011	Unit 1 Cooler valve and replacing check-valve	As required
29/11/2011	Unit I replacement of blade no.11 joint	As required

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

2.2 Deviations from the Monitoring Plan

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 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. At the end of each month, electricity produced/consumed (i.e. exported/imported) is recorded in a pre-agreed format, and these documents are signed by the Project Plant Manager and a TEİAŞ representative, and are then sent to MFRC/PMUM where they become the official document for the Project for that given month.

2.3 Grouped Project

Not Applicable

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

⁸ www.teias.gov.tr

3 Data and Parameters

3.1 Data and Parameters Available at Validation

Data / 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
Any comment:	Data is published by the transmission company (TEİAŞ) annually. It will be used once for the crediting period

Data / 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)
Any comment:	Applied in the calculation of the simple OM, where fuel consumption data is available for all power plants.

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

Data / parameter:	$EFCO_2_y$
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

Any comment:	Fossil fuel used in Standby generator
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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:	284,953 MWh
Monitoring equipment:	- TR-1: Main Electricity Meter 1 Make & model: Elster A1500-W043 Serial #: 361509 Official code: 11047 Last calibrated: 06/02/2008 Valid till: 05/02/2018 - Back-up Electricity Meter Make & model: Elster A1500-W043 Serial #: 361510 Last calibrated: 06/02/2008 Valid till: 05/02/2018 - TR-2: Main Electricity Meter 2 Make & model: Elster A1500-W043 Serial #: 364713 Official code: 11048 Last calibrated: 02/04/2008 Valid till: 01/04/2018 - Back-up Electricity Meter Make & model: Elster A1500-W043 Serial #: 364714 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 electricity meters are backed up by two auxiliary 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:	9.249 tCO ₂
Monitoring equipment:	Site Log Book
QA/QC procedures to be applied:	As per the “Tool to calculate project or leakage 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:	

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

Data Unit / Parameter:	FC _{j,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 = Mass [kg] • d = average density of diesel fuel (0.845 kg/L¹⁰) • V = 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:	3,379 L of diesel usage 3,379 L x 0.845 kg/L = 2,855 kg = 2.855 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.
Calculation method:	As per the "Tool to calculate project or leakage

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

	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 Darica-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 electricity production is measured, recorded monthly through two high precision 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 electrical engineer or the plant manager accompany the TEİAŞ officer during the monthly measurements, since this data also 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 exhibiting the monthly electricity production data by the Darica-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

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

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.

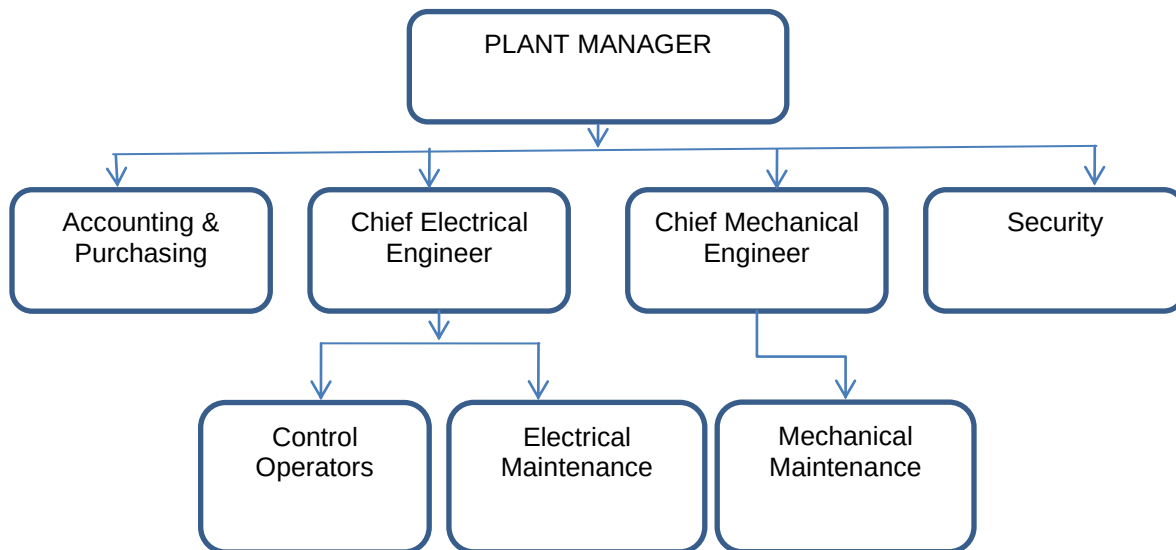


FIGURE 2 - Organisational Chart

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

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Based on ACM0002, version 7, the emission factor for the grid system is calculated in accordance with the “Tool to calculate the emission factor for an electricity system”, version 01. According to this tool, the following four methods may be used to calculate the operating margin:

- a) Simple OM,
- b) Simple adjusted OM,
- c) Dispatch Data Analysis OM, and
- d) Average OM.

Table 2 (below) lists the share of primary sources in electricity generation for the five most recent years, at the time the validated PDD was prepared. Hydro and other renewable energy sources are accepted as low cost/must run sources and their share is below 50%, therefore, in accordance with the Tool, (a) Simple OM method is used in the calculations.

Year	Thermal		Hydro		Geothermal/wind		TOTAL
	MW	%	MW	%	MW	%	
2002	19,569	73.8	12,241	26.8	36.4	0.2	31,846
2003	22,974	74.8	12,579	25.1	33.9	0.1	35,587
2004	24,145	69.2	12,645	30.6	33.9	0.2	36,824
2005	25,902	75.4	12,906	24.4	35.1	0.2	38,844
2006	27,420	74.8	13,063	25.1	81.9	0.2	40,565

TABLE 2 - Share of primary sources in electricity generation, 2002 – 2006¹²

The following steps show the Simple Operating Margin approach provided in the “Tool to calculate the emission factor for an electricity system”, Version 01 that was employed to calculate the combined margin emission factor for Turkey.

Step 1. Identification of the relevant electric power system

The spatial extent of the Project boundary includes the Project power plants and all power plants that are connected physically to the Turkish national electricity grid system. The total installed capacity of the Turkish electricity grid system reached to 40,565 MW in 2006, and total annual generation was 176,299.8 GWh^{13,14}.

Step 2. Selecting an operating margin

The Simple Operating Margin (OM) emission factor ($EF_{grid, OMsimple, y}$) is calculated as the generation-weighted average CO₂ emissions per unit of net electricity generation (tCO₂/MWh) of all the generating plants serving the system, not including low-cost/must-run power plants. The electricity generation from solar and low cost biomass facilities is insignificant in Turkey, and there are no nuclear power plants. Therefore the only low cost /must run plants are hydro, wind, and geothermal facilities.

The *ex-ante* option is defined as a 3-year generation-weighted average, based on the most recent data available for data vintage. The step-wise approach provided in ACM0002 to calculate the combined margin emission factor for Turkey is described below.

Step 3. Calculating the operating margin emission factor according to the selected method

According to the “Tool to calculate the emission factor for an electricity system”, Version 01, the following option C equation is chosen and applied:

¹² [Annual Development of Turkey's Gross Electricity Generation by Share of Primary Energy Resources \(1970-2006\)](http://www.teias.gov.tr/ist2006/32.xls) (http://www.teias.gov.tr/ist2006/32.xls)

¹³ Annual Development of Turkey's Installed Capacity (1913-2006), <http://www.teias.gov.tr/ist2006/1.xls>

¹⁴ Annual Development of Installed Capacity and Generation in Turkey (1970-2006) ,<http://www.teias.gov.tr/ist2006/13.xls>

$$EF_{\text{grid, OMsimple, } y} = \sum FC_{i,y} \cdot NCV_{i,y} \cdot EF_{\text{co2,i,y}} / \sum EG_y \quad (1)$$

Where:

$EF_{\text{grid,OMsimple,y}}$	Simple operating margin CO ₂ emission factor in year y [tCO ₂ /MWh]
$FC_{i,y}$	Amount of fossil fuel type i consumed in the Project electricity in year y [mass or volume unit]
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y [GJ / mass or volume unit]
$EF_{\text{CO2,i,y}}$	CO ₂ emission factor of fossil fuel type i in year y [tCO ₂ /GJ]
$EG_{m,y}$	Net electricity generated and delivered to the grid by power plant / unit m in year y [MWh]
i	All fossil fuel types combusted in power sources in the Project electricity system m in year y
y	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (<i>ex-ante</i> option) or the applicable year during monitoring (<i>ex-post</i> option), following the guidance on data vintage in step 2

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

- Annual fuel consumption by fuel type¹⁵,
- Annual heating values for fuels consumed for electricity generation¹⁶, and
- Annual electricity generation by fuel type, import and export¹⁷

Annual heating values for each fuel type are directly related to the fuel consumption, and are used to calculate average Net Calorific Values [TJ/kt] – please refer to Table 3 (below).

¹⁵ Fuel Consumed in thermal P.P. in Turkey by the Electric Utilities (2000-2005)&(2006) (<http://www.teias.gov.tr/ist2006/42.xls>)& (<http://www.teias.gov.tr/ist2006/43.xls>)

¹⁶ [Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electric Utilities \(2000-2005\)](http://www.teias.gov.tr/ist2006/44.xls) & (2006), (<http://www.teias.gov.tr/ist2006/44.xls>)& (<http://www.teias.gov.tr/ist2006/45.xls>).

¹⁷ [Annual Development of Turkey's Gross Electricity Generation by Primary Energy Resources and The Electric Utilities \(2001-2005\)](http://www.teias.gov.tr/ist2006/35(2001-2005).xls) & [Turkey's Gross Electricity Generation by Primary Energy Resources and The Electric Utilities \(2006\)](http://www.teias.gov.tr/ist2006/36(06).xls), ([http://www.teias.gov.tr/ist2006/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2006/35(2001-2005).xls))& ([http://www.teias.gov.tr/ist2006/36\(06\).xls](http://www.teias.gov.tr/ist2006/36(06).xls)).

Fuel Type	NCV (TJ/kt)
Hard Coal + Imported Coal	21.87
Lignite	6.82
Fuel Oil	40.12
Diesel Oil	42.64
LPG	45.99
Naphtha	44.10
Natural Gas	37.08

TABLE 3 - Net Calorific Values per fuel type for Turkey.

The operating calculation has been based on data from the 3 most recent available years: 2004, 2005, and 2006. The coefficients required for calculation of CO₂ emission factor [tCO₂/TJ] have been obtained through IPCC 2006 guidelines for GHG inventories¹⁸. Using the available data and ACM0002 methodology, overall CO₂ production by electricity generation is calculated as per Tables 4 and 5 (below).

¹⁸ Table 2.2.Default Emission Factors for Stationary Combustion in the Energy Industries, Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf)

	NCV [TJ/kt]	Lower COEF [tCO ₂ /TJ]	Consumption (2004 - 2006) [tonnes or 1,000 m ³]	Total Emission (2004 - 2006) [tCO ₂]
Hard Coal+ Imported Coal	21.87	94.6	15,441,634	31,947,227.47
Lignite	6.82	90.9	132,679,613	82,242,778.28
Fuel Oil	40.12	75.5	6,155,607	18,645,702.94
Diesel Oil	42.64	72.6	119,084	368,615.23
LPG	45.99	61.6	25,614	72,564.05
Naphtha	44.10	69.3	306,683	937,333.96
Natural Gas	37.08	54.3	46,117,033	92,789,290.64
Total Emissions				227,003,512.57

TABLE 4 - Calculation of total emission by electricity generation

Net electricity generated and supplied to the grid by thermal plants has been calculated using data obtained from the TEİAŞ web page¹⁹. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to determine net generation by thermal plants. Summing this with imported electricity, total supply excluding low cost / must run sources are determined as listed in Table 5 (below).

¹⁹ Annual Development of Electricity Generation-Consumption and Losses in Turkey ([http://www.teias.gov.tr/ist2006/30\(84-06\).xls](http://www.teias.gov.tr/ist2006/30(84-06).xls))

Year	Gross generation	Net generation	Net/Gross (1)	Gross Gen. Thermal (2)	Net Gen. Thermal (1 x 2)	Import	Total Supply to grid
2004	150,698	145,066	0.963	104,464	100,559	464	101,023
2005	161,956	155,469	0.960	122,242	117,346	636	117,982
2006	176,299	169,543	0.962	131,835	126,783	573	127,356
Total Net Thermal Gen.					344,688	1,673	346,360

TABLE 5: Net Electricity Generation from thermal power plants [GWh]

Finally, using the data in the previous two tables, the OM emission factor considering years 2004 - 2006 is calculated by dividing the total CO₂ emissions by total electricity supply to the grid (from equation (1) above):

$$EF_{\text{grid, OMsimple, } y} = 227,003,512.57 \text{ tCO}_2 / 346,360,200 \text{ MWh} = \mathbf{0,655 \text{ tCO}_2/\text{MWh}}$$

The Operating Margin emission factor calculated above will be constant throughout the 10-year crediting period.

Step 4. Identification of the cohort of power units to be included in the build margin (BM)

The Build Margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units *m* during the most recent year *y* for which power generation data is available.

According to the “Tool to calculate the emission factor for an electricity system”, version 01, the cohort of power units *m* used to calculate the built margin consists of either the:

- Set of 5 power plants/units that have been built most recently, or
- Set of power capacity additions in the electricity system that comprise 20% of the system generation [MWh] and that have been built most recently.

The larger annual generation set of power plants shall be used from these options. Therefore the set of power plants that comprise 20% of the system generation and have been recently added to the system is chosen for BM calculations.

The gross electricity generation in year 2006 is taken as reference for determination of plants that comprise 20% of the system generation. The gross generation was 176,299.8 GWh in 2006 and 20% of that amount is calculated as 35,259.96 GWh. Summing up all the plants built in 2006, 2005 and 2004, the total generation is 35,289.8 GWh.

The lists of most recent capacity additions to the grid by year and their average and firm generation capacities are available at the TEİAŞ web page^{20,21,22}. However; for 2006, the annual generation capacity data for each plant is not available. Two datasets are published for 2006:

- (1) Annual generation capacity by fuel type; and
- (2) List of plants added in 2006 with their installed capacity²³.

Comparing the two datasets, it is concluded that 1,080 MW of installed capacity mentioned in the first dataset belongs to the power plants working with lignite in the second dataset. Therefore; the generation capacity 7,020 GWh out of 11,155 GWh of thermal total has been accepted to be produced by lignite while the rest is assumed to be produced by natural gas.

BM has been calculated *ex-ante* using the most recent data available (i.e. "Option 1")

Step 5. Calculating the build margin emission factor

The Build Margin emission factor $EF_{grid, BM, y}$ is calculated as the generation-weighted average emission factor of a sample of power plants m for a specific year y , as follows:

$$EF_{grid, BM, y} = \sum EG_{m,y} \cdot EF_{EL,m,y} / \sum EG_{m,y}$$

Where:

$EF_{grid, BM, y}$	Build margin CO ₂ emission factor in year y [tCO ₂ /MWh]
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y [MWh]
$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y [tCO ₂ /MWh]
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

Data for oxidation index and default values for effective CO₂ emission factor have been obtained through IPCC²⁴ guidelines. For generation efficiencies, real values of present thermal power plants have been used from Türkiye Çevre Atlası (prepared by Ministry of Environment and Forestry²⁵). The average generation efficiencies have been calculated from the published values for existing plants. The rest of the generation efficiencies (for LPG and Naphtha) have been obtained from the reference documents for best available techniques of European Integrated Pollution Prevention and Control Bureau (EIPPCB)²⁶ – please refer to Table 6. The Build Margin emission factor has been determined for most recent capacity

²⁰ [Generation Units Put Into Operation and Out of Operation in 2006](http://www.teias.gov.tr/ist2006/8.xls), (http://www.teias.gov.tr/ist2006/8.xls)

²¹ [Generation Units Put Into Operation and Out of Operation in 2005](http://www.teias.gov.tr/ist2005/7.xls), (http://www.teias.gov.tr/ist2005/7.xls)

²² [Generation Units Put Into Operation and Out of Operation in 2004](http://www.teias.gov.tr/ist2004/7.xls), (http://www.teias.gov.tr/ist2004/7.xls)

²³ Türkiye Elektrik Enerjisi 10 yıllık Üretim Kapasite Projeksiyonu, (2007-2016), pg.76-77

(http://www.teias.gov.tr/projeksiyon/projeksiyon%20Temmuz2007.pdf)

²⁴ Table 1.4.Default CO₂ emission factors for Combustion, Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)

²⁵ Tablo X.3.1. Türkiyedeki termik santrallerin adları, bulunduğu yer ve diğer bilgiler, Türkiye Çevre Atlası, MoEF, Ankara 2004, pg.197, (http://www.cedgm.gov.tr/dosya/cevreatlasi/atlasin_metni.pdf)

²⁶ EIPPCB, Reference Document on Best Available Techniques for Large Combustion Plants, (http://eippcb.jrc.es/pages/FActivities.htm)

additions using the EF values calculated for each fuel source (Table 7). The emission factor has been taken as “zero” where no data is available.

	A	B	C	D
	COEF [tCO ₂ /TJ]	OXID	Generation Efficiency [%]	EF _{BAT} [tCO ₂ /MWh] (AB/278C)
Coal	94.6	1	33.6	1.014
Lignite	90.9	1	32.8	0.998
Fuel Oil	75.5	1	35.1	0.774
Diesel	72.6	1	27.5	0.949
LPG	61.6	1	45.0	0.492
Naphtha	69.3	1	45.0	0.554
Natural Gas	54.3	1	46.0	0.425

TABLE 6 - Calculation of emission factor from most recent plants.

The build margin emission factor in the last column has been determined by multiplying each EF value with the corresponding electricity generation for that fuel, and dividing by the total generation by selecting most recent capacity additions.

	G	H (G/35,289.8)	E	EF_w (GH)
Fuel Source	Generation [MWh]	Generation [%]	EF	Weighted EF
Coal	1,463	4.1	1.014	0.04
Lignite	11,480	32.5	0.999	0.32
Fuel Oil	565	1.6	0.775	0.01
Diesel oil	6	0.0	0.949	0.00
LPG	50	0.1	0.493	0.00
Naphtha	323	0.9	0.554	0.01
Natural Gas	19,811	56.1	0.425	0.24
Renewable and wastes	85	0.2	0.000	0.00
Solid	5	0.0	0.000	0.00
Total Renewable	1,502	4.3	0.000	0.00
TOTAL Capacity additions	35,289.8			0.624

TABLE 7 - Distribution of most recent capacity additions by fuel source

Finally, by summing up the weighted EF_{BAT} values, overall build margin emission factor has been calculated as:

$$EF_{grid, BM, y} = 0.624$$

STEP 6 - Calculate the combined margin emission factor

Based on ACM0002, weighted average baseline emission factor is calculated as follows;

$$EF_{grid, CM, y} = [w_{OM} * EF_{grid, OMsimple, y}] + [w_{BM} * EF_{grid, BM, y}] \quad (13)$$

Where:

$EF_{grid, BM, y}$ Build margin CO₂ emission factor in year y [tCO₂/MWh] as calculated from equation (12) above.

$EF_{grid, OM, y}$ Operating margin CO₂ emission factor in year y [tCO₂/MWh] as calculated from equation (1) above.

w_{OM} Weighting of operating margin emissions factor [%]

w_{BM} Weighting of build margin emissions factor [%]

The default values of the weights, w_{OM} and w_{BM} , as recommended by the selected methodology are both equal to 0.5 and. These default values have been used.

Based on the formula above, baseline emission factor is calculated as;

$$EF_{grid, CM, y} = [0.5 * 0.655] + [0.5 * 0.624] = \mathbf{0.640}$$

The combined margin emission factor is therefore **0.640 tCO₂/MWh**, and will be used as the baseline emission factor in calculation of emission reductions by the project activity.

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

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

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 [KWh]	B - Plant's Electricity Consumption [KWh]	C - Net Electricity Generation [KWh] = A-B	D=C*EF _{CM} Baseline Emissions (Emission Factor 0.640) kg CO ₂ e	E=(D/1000) Baseline Emissions (Emission Factor 0.640tCO ₂ /MWh) tCO ₂ e
2010	December	15,502,203	47,268	15,454,935	9,891,158	9,891.16
2011	January	6,969,202	65,690	6,903,512	4,418,248	4,418.25
	February	7,630,460	60,879	7,569,581	4,844,532	4,844.53
	March	17,321,891	57,875	17,264,016	11,048,970	11,048.97
	April	27,061,775	46,691	27,015,084	17,289,654	17,289.65
	May	68,726,456	6,757	68,719,699	43,980,607	43,980.61
	June	40,281,222	38,778	40,242,444	25,755,164	25,755.16
	July	52,025,974	28,096	51,997,878	33,278,642	33,278.64
	August	27,481,550	56,499	27,425,051	17,552,033	17,552.03
	September	8,714,620	59,492	8,655,128	5,539,282	5,539.28
	October	699,622	77,200	622,422	398,350	398.35
	November	8,527,884	72,091	8,455,793	5,411,708	5,411.71
	December	4,722,632	94,835	4,627,797	2,961,790	2,961.79
TOTAL		285,665,491	712,151	284,953,340	182,370,138	182,370

TABLE 8 – 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:

$PE_{FC,j,y}$	CO ₂ emissions from fossil fuel combustion in process <i>j</i> during year <i>y</i> [tCO ₂ /yr]
$FC_{i,j,y}$	Quantity of fuel type <i>i</i> combusted in process <i>j</i> during year <i>y</i> [mass or volume unit/yr]
$COEF_{i,y}$	CO ₂ emission coefficient of fuel type <i>i</i> in year <i>y</i> [tCO ₂ /mass or volume unit]
<i>i</i>	Fuel types combusted in process <i>j</i> during year <i>y</i>

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*²⁷, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

$COEF_{i,y}$	CO ₂ emission coefficient of fuel type <i>i</i> in year <i>y</i> [tCO ₂ /mass or volume unit]
$NCV_{i,y}$	Weighted average net calorific value of the fuel type <i>i</i> in year <i>y</i> [GJ/mass or volume unit]
$EF_{CO2,i,y}$	Weighted average CO ₂ emission factor of fuel type <i>i</i> in year <i>y</i> [tCO ₂ /GJ]
<i>i</i>	Fuel types combusted in process <i>i</i> during the year <i>y</i>

²⁷ “*i*” is Diesel Fuel in this case.

Project Emissions are therefore:

Parameter	Value	Unit	Explanation
Total Diesel Consumption	3,379	L	The amount of diesel consumption which is recorded in the Project on-site log books.
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 ²⁸
M = dV	2,855	kg	Mass of Diesel used
FC_{i,j,y}	2.855	tonne	-
NCV_{i,y}	43.3	GJ/tonne	-
EF_{CO2,i,y}	74.8	kgCO ₂ /GJ	-
COEF_{i,y}	3.239	tCO ₂ /tonne	-
PE	9.248	tCO ₂ e	-
PE	9,248	kgCO ₂ e	-

TABLE 9 – Calculation of Project Emissions

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):

$$\begin{aligned}
 ER &= BE - LE - PE \\
 &= 182,370,138 \text{ kgCO}_2\text{e} - 0 \text{ kgCO}_2\text{e} - 9,248 \text{ kgCO}_2\text{e} \\
 &= 182,360,890 \text{ kgCO}_2\text{e} \\
 &= 182,360.89 \text{ tCO}_2\text{e which rounds down (conservativeness) to} \\
 &= 182,360 \text{ tCO}_2\text{e}
 \end{aligned}$$

²⁸ http://www.tupras.com.tr/detailpage_en.php?strProductKey=403&RedirectPageID=1145

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.

This second monitoring period covers a time frame that is longer than one year, whereas the PDD considers emission reductions annually. The amount of annual Emission Reductions for a 12-month period estimated in the PDD is 209,722 tCO₂e. To be able to compare the amount estimated in the PDD we have divided the annual value by 12 (therefore 17,477 tCO₂e). Accordingly, the annual emission reduction in the PDD for a 13 months period is estimated to be 227,199 tCO₂e.

Item	Values applied in <i>ex-ante</i> calculation of the registered CDM-PDD	Actual values reached during the monitoring period (Total Emission Reductions)
Emission Reductions expected (tCO ₂ e) for 13 months (01/12/2010 – 31/12/2011)	227,199 tCO ₂ e	182,360 tCO ₂ e

Due to low rainfall during the second monitoring period, the project produced approximately 19.7% 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 second monitoring period.

5.2 Built Capacity larger than Designed: Effect on Additionality

The guidelines published in EB48 Annex 66 state that if the Project has never been implemented in accordance with the PDD then the case must be made as to why the change to the Project does not affect its additionality.

Section B.5. of the PDD shows that the Additionality of the project was proven using Option 3: Barrier Analysis. Below we analyse how these Barriers may have been affected by the increase in size of the turbines. The barriers in Option 3 were:

Investment Barrier

- The Project Developer had to use a high level of equity as there were difficulties raising debt: This barrier has not changed.
- Lenders had a perceived risk of low flow and variable climatic data for the region. Whilst rainfall was higher one year, this does not reflect a long-term trend: This barrier has not changed.

Technological Barriers

- Tunnel Construction and Terrain: The upgrading of the turbines necessitated no change to this barrier.

Common Practice in 4a

- The increase in turbine capacity has not affected the given evidence that government is the largest investor in large-scale hydro: The turbines upgrade has not changed this.
- The maximum size of hydro under private ownership was 48.5 MW: The turbines upgrade has not changed this.

Common Practice 4b

- Public vs. Private Sector Investment in electricity generation: The turbines upgrade has not changed this.
- Public sector investment in Thermal and Hydro Generation sources: The turbines upgrade has not changed this.
- Private Sector Investment in Hydro Sector Generation: The turbines upgrade has not changed this.

Conclusion

The original conclusions continue to be valid, correct, and applicable:

- The Project faces significant Investment Barriers
- The Project is not Common Practice

5.3 Further Action Requests (FARs) from the First 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.”***

FAR 2: It is requested to monitor and record the available water flow for the project for the rest of the crediting period.

During the 1st verification period, Topçam Dam (located above the Project), was full. Since the Project was in the construction phase, the Topçam Dam was able to store the water (the project did not use the water throughout the year, and the Dam thus entered the wet season at full volume). As Darica went into commercial operation, the full capacity of Topçam Dam and the nearby rivers was used.

During this 2nd monitoring period, water in Topçam Dam was already used by the Project, and the wet season commenced with no water in the dam (i.e. general case predicted for the whole project period). The regular operating practice of Darica HEPP would be to enter the wet season without water, such that water inflows and rain could be stored and used throughout the year (until the next wet season). The first verification period therefore represented an exceptional case, and the production in that period is commensurately higher than the PDD.

In any case, monthly water flow data is included in Table 10 (below):

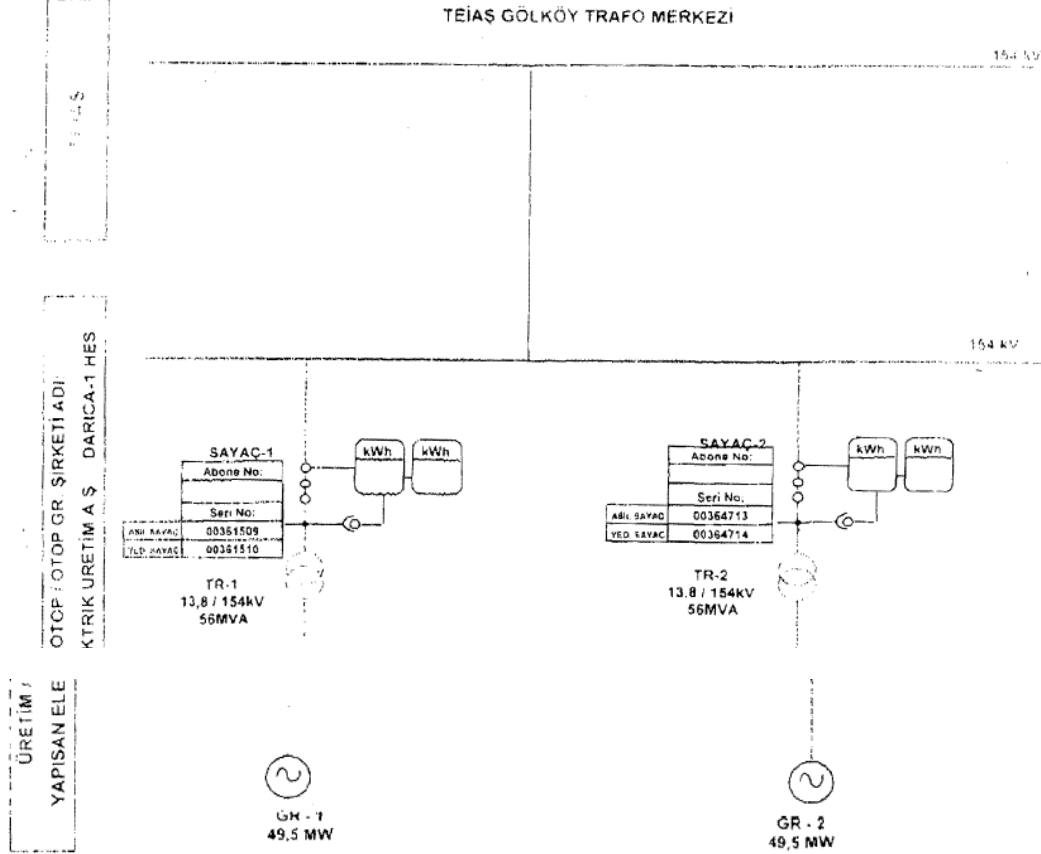
Month	Project water flow [m ³ /month]
12/2010	19,583,785
01/2011	9,123,614
02/2011	9,984,140
03/2011	22,807,304
04/2011	35,558,860
05/2011	89,687,049
06/2011	52,891,924
07/2011	68,443,989
08/2011	36,184,343
09/2011	11,471,528
10/2011	896,990
11/2011	11,127,031
12/2011	6,181,768

Table 9 – Project water flow per month.th.

ANNEX-1

OFFICIALLY APROVED LINE DIAGRAM OF THE PROJECT ACTIVITY

FORM NO: K.03.01

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

SAYAÇ KODU *	SAYAÇ SERİ NO	TK	Pb	Pcu	HK	Devre Sayısı	İletken Tipi Al/Cu	Uzunluk	Kesit	İletim Sistemi Kaybı *	Nükleer Sistemi Kaybı OG *	Nükleer Sistemi Kaybı AG *
		EVET/HAYIR			EVET/HAYIR							
	00361509	HAYIR			HAYIR							
	00364713	HAYIR			HAYIR							

TK=Trafo Kaybı; HK=Hat Kaybı

TK ve HK "Evet" olarak işaretlenmişse ilgili bölümler doldurulmalıdır.

* Bu bölümler, PMUM tarafından doldurulacaktır.

NOT 1. Üretim tesisine ait bilgiler, sayaç sayısı, trafo ve bara gerilim seviyeleri örnek olarak gösterilmiştir. Format bozulmadan tesisin durumuna göre sadece mevcut olan Estiçe 6636 sayılılar kullanılmalıdır.

2. Yukarıdaki tablolardaki satır sayısı, sayaç sayısına göre arttırılmalıdır.

	İLETİM ŞİRKETİ YETKİLİ KİŞİLER	TARİH	İMZA	İLETİM ŞİRKETİ MÜHÜRÜ
1.	Aynur DOĞDAŞ AGİT	25.09.2009	X Agit	İLETİM ŞİRKETİ MÜHÜRÜ 3001
2.	Kenan KOLDERE	25.09.2009	K. Kolder	

** İletim Şirketi mührü ve iki yetkili kişi imzası olmayan form geçersizdir.