

KEPEZKAYA HYDROELECTRIC POWER PLANT PROJECT



Document Prepared By Ekobil Environmental Services and Consulting Ltd.

Contact Information : info@ekobil.com

Project Title	KEPEZKAYA Hydroelectric Power Plant Project
Version	2.00
Date of Issue	24-08-2012
Prepared By	Ekobil Environmental Services and Consulting Ltd.
Contact	Güneykent Sitesi 51. Cadde 1839. Sk. (OYSEKENT 116. Sk) No 56 Ahlatlıbel, 06805 Ankara, Turkey. Tel: +90 312 489 1338 e-mail: info@ekobil.com

TABLE OF CONTENTS

Table of Contents	2
1 Project Details	3
1.1 Summary Description of the Project.....	3
1.2 Sectoral Scope and Project Type.....	8
1.3 Project Proponent	8
1.4 Other Entities Involved in the Project.....	8
1.5 Project Start Date.....	8
1.6 Project Crediting Period	8
1.7 Project Scale and Estimated GHG Emission Reductions or Removals	8
1.8 Description of the Project Activity.....	9
1.9 Project Location	11
1.10 Conditions Prior to Project Initiation.....	12
1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks	12
1.12 Ownership and Other Programs	13
1.12.1 Proof of Title.....	13
1.12.2 Emissions Trading Programs and Other Binding Limits.....	13
1.12.3 Participation under Other GHG Programs	13
1.12.4 Other Forms of Environmental Credit	13
1.12.5 Projects Rejected by Other GHG Programs	13
1.13 Additional Information Relevant to the Project.....	14
2 Application of Methodology	15
2.1 Title and Reference of Methodology	15
2.2 Applicability of Methodology.....	15
2.3 Project Boundary.....	17
2.4 Baseline Scenario	18
2.5 Additionality.....	19
2.6 Methodology Deviations.....	27
3 Quantification of GHG Emission Reductions and Removals.....	28
3.1 Baseline Emissions	28
3.2 Project Emissions.....	35
3.3 Leakage	36
3.4 Summary of GHG Emission Reductions and Removals	36
4 Monitoring.....	42
4.1 Data and Parameters Available at Validation.....	42
4.2 Data and Parameters Monitored	45
4.3 Description of the Monitoring Plan	50
5 Environmental Impact.....	57
6 Stakeholder Comments.....	60
Annex-1: The Legal Framework of the Host Country That Binds the Project	65
Annex-2: Baseline Information.....	67
Annex-3: Certificate of EIA not Needed	82
Annex-4: Volume vs Area Curve.....	83
Annex-5: Electricity Generation License of the project	84
Annex-6: Circuit Single Line Diagram of Kepezkaya HPP	85

1 PROJECT DETAILS

1.1 Summary Description of the Project

The proposed project is the construction of Kepezkaya Hydroelectric Power Plant (the "Project Activity" or "Kepezkaya HPP" from this point onward), which has been planned on the Göksu River in the Eastern Mediterranean Region of Turkey. It has been developed by Selen Elektrik Üretim A.Ş. (one of the AES-IC İÇTAŞ Enerji Üretim ve Ticaret A.Ş. affiliates), hereafter referred to as the "Project Owner" or "The Owner" who owns the generation license (Annex-5). The purpose of the Kepezkaya HPP is to utilize the hydropower potential of the Göksu river to generate electricity based on a renewable resource and thus to generate Verified Emission Reductions (VERs) by displacing electricity generation from grid connected fossil fuel-fired power plants.

The Energy Market Regulatory Authority (EMRA) tendered the Project Activity in 2005 and the generation license was awarded to the project owner in 05/07/2007 for the period of 48 years and 2 and half months (The license is presented in Annex 5). The Project Activity started operation on October 1st, 2010.

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

Table 1: Major Milestones of Kepezkaya HPP Project

Date	Milestone	Reference
2-Sep-04	Selen Elektrik Üretim A.Ş. Applied to EMRA to acquire the production license	Referred in the letter came as an answer to the request
21-Oct-05	EMRA replied to Selen Elektrik Üretim. A.Ş. and invited them to the auction that will be organized to sell the license of the project.	
12-Sep-06	Correspondences starts to seek consultancy to develop Carbon asset of the project	Proposal
15-Nov-06	A proposal was taken from E&C Services GmbH Germany to develop the projects in the pipeline of the mother company	Correspondences
6-Feb-07	Project Owner Was Granted the Preliminary Forestry Permit to operate within the jurisdictions of the forestry authorities lands	The Preliminary permit proclamation
5-Jul-07	EMRA granted Electricity Production License to Selen Elektrik Üretim A.Ş.	License (Annex-5)
13-Jul-07	EIA not Needed Certificate Issued by MoEF Karaman Province Representation	Certificate in Annex 3
28-Sep-07	LSC Announced in local (Anadolu Manşet) and Regional (Türkiye Gazetesi) News Papers	News paper clips
2-Oct-07	LSC organized in Karaman	Date on nontechnical summary distributed in LSC meeting
28-Jan-08	Turnkey Engineering Procurement and Construction Contract Signed between Selen Elektrik Üretim A.S. and IC İçtaş İnşaat	Agreement

6-Feb-08	Loan Agreement Signed	Agreement
18-Mar-08	Construction start Date	NHS record for the opening of the Work site
2-Apr-08	Project Owner Was Granted the Ultimate Forestry Permit to operate within the jurisdictions of the forestry authorities lands	The ultimate permit proclamation
15-Apr-08	Electromechanical equipment procurement agreement was signed between IC İtaş (as the Turnkey EPC Contractor) and Harbin electric Co.	Agreement
1-Jun-08	Feasibility study Report Finalized	FSR Report
22-Sep-08	DSI Approval for the Feasibility Study	DSI Approval letter
23-Jan-09	Water Usage Agreement Signed between Selen and DSI	Agreement
7-Oct-09	TEIAS Connection Agreement Signed	Agreement
6-Sep-10	Government officials approved the project to be suitable to be connected to the grid	Ministry of Energy and Natural Resources approval committee report
29-Sep-10	Notice letter for readiness to Substantial Completion Sent to Selen Elektrik Üretim A.S. by IC İnşaat (EPC Contractor)	Letter sent to Selen Elektrik Üretim A.S. by IC İnşaat
30-Sep-10	Selen Elektrik Üretim A.S. accepted and issued official Substantial Acceptance Certificate	Substantial Acceptance Certificate
1-Oct-10	First Date Electricity is supplied to the grid	October 2010 PMUM Screen Printout

The Project Activity is planned as a run-of-river type which is composed of a weir, water intake structures, 3 610 m long conveyance tunnel, a head pond, penstocks and powerhouse equipped with 28.00 MWe installed capacity turbines and other facilities.

Other Project Developments at the upstream of the Project Activity

As was also explained in the DSI approved project feasibility study report, the Project Activity is a part of the Konya-Çumra 3rd Stage Irrigation Plan of DSI. At the upstream basin of the Kepezkaya HPP, a large-scale irrigation project was conducted by General Directorate of State Hydraulic Works (DSİ). Within the scope of this irrigation project at the upper elevation of 1,000 m of Göksu basin 3 dams: Namely Bağbaşı, Afşar and Bozkır dams, and 1 conveyance tunnel- Mavi tunnel, will be constructed. The stream flow of Göksu river will be regulated via these dams and will be diverted to Konya Çumra plain, which is situated in the neighboring basin (see Figure 1).

Bağbaşı dam and Bozkır dams are planned to be constructed on Göksu river; Afşar dam is planned to be constructed on one of the tributary of Göksu river. The Mavi tunnel, is planned to convey the water from Bağbaşı dam to Konya Çumra Plain. The water regulated in Afşar dam is planned to be diverted to Bağbaşı dam through a conveyance system. And Bozkır dam will be located in the upstream of Bağbaşı dam.

The third party feasibility study investigates in depth and takes into account the development of the upstream irrigation and energy projects, to determine the water flow and generation calculations of the Kepezkaya HPP. Based on this comprehensive hydrological analysis that has been performed on the basis of the overall basin, the impact of the upstream water consumption

of the irrigation project on the amount of water and hence on the generation potential available at the site of the Project Activity, was estimated. Accordingly it is revealed that, the annual electricity generation of the Kepezkaya HPP and hence the emission reductions will decrease in the future depending on the development of these stages. The expected electricity generation over the 10 years crediting period was estimated to be an annual weighted average of 107,587 MWh as shown on table (Table 2) below:

Table 2: Table showing how the annual average electricity generation over the 1st crediting period is calculated.

		Upstream Development Phase			
		Phase 1	Phase 2	Phase 3	Phase 4
During the entire project life span	Number of Years	7	5	5	33
	Expected Annual Electricity Production (MWh)	124,051	107,970	81,934	81,298
During 1st Crediting Period	Production Time (years)	3	5	2	N/A
	Total Production(MWh)	372,153	539,850	163,868	N/A
	10 years Total (MWh)	1,075,871			
	Average Annual Production (MWh)	107,587			

The following figure shows the location of the Project Activity (black arrow) and its relation to other projects on Göksu River.

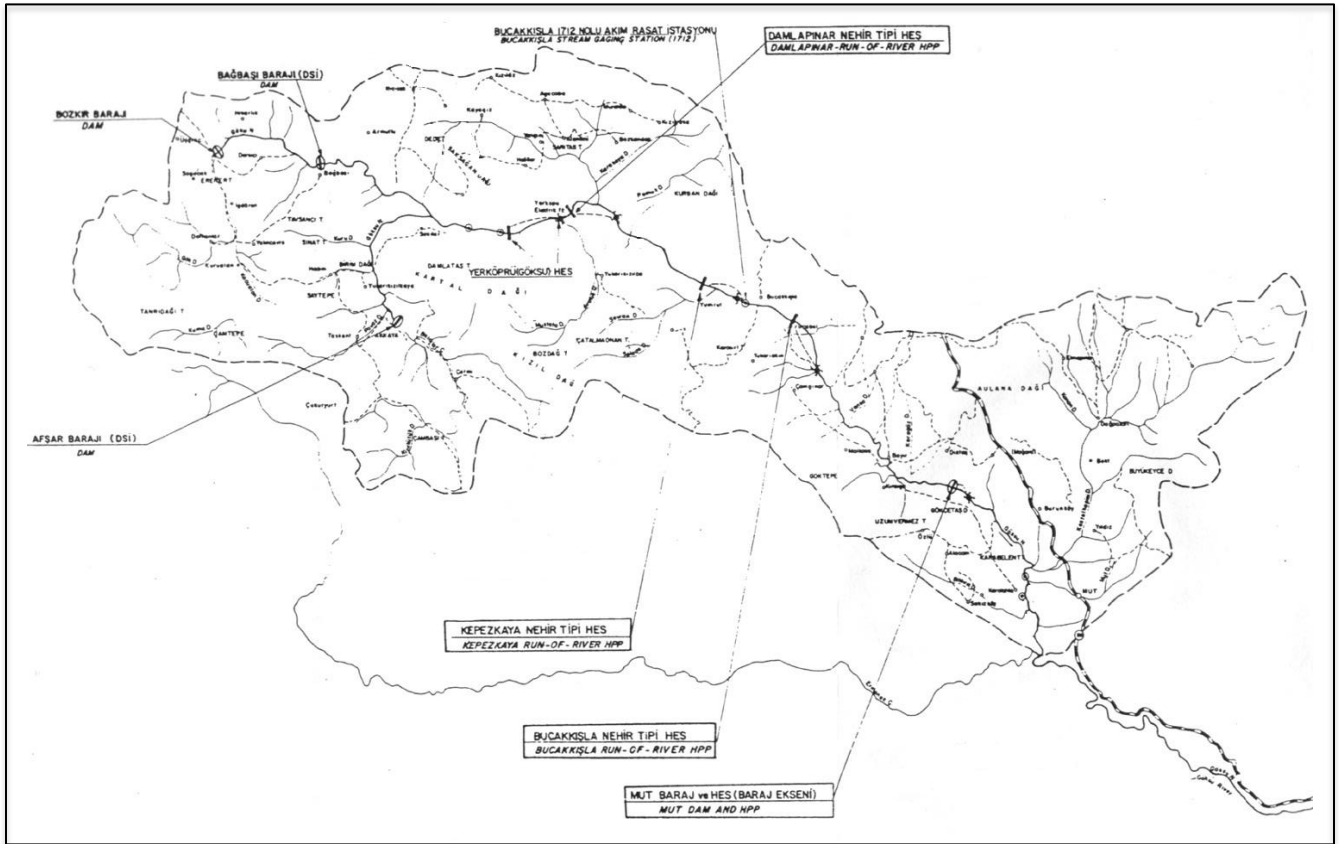


Figure 1: The location of the Project Activity (black arrow) and its relation to other projects on Göksu River. (Taken from the feasibility study report).

The Project Activity is a run-of-river type hydro power plant with a total installed capacity of 28 MW (2 x 14.00 MW). A concrete gravity weir diverts water into the conveyance tunnel with 40 m³/s flow rate capacity. A net water head of 81.57 m (gross head 87.88 m) is formed, and water is discharged into two vertical Francis turbines. A 30 km 33 kV transmission line will interconnect to the national grid at the Kepezkaya Basin Transformer Substation. The following figure (Figure 2) summarizes the general layout of the project, and the next figure (Figure 3) schematically summarizes how the project activity will be operating and what needs to be considered within the physical project boundary.

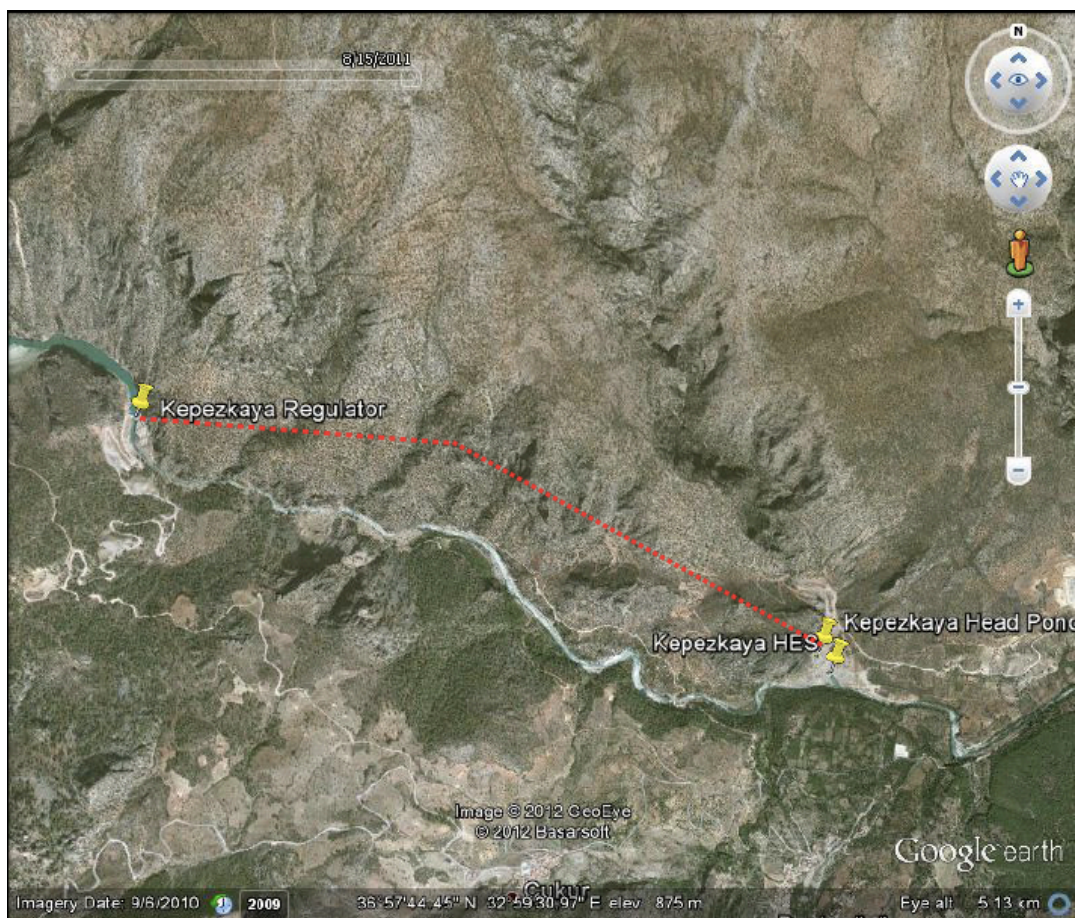


Figure 2: General Layout Plan of the Project Activity

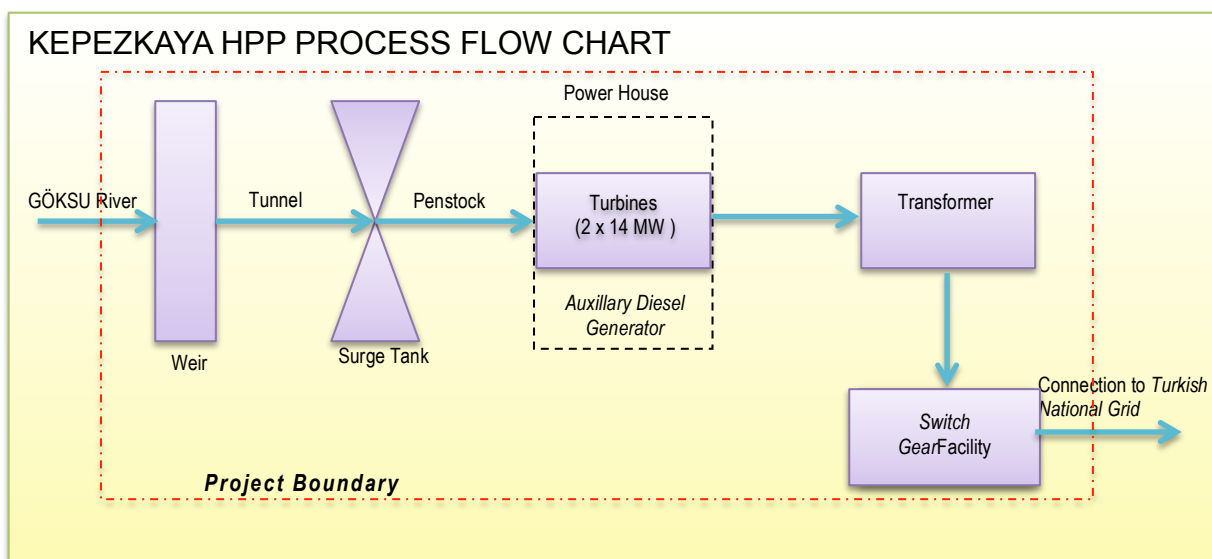


Figure 3: Flow chart showing the basic operational principles of the project activity.

1.2 Sectoral Scope and Project Type

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

1.3 Project Proponent

Project Proponent	Role and Responsibility	Contact Information
Selen Elektrik Üretim Anonim .Şti.	Project Owner – Implementation of the Project	Çetin Emeç Bulvarı 65. Sk. No 4 Balgat Ankara TEL: +90 312 285 8363 FAX: +90 312 285 8343

1.4 Other Entities Involved in the Project

Other Entities Involved	Role and Responsibility	Contact Information
Ekobil Environmental Services and Consulting Ltd. ¹	Preparation of the Project Description Document	Güneykent Sitesi 51. Cad. 1839. Sk. No: 56 Ahlatlıbel-ANKARA T:+90 312 489 13 38 E-mail:info@ekobil.com

1.5 Project Start Date

Project start date is: 1st of October, 2010.

1.6 Project Crediting Period

The project crediting period is 10 years: 01.10.2010 to 30.09.2020 (both dates inclusive). The crediting period is renewable twice.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	☒
Mega-project	☐

Years	
Year 0: 01.10.2010 to 31.12.2010	15,487
Year 1: 2011	61,443
Year 2: 2012	61,443
Year 3: 2013	61,443
Year 4: 2014	61,443
Year 5: 2015	61,443
Year 6: 2016	61,443

¹Registered to the Ankara Chamber of Trade, with the full name of "Ekobil Çevre Hizmetleri Danışmanlık Eğt.Tar. Hayv. Mad. İnş. İth. İhr.Tur. ve Tic. Ltd. Şti."

Year 7: 2017	61,443
Year 8: 2018	61,443
Year 9: 2019	61,443
Year.10: 2020 (01.01.2020 to 30.09.2020)	45,956
Total estimated ERs	614,430
Total number of crediting years	10
Average annual ERs	61,443

1.8 Description of the Project Activity

The Project Activity is a run-of-river type hydro power plant with a total installed capacity of 28 MW (2 x 14.00 MWe). The following is a list of the main components of the project activity:

- A weir with a 80 m crest length and 15.5 m height.
- Spillway equipped with two flap gates for flood control.
- A water intake structure dedicated for energy water diversion purpose.
- A 3 610 m long conveyance tunnel with a diameter of 4.0 meters and a capacity of 40 m³/s.
- A head pond with 15.00 x 13.50 x 9.20 m dimensions.
- Two, 152 m long penstocks with diameter of 2.40 m.
- A powerhouse with 29.40 x 22.20 x 27.00 m dimensions where the turbines and generators will be placed.
- A specially designed fish ladder to allow fish to swim upstream and over the dam.
- Two “Francis” turbines. For an 81.57 m of net head, these turbines are considered to be state-of-the-art technology. Each turbine will have a design discharge of 20 m³/s.
- Two generators, each rated at 16.90 MVA, placed on the top of each turbine.
- A 30 km 33 kV transmission line will interconnect to the national grid at the Karaman Transformer Substation.
- Substation for the electricity dispatch.

Related with the electromechanical equipment of the Project Activity, a contract, “The Supply and Installation of Electro-Mechanical Equipment for Kepezkaya Hydro-Electric Power Plant” has been signed with Harbin Electric (HE) Corporation. Harbin Electric, headquartered in Harbin, China, which is one of the well known international company about developing and manufacturing a wide array of electric motors. In this context, technology transfer has been provided from China within the scope of Project Activity.

The Project Activity will be environmentally safe since it simply uses the water instead of any fossil fuel to produce electricity and it does not contaminate the water and environment.

The main technical characteristics obtained from the DSI Approved, final feasibility report are provided below (Table 3):

Table 3 : Technical characteristics of the Kepezkaya HPP.

Technical characteristics of Kepezkaya HPP		
Thalweg elevation of the weir	:	490.50 m
Crest elevation of the weir	:	503.50 m
Weir height	:	15.50 m
Spillway capacity	:	1 084.78 m ³ /s
Max. operation level	:	501.80 m
Min. operation level	:	497.00 m
Project design capacity	:	40 m ³ /s
Conveyance tunnel length	:	3 610 m
Average flow	:	28.63 m ³ /s
Gross head	:	87.88 m
Net-head	:	81.57 m
Turbine type	:	Francis (Vertical)
Number of units	:	2
Capacity of each unit	:	20 m ³ /s
Installed Capacity	:	28.00 MWe
Total Gross Energy (Maximum)	:	124.05 GWh/year
Average Annual Energy over the 1 st Crediting Period:	:	107.587 GWh/Year


Figure 4: A-Location of the planned weir. B-Location of the penstock and powerhouse

The project will be using two vertical Francis turbines. The Francis type of turbine is a reaction type of turbine. In case of reaction turbines, the water approaches a set of curved blades mounted on a shaft and glides over them thereby changing direction and so imparting pressure on the blades due to centrifugal force, i.e. the force experienced by a passenger in a car when turning very fast. The water enters the blades nearly at a tangent and for the highest efficiency leaves the blades radially and at a reduced velocity. Francis turbines were invented by an English engineer J.B. Francis (1815 – 1892) water is delivered into a volute casing which completely surrounds the runner and is under pressure as well as velocity. The water is guided through both fixed and adjustable veins in the casing and glides onto the runner blades at an angle. The water then turns in the runner to exit parallel with the axis of rotation. The adjustable vanes cater for load changes. A bypass valve or a surge tank deals with sudden load changes. In a Francis turbine the entire wheel assembly is immersed in water and surrounded by a pressure casing. In a Francis turbine the pressure casing is spiral shaped and is tapered to distribute water uniformly around the entire perimeter of the runner. It uses guide vanes to ensure that water is fed into the

runners at the correct angle. See the below Figure (Figure 5), for a schematic explanation of working principles of a Francis Turbine.

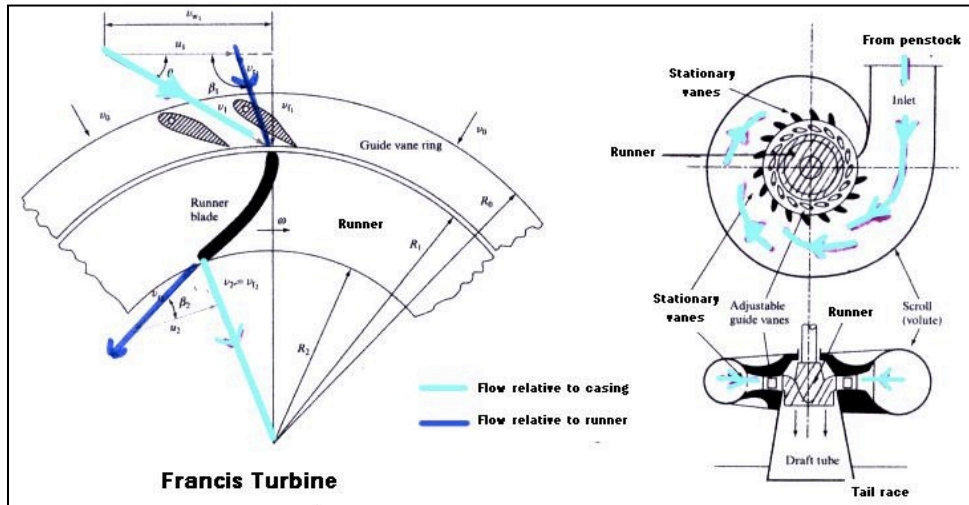


Figure 5: The working principle of a Francis type turbine, in case of the project activity the axis of the turbine will be vertical.

The project owner is granted a production license for 48 years² and 2 and a half months including the 34 and a half months project design and construction phase. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report³ on energy under the 8th development plan published by the State planning organization. Even if the facility can last for 50 years the major equipment needs to be replaced in every 20 years⁴.

The project is expected to produce an average of 107,587 MWh of electricity per year, over the extent of the first crediting period. The annual electricity delivered to the grid by the project, would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. Based on this a combined margin emission reduction factor is calculated as detailed below in Chapter 3 of this document.

1.9 Project Location

The Project Activity is located on the Göksu River in the Eastern Mediterranean region of Turkey, within the Karaman city borders. It is located between the elevations of 500 m and 410 between 32°57'15" - 33°01'25" east longitudes and 36°57'00" - 36°58'15" north latitudes (Figure 6).

The Following (Table 4) gives the coordinates of the Kepezkaya HPP weir location and Power house location.

² According to the production licence dated 5/07/2007 and numbered EÜ/1245-6/897

³ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> (page 4.25 –p72 of PDF document Last visited on 22/07/2012)

⁴ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> (page 4.26 - p73 of PDF document Last visited on 22/07/2012)

Table 4: Coordinates of the Weir and Power house:

	Latitude	Longitude
Weir	36° 57'52.52"N	32°58'09.12"E
Powerhouse	36° 57'10.97"N	33°0'29.91"E



Figure 6: Map showing the location of Kepezkaya HEPP (black arrow within the inset map) on the Göksu River, Karaman, Turkey.

1.10 Conditions Prior to Project Initiation

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

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Addition of a new power generation capacity to the grid is regulated by Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity additions are in compliance with its rules and regulations. The list of the rules and regulations of the host country that a new electricity generation project has to comply with is given in Annex 1..

1.12 Ownership and Other Programs

1.12.1 Proof of Title

Ownership of the plant, equipment and electricity generation licence belongs to Selen Elektrik Üretim A.Ş. and all emission reductions/removals are granted to the company. The production license and the operating certification of the company given by the Chamber of Commerce are provided to the validating DOE as proof of the Title.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable

The Project Activity is not embedded under any kind of Emission trading programs. Turkey is not an Annex-B country under Kyoto Protocol, neither has its set national emission reduction targets nor any related obligations.

1.12.3 Participation under Other GHG Programs

Not applicable

The project is a voluntary project and the host country, Turkey cannot host CDM or JI projects.

1.12.4 Other Forms of Environmental Credit

Not applicable

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

1.12.5 Projects Rejected by Other GHG Programs

Not applicable

The project has not been rejected by any other Green House Gas programme.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The Project is eligible to be a VCS Project because:

- VCS v.3.2 has taken effect on 08.03.2011, accordingly the Project is eligible to use this version.
- VCS v.3.2 requires project crediting period start date earliest to be 01.01.2002, besides, the Project must also complete the validation within two years of the Project Start Date. Both conditions are satisfied for the Project activity.
- VCS v.3.2 accepts all six Kyoto gases. The Project aims to reduce CO₂, which is one of these six Kyoto gases.
- VCS v.3.2 accepts all technologies supported by an approved VCS program. The Project is a hydropower plant, the technology of which is included in the UNFCCC- CDM sectoral scope 1.
- VCS v.3.2 requires the use of one of the VCS program approved project methodologies. The Project activity uses the tools and methodologies of approved by UNFCCC CDM executive board, which is a VCS approved program.
- The project does not benefit from any kind of Official Development Assistance.
- In addition to the above, the project is not a grouped project activity, nor de-bundled part of a grouped project activity

Leakage Management

Not Applicable as the project is a green field project.

Commercially Sensitive Information

A detailed excel workbook summarizing the financial analysis is provided to the validating DOE with relevant evidences that are commercially sensitive, these will not be disclosed to public.

Further Information

No further information to be added.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilised:

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 13.0.0.

The Approved Methodology refers to the following tools:

“Tool for the demonstration and assessment of additionality” (Version 06.0.0)

“Tool to calculate the emission factor for an electricity system”. (Version 02.2.1)

"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02).

2.2 Applicability of Methodology

The methodology ACM0002 (Version 13.0.0) is applicable to the proposed project activity because the proposed project meets all the applicability criteria stated in the methodology:

The methodology is applicable under the following conditions:

- “The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;
- In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2 on page 10 (of the ACM0002 (version 13.0.0)). to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;”

The proposed project activity fits to first condition stated above as it is the installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant).

“In case of hydro power plants:

- One of the following conditions must apply:

- The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or
- The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 ; or
- The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2 .”

In case of Kepezkaya HPP, there is only a weir that rises the water level to transfer the water to the water conveying system. At the maximum operation level of 501.80 m water level the total extend of the area that is flooded by river is 166,258.40 m² therefore the power density is calculated to be 168 W/m^2 , which is much greater than 4 W/m^2 .

“In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply:

- The power density calculated for the entire project activity using equation 5 (provided in the methodology) is greater than 4 W/m^2 ;
- Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant;
- Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;
- Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2 , is lower than 15MW;
- Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2 , is less than 10% of the total installed capacity of the project activity from multiple reservoirs.”

The proposed project activity does not have multiple reservoirs so the above conditions are not applicable and the project activity is eligible.

“The methodology is not applicable to the following:

- Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;
- Biomass fired power plants;

- A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m². “

The proposed project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activity, is not a biomass fired plant, is not a hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m², therefore the project activity is eligible to implement the ACM0002 version 13.0.0

“In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.

The project is not a retrofit, replacement or capacity addition so the above condition is not applicable,

In addition, Kepezkaya HPP meets the applicability conditions included in “Tool for the demonstration and assessment of additionality” (Version 6.0.0) and “Tool to calculate the emission factor for an electricity system” (Version 2.2.0) referred below, the following reasons justify the applicability of the methodological tools:

- “Tool for the demonstration and assessment of additionality” (Version 6.0.0) is required to apply for demonstrating and assessing the additionality of a project activity in ACM0002 (Version 13.0.0).

According to the “Tool to calculate the emission factor for an electricity system” (Version 2.2.0), “This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid.” Accordingly, Kepezkaya HPP will supply electricity to the Turkish National Grid, and therefore this tool can be used to estimate the OM, BM and CM of calculating baseline emissions.

2.3 Project Boundary

Table 5 exhibits the gases included in the project boundary. CO₂ emission is included in the baseline but the project activity does not emit any of the gases listed, in Table 5.

The project boundary includes net electricity generated and supplied to the Turkish national grid. The internal consumption and the GHG due to the temporary use and burning of the diesel fuel by the auxiliary power generators.

Table 5: Main gases included in the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Electricity generation in baseline (Turkey's Grid)	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	N.A.	N.A.
Project	Emission from the reservoir of the proposed project	CO ₂	No	Minor emission source
		CH ₄	No	Minor emission source (Power density greater than 10W/m ²)
		N ₂ O	No	Minor emission source
		Other	N.A.	N.A.
	Auxiliary Diesel Generator ⁵	CO ₂	No	Minor emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	N.A.	N.A.

2.4 Baseline Scenario

Since the proposed project activity is the installation of a new grid-connected hydroelectric, that is renewable power plant and therefore, the baseline scenario is defined as the following based on ACM0002 (Version 13.0.0):

“Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the. Tool to calculate the emission factor for an electricity system (v.02.2.1).”

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

Based on ACM002, baseline emissions are equal to power generated by the project activity that is delivered to the Turkish national grid, multiplied by the baseline emissions factor. This baseline emissions factor (EF_y) is calculated as the Combined Margin (CM), of which the breakdown and detailed description is given below in chapter 3.

⁵ CO₂ emissions from combustion of fossil fuels for electricity generation.

2.5 Additionality

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

This part refers to the “Tool for the Demonstration and Assessment of Additionality Version 6.0.0” and the numbering in this section reflects the Tool’s Guidelines provided at EB 65.

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

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

The project alternatives can be defined as follows:

- a. The proposed project activity undertaken without being registered as a VCS project activity. This alternative is very unlikely as it is not financially attractive, please refer to step 2 for details.
- b. Potential alternatives with the output of renewable electricity such as a geothermal, solar or wind power plants. These alternatives are very unlikely as, wind or geothermal resources are not existing in the project area and the solar plants are technologically not available and is not technically feasible to implement.
- c. Continuation of the current situation (No project activity or other alternatives undertaken). This alternative is the most likely scenario, since there are no legal obligation to implement such a project and without VCS support the project implementation is financially not attractive.

Outcome of Step 1a: The only realistic and credible alternative scenario to the project activity is Scenario (c) Continuation of the current situation, without any project undertaken (a) is not realistic as shown below by the financial analysis that exhibits that the project is not viable without VER revenues.

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

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

Outcome of Step 1b: The alternative scenario to the project activity is the supply of electricity by the existing grid with additional capacity is in compliance with mandatory legislation and regulations.

Step 2 - Investment analysis

At this step it will be demonstrated that “the proposed project activity is not the most economically and financially viable” option without the VER revenue. Please note that, at this step, the “Guidelines on the assessment of investment analysis” (EB 62 Report Annex 5) Version 05 is taken into account.

Sub-step 2a - Determine appropriate analysis method

There are three options for investment analysis method:

- Simple Cost Analysis
- Investment Comparison Analysis and
- Benchmark Analysis

“Simple Cost Analysis” is not applicable for this project activity as the project generates economical benefits from sale of electricity to the Turkish national grid”. Investment Comparison Analysis is also eliminated since the baseline for the project is “the generation of electricity by the existing grid” and no similar investment alternatives exist. Therefore, Benchmark Analysis is the most appropriate approach for the evaluation of the project activity.

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

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

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

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

The Tool for the Demonstration and Assessment of Additionality Version 6.0.0 and the Guidelines issued at EB 62 state that “...Discount rates and benchmarks shall be derived from: Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data”

The Guidelines issued at EB 62⁶, provides the default values for the expected return on equity as an appendix, and Moody’s index values of most of the CDM Countries. Turkey’s Moody’s index (Ba2) is comparable to country’s with the same Moody’s index, and same default benchmark value from this point of view a reasonable and appropriate benchmark to compare the Equity IRR can be taken as 12.50 %.

⁶ Annex 5 Guidelines on The Assessment of Investment Analysis (Version 05)

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

The following parameters are taken into account for the assessment of the investment (Table 6) and supplementary parameters are provided in the "KPZHPPFinancialAnalysis" workbook and submitted to the validating DOE.

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

Parameter	Value	Unit	References
Installed Capacity	28.00	MWe	Production Licence
Expected Annual Electricity Generation	107,587 ⁷ 81,298	MWh MWh	See table 1, calculated based on the assumptions in chapter 9 of DSI Approved Feasibility Study Report (dated March 2008)
Expected Annual Emission Reduction(ER)	61,443	tCO ₂ e	Calculated (see Chapter 3 for details)
Expected VCS-SCS- VCU sales price	7.00	USD/t CO ₂ e	State of the Voluntary Markets 2010 ⁸
Total Investment	61,684,214	USD	Based on FSR Report table 8.11
Annual Operation Costs	768,881.21	USD	Based on Chapter 9 of FSR
Loan	41,100,000	USD	Loan Agreement
Loan Period	10	years	Loan Agreement
Electricity Sales Price	0.073	USD/KWh	Based on the guaranteed price by the "Renewable Energy Law" number 6094
VAT	18	%	V.A.T. Law No:3065
Income Tax	20	%	Income Tax Law number 5281

The value of the investment has been depreciated on a reducing balance basis over 20 years. And 70 % of the long lasting assets are depreciated over 45 years and the residual book value of 23,876,422.05 USD is added back to the cash flow. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report⁹ on energy under the 8th development plan published by the State planning organization. Even if the facility can last for 50 years the major equipment needs to be replaced in every 20 years¹⁰. As a result the project lifetime is estimated to be about 20 years and the investment analysis is therefore done for a time frame of 20 years.

For the assessment of the viability of the project activity the Equity IRR is compared to the benchmark. The equity IRR is worked out as 7.86 %, which is below the benchmark of 12.50%.

⁷ Please note that the electricity generation value applied for the first crediting period (1st 10 years of the financial analysis) reflects the weighted average of electricity generation estimated in parallel to the upstream development of the Mavi tunnel irrigation project mentioned in chapter 1 of the PD. For the next 10 years of the financial analysis the electricity generation values of the development phase 4, namely 81,298 MWh is used in the financial analysis (See Table 2 for the details of the generation values at different upstream development phases).

⁸ Hamilton, K., Sjardin, M., Peters-Stanley, M., and Marcello, T., 2010, Building Bridges: State of the Voluntary Carbon Markets 2010; A Report by Ecosystem Marketplace & Bloomberg New Energy Finance, June 14, 2010.

⁹ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> page 4.25 (Last visited on 3/3/2011)

¹⁰ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> page 4.26 (Last visited on 3/3/2011)

Sub-step 2d - Sensitivity Analysis

To be able to conclude if the investment decision is the financially the most attractive alternative, a sensitivity analysis is performed. Three parameters that affect the equity IRR are examined for the sensitivity analysis:

- Investment Cost
- Operating and Maintenance Cost
- Electricity Revenue

The sensitivity analysis is performed for a range of $\pm 10\%$ fluctuations in the above parameters. The figures in the following table (Table 7) are obtained. Following the "Guidelines on the assessment of investment analysis (Version 05)" of EB 62 Annex 5 when any of the key variables are increased or decreased by at least 10%, and the benchmark is not exceeded (also see Figure 7).

Table 7: Sensitivity analysis for the Equity IRR without carbon revenue for the project (Benchmark: 12.50%)

Change	-10%	-5%	5%	10%	Exceed Benchmark?
Investment Cost	11.0%	9.2%	6.8%	5.8%	No
Operating Cost	8.1%	8.0%	7.8%	7.7%	No
Electricity Revenue	6.3%	7.1%	8.7%	9.6%	No

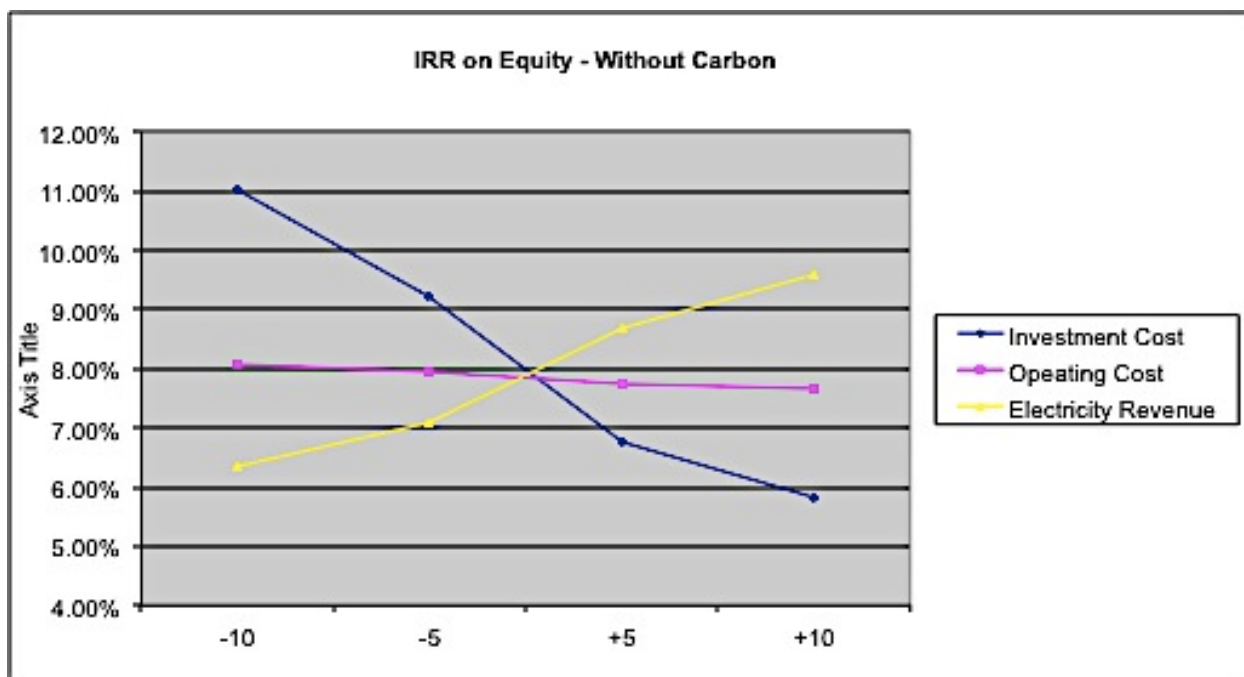


Figure 7: Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by $\pm 10\%$

To exceed the benchmark, the electricity revenue must increase by about 24.65% over the life of the project, or the investment cost must be reduced by about 13,18%. As the Renewable energy law only guarantees a minimum price of USD 0.073 per kWh, and as the project is a run of river type project, it is unlikely for it to wait and catch the best price of the day in the day a head electricity market. As the feasibility report considers the upstream developments and water usage in 4 phases, as these phases will realize, the water available to produce electricity will decrease therefore such an increase in electricity generation is very unlikely. In addition to that as the availability of the water decreases due to the globally accepted results of global climate change, electricity production is very unlikely to reach to an increased generation of 24,55%. In addition to this the climate change models indicate for the Mediterranean basin an increased drought and water scarcity that could even risk the project to reach the firm energy values.

The investment costs we have considered in our financial analysis is reasonable and reflect the average market conditions but are unlikely to go down, and the turnkey, engineering, procurement and construction contract indicates even a higher investment cost.

Outcome of Step 2:

Without the VER revenue the Internal Rate of Return of the project cannot get close to the benchmark of 12.50 %, with an equity internal rate of return of 7.86%. A fluctuation of $\pm 10\%$ in the key parameters also does not make the project exceed the benchmark.

Step 3 - Barrier Analysis

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

Step 4: Common Practice Analysis

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

As per “Tool for the Demonstration and Assessment of Additionality”, projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory frame-work, investment climate, access to technology, access to financing, etc. According to the Guidelines on Common Practice (version 01), common practice analysis is presented through the following 4 steps.

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

As a hydropower project, the installed capacity is chosen as an appropriate proxy for “similar scale”. The power generation capacity of 24.00 MW of the proposed project is selected as the design capacity. Therefore, the range from 12.00 MW to 36.00 MW is considered as applicable capacity.

Common Practice tool Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all} . Registered VER project activities shall not be included in this step:

Projects located in different geographical regions in Turkey have different natural conditions.

The different water availability, climatic regime and considering that the permissions are given from the same regional district of the DSI, lead us to conclude that only the hydroelectric power projects in the 4th region of DSI-Konya, that covers the Karaman Province where the Kepezkaya HPP Project is located, The Konya, and Mersin, provinces that are the closest neighbouring cities, of the Eastern Mediterranean region, where the Göksu River Basin is located is chosen as a realistic comparison geography. See the below figures for the boundary of DSI regional jurisdiction boundaries (Figure 8) and the geographical location of the boundary of the Göksu River Basin (Figure 9). Therefore only projects that are in the Göksu Basin and or are located in one of these provinces are considered: Konya, Karaman and Mersin



Figure 8: The Map showing the jurisdictional boundaries of the DSI regional directorates¹¹. (Please note that the project is located in Karaman Province)

¹¹ Please Note that Karaman Province (where the project is located) is designated as part of the DSI 4th District: Konya, and the Göksu River Basin lies between the Karaman and Mersin Provinces, and between the 4th and 6th DSI Districts (<http://dsi.gov.tr/bolgelerimiz>).

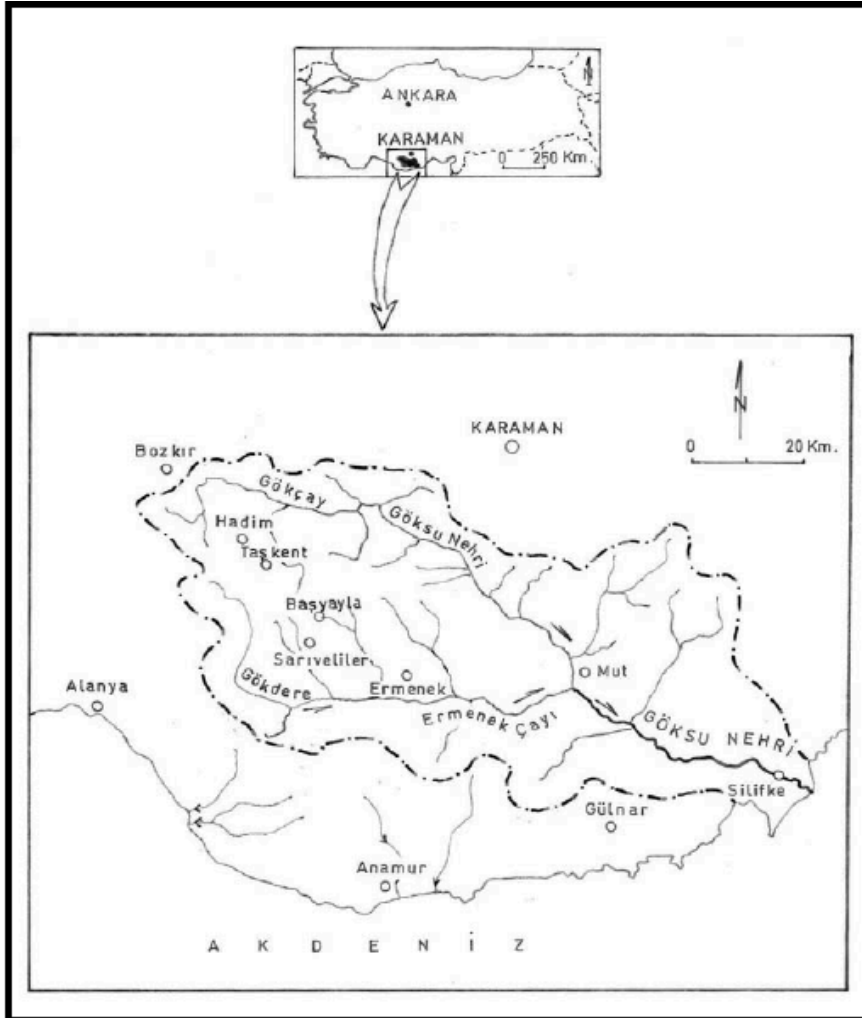


Figure 9 : Location Map showing the boundaries of the Göksu River basin¹².

Projects located in this geography with installed capacity of 12 MW to 36.00 MW, having started commercial operation before the start date of the project, were selected for further analysis. With the above-mentioned criteria, a number of projects under construction or seeking VER revenue assistance are therefore not included.

Within the jurisdiction of DSI 4th Geographical District, there is only one hydroelectric power projects within the range from 12 MW to 36 MW, which started commercial operation before the start date of the Kepezkaya HPP (Table 8). The number of N_{all} is 1.

¹² The figure is taken from a publically available article that can be downloaded from the following link: is : www.sosyalbil.selcuk.edu.tr/.../BULDUR,%20ADNAN%20VD.pdf

Table 8: Projects that are commissioned before the project activity that can be considered to be included in the count of N_{all} .

Name	Investment Type	Capacity (MW)	Mean Annual (GWh)	Province	DSI District	Commissioned in
Pamuk	PL	23.7	81	Mersin	06 Adana	2004

Common Practice tool Step 3: identify the different technologies delivered the same output and differ by at least one of the following aspects, Note their number N_{diff} :

- (i) Energy source/fuel;
- (ii) Feed stock
- (iii) Size of installation (power capacity):
 - Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision3/CMP.6);
 - Small (as defined in paragraph 28 of Decision 1/CMP.2);
 - Large;
- (iv) Investment climate in the date of the investment decision, inter alia:
 - Access to technology;
 - Subsidies or other financial flows;
 - Promotional policies;
 - Legal regulations
- (v) Other features, inter alia:
 - Unit cost of output (units costs are considered different if they differ by at least 20%);

Common Practice tool Sub-step 3a:

When we consider the project listed in Table 8, this project is different from Kepezkaya HPP in the following aspects:

- The project Pamuk HPP was commissioned in 2004 long before carbon finance was available in Turkey.
- It was developed before the 2008 financial crisis so it was developed in a different investment climate.
- This project is 23.7 MW so it is smaller in size than Kepezkaya Project.
- The project was developed in DSI Adana Jurisdiction.

Conclusion of Common Practice tool Sub- Step 3b is $N_{diff}=1$

Common Practice tool Step 4: Calculate factor $F = 1 - N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

$$F = 1 - N_{diff}/N_{all}$$

$$F = 1 - (1/1)$$

$$F = 0$$

Common Practice tool Step 5: Conclusion

The proposed project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all} - N_{diff}$ is greater than 3

Factor F is calculated to be $0 < 0.2$

$N_{all} - N_{diff} = 1 - 1 = 0 < 3$ in that case the Kepezkaya HPP is not common practice.

Conclusion of Step 4: In conclusion the proposed project is deemed to be additional according to ACM0002 and the tool and guideline for the demonstration and assessment of additionality.

2.6 Methodology Deviations

The UNFCCC methodology of ACM0002/ Version 13.3.0 and its related tools have been applied without any deviations.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

According to the latest version (version 13.0.0) of ACM0002 and the tool to calculate the emission factor for electricity system, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” (version 02.2.1 (EB63)).

The Project therefore applies the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” (version 02.2.1 (EB63)).

Step 1 -Identify the relevant electric power system

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

1. *“In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.”* This criteria is not applicable as there is no spot electricity market in the host country.
2. *“The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year”.* The transmission line operator (TEIAS) or any other official source has not published the capacity usage figures for the Turkish grid, hence this criterion can not be proved.

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

Therefore, for the case of the subject project activity “the project electricity system” and “the connected system” are same, and the Turkish National Grid is used as the “project electricity system”. It is also confirmed by TEIAS that the Turkish grid is interconnected. There isn’t any independent or regional grid system in any region of Turkey. The map of the Turkish Electricity Grid is given in the below figure (Figure 10):

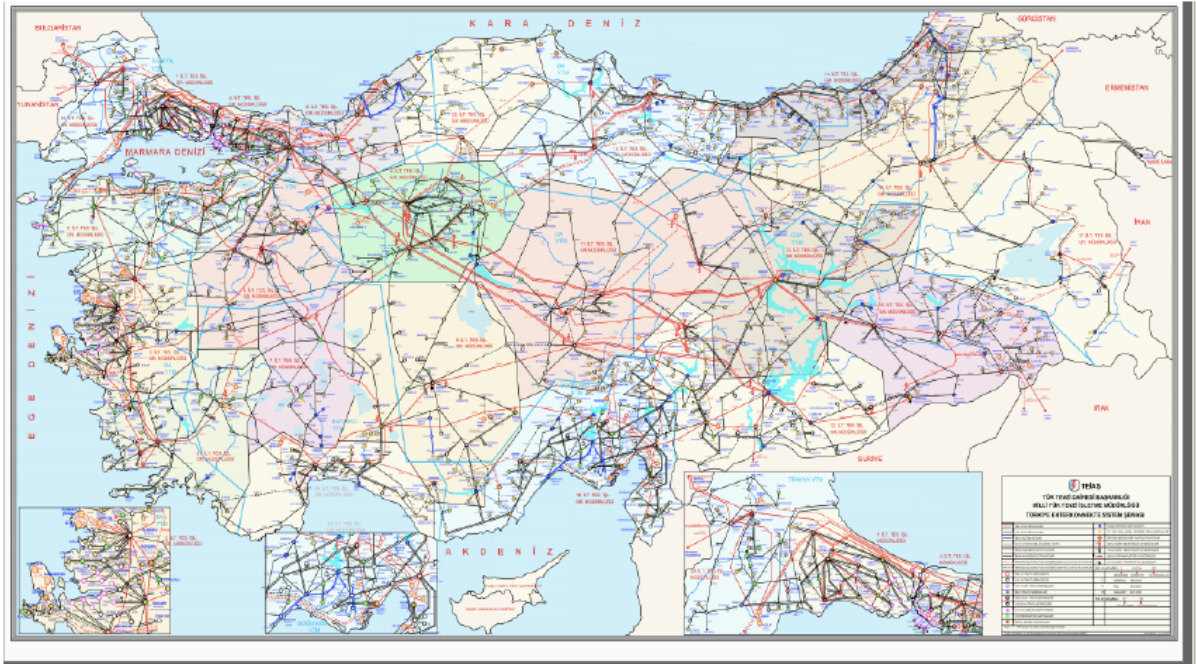


Figure 10: The Map showing the boundaries of Turkish Electricity Grid (Source Electricity Market Report 2010, by Electricity Market Regulatory Authority)

<http://www.epdk.gov.tr/documents/10157/48dd12d4-74da-4dcf-9f48-86983146c0d8>

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

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

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

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

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

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

Step 3 – Select an operating margin (OM) method

According to the “Tool to calculate the emission factor for an electricity system”, version 02.2.1 in calculating the Operating Margin grid emission factor for a given year y ($EF_{grid,OM,y}$), project developers have the option of selecting from four methods:

- (a) Simple OM,
- (b) Simple adjusted OM,
- (c) Dispatch Data Analysis OM, or

(d) Average OM.

As the share of “low cost/must run” resources are below 50% for the five most recent years (Table 9), therefore, in accordance with the Tool, (a) Simple OM method will be used in the calculations.

Table 9: **Share of primary sources in electricity generation, 2006 – 2010**¹³

	2006	2007	2008	2009	2010
<i>Thermal</i>	74.78 %	81.02 %	82.72 %	80.5 %	73.78 %
<i>Hydro</i>	25.10 %	18.72 %	16.77 %	18.46 %	24.52 %
<i>Wind & Geothermal</i>	0.12 %	0.26 %	0.51 %	0.99 %	1.70 %
Total	100 %	100 %	100 %	100 %	100 %

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

- *Ex-ante* option

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

- *Ex-post* option

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

For the calculation of the Simple OM, the “**Ex-Ante**” option is selected, at the time of PDD submission to the DOE, the data vintages that were most recent at the start of validation, belongs to the years 2008, 2009 and 2010. All the data used in calculation of the Simple OM are taken from the TEIAS website, details of which are given below.

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

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

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

¹³ [Annual Development of Installed Capacity Generation in Turkey \(1970-2010\)](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kgucunkullanım(13-21)/13.xls)
([http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kgucunkullanım\(13-21\)/13.xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kgucunkullanım(13-21)/13.xls))

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

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

- Annual fuel consumption by fuel type¹⁴,
- Annual heating values for fuels consumed for electricity generation¹⁵,
- Annual electricity generation by fuel type, import and export¹⁶

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

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_{y,grid}} \quad (7)$$

Where:

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

FC_{i,y} = Amount of fossil fuel type *i* consumed in the project electricity system 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_{CO₂,i,y} = CO₂ emission factor of fossil fuel type *i* in year y (tCO₂/GJ)

¹⁴ Fuel Consumed in thermal P.P.in Turkey by the Electric Utilities (2008-2010) (<http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls>)

¹⁵ Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electric Utilities (2008-2010), (<http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls>).

¹⁶ Turkey's Gross Electricity Generation by Primary Energy Resources and The Electric Utilities (2008-2010) / (<http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls>) / Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2009), ([http://www.teias.gov.tr/istatistik2009/30\(84-09\).xls](http://www.teias.gov.tr/istatistik2009/30(84-09).xls)).

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

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

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

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

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

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

And ,

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

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

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

- a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- b) Determine the annual electricity generation of the project electricity system; excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);

- c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

Between the $SET_{5-units}$ and $SET_{\geq 20\%}$, the sample group that comprises the larger annual generation is $SET_{\geq 20\%}$, hence the set of capacity additions in the electricity system that comprise 20% of the system generation is used.

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

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO2 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)

$EF_{EL,m,y}$ = CO2 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 electricity generation data is available

According to the tool, the CO₂ emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin. Taking into consideration the available data on the capacity additions, the formula given under Option A2 of the Simple OM option A is used to calculate $EF_{EL,m,y}$.

The CO₂ emissions from the most recent capacity additions are calculated by multiplying the $EF_{EL,m,y}$ values calculated for each fuel source by the annual generation of that fuel source (Table 15). The emission factor has been taken as “zero” for the renewable and wastes and the generation efficiencies for the thermal power plants type of which are not known are taken as 60% which is generation efficiency for the combined cycle natural gas power plants. The Build Margin Emission Factor for each year is calculated by dividing the total CO₂ Emissions of the subject year by the total generation from the capacity additions of the same year.

The Build Margin Emission Factor of the grid is then calculated as an average for the years 2009 and 2010.

Step 6 - Calculation of the combined margin emissions factor

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

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

Where:

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

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

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

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

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

Then baseline emissions (BE_y) are obtained as:

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

Where:

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

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

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

And

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

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

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

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (tCO₂)

BE_y = Baseline emissions in year y (tCO₂)

PE_y = Project Emissions in year y (tCO₂)

L_y = Leakage emissions in year y (tCO₂)

As methodology states the PE_y and L_y in case of a hydro power project with a power density > 10 W/m² (, which is 168 W/m² for the Project Activity) to be zero hence $ER_y = BE_y$

3.2 Project Emissions

As the methodology states the PE_y in case of a hydro power project will be calculated:

"Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

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

"...the power density of the project activity (PD) is greater than 4 W/m² and less than or equal to 10 W/m²:"

The project has a power density of 168 W/m² therefore

$$PE_{HP,y} = 0$$

Where:

PEH Project emissions from water reservoirs (tCO₂e/yr)

$P_{,y}$

By the time the final version of this PDD was being prepared the auxiliary generator was recorded to be used for a total of 103 hours (starting from the date of project start date¹⁷). All the power outage was recorded. Even under these extreme and unusual conditions the annual work hours of the diesel generator can be approximated to 59 hours (see foot note 16). Based on the "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" (Version 02)", the emissions that resulted from use of diesel generator as shown in the Box 1 below, calculates to be 10 tCO_{2e} (rounded up). This amount is merely 0.016% of the annual emission reductions estimated to be generated by the project and therefore is considered to be insignificant, and as

¹⁷ The project start date was 01.October 2010, the date total power outage hours was recorded was July 24, so the time frame was 21 months. Dividing the 103/21 and multiplying it by 12 gives 59 hours of power outage for one year.

also implied by the ACM0002 (version 13.0.0) methodology, the emissions from the use of auxiliary diesel generator is not taken into account and the PE is deemed to be zero “0”.

Box 1: Calculation of Diesel gas related emissions assuming 56.8 L/h diesel consumption at 75% of load (based on the project activity diesel generators' specifications).

Parameter	Value	Unit
Average load factor during verification period	75%	
Work hours during verification Period at 50%load	59	h
Diesel consumption per hour (75% load)	56.8	L
Total Diesel consumption during one year	3352	L
<i>Calculating Emissions due to diesel consumption :</i>		
- PE = (FDy) × NCV_{diesel} x COEF_{diesel} - PE: Project emissions from diesel generator (tCO_{2e}) - FDy : Annual diesel fuel consumption (Litres) - NCV_{diesel}: Net Calorific Value for diesel oil (TJ/m³) - COEF_{diesel}: CO₂ emission coefficient for diesel oil (tCO₂/TJ)		
Density of Fuel	0.845	kg/L
M=dxV	2832.440	kg
Fuel in Gigagrams:	0.00283244	Gg
EF _{CO₂,i,y}	74,800 ¹⁸	kgCO ₂ /TJ
NCV _{i,y} :	43.3 ¹⁹	TJ/Gg
COEF _{i,y} (EFXNCV)	3,238,840	kgCO ₂ /Gg
PE=COEFXFuel in Gigagrams	9173.820	kgCO ₂
PE=	9.174	tCO ₂

3.3 Leakage

There are no leakage emissions related to project activity.

3.4 Summary of GHG Emission Reductions and Removals

Ex-ante calculation of emission reductions:

Simple Operating margin (OM)

As also explained above, for the computation of the Simple OM, the Ex-Ante option is selected, at the time of PD submission to the DOE, the data vintages that were most recent, belongs to the years 2008, 2009 and 2010. All the data used in calculation of the Simple OM are taken from the TEİAŞ website, details of which are given below. Taking into account the available data “Simple OM” method “Option B” is the appropriate method for the project activity. TEİAŞ publishes the

¹⁸ IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

¹⁹ 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.

annual heating values of the fuels consumed in the power plants, the heating values are directly related to fuel consumption and are used to calculate average Net Calorific Values (TJ/kt) (Table 10).

The heating values of fuels consumed in thermal power plants are announced by TEİAŞ, the unit of the heating values are Tcal. Tcal is converted to GJoule by using the conversion factor 1cal = 4.1868 Joule. Then the heating values in GJ are divided by Fuel Consumption ($FC_{i,y}$) to get the Net Calorific Values of the fuels consumed in TJ/kt as follows:

Table 10: Net Calorific Values for each fuel type for Turkey

Fuel Type	NCV (TJ/kt)		
	2008	2009	2010
Hard Coal+ Imported Coal	22.24	22.21	22.32
Lignite	6.83	6.43	7.13
Fuel Oil	8.16	7.91	8.89
Diesel Oil	39.70	39.81	40.23
LPG	42.38	42.37	43.09
Naphtha	0.00	0.00	1.00
Natural Gas	44.61	43.65	33.50

The emission factors of fuels required are taken from IPCC 2006 guidelines for GHG inventories²⁰. All data used for the calculations can be found in Annex-2 (See Table 1 and Table 2 to in Annex -2). Table 11 shows total CO₂ emission by fuel types calculated using lower IPCC emission factors and available data from the TEİAŞ website.

Table 11: Calculation of emission by electricity generation (2008-2010)

	Default CO ₂ Emissions (tCO ₂)		
	2008	2009	2010
Hard Coal+Imported Coal	12,942,102.18	13,649,138.82	15,365,199.79
Lignite	41,189,044.65	37,164,240.90	36,745,389.26
Fuel Oil	6,513,942.76	4,792,096.57	2,708,730.18
Diesel Oil	403,661.11	556,318.57	63,674.50
Lpg	0.00	0.00	0.00
Naphtha	32,786.41	24,429.94	30,502.68
Natural Gas	42,980,830.92	42,346,272.06	44,215,362.69
TOTAL	104,062,368.04	98,532,496.86	99,128,859.11

Net electricity generated and supplied to the grid by thermal power plants has been calculated using data obtained from TEİAŞ web page. The ratio between total gross and total net generation (including low-cost/must run plants) has been calculated for each year. The same ratio is assumed to be valid for all thermal plants and total net generation by the plants has been

²⁰ 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)

calculated accordingly. Summing up total net generation with the imported electricity, total supply excluding low cost / must run sources for each year is determined and given in Table 12.

Table 12: Net Electricity Generation from thermal power plants (units in GWh)

	2008	2009	2010
	Unit: GWh		
Net Generation	189,761.90	186,619.30	202,686.36
Gross Generation	198,418.00	194,812.90	211,207.70
Net/Gross Ratio	0.9563744	0.9579412	0.9596542
Net Thermal Generation	156,978.63	150,323.43	149,540.61
Electricity Imports	789.40	812.00	734.26
EG_y (GWh)	157,768.03	151,135.43	150,274.87
EG_y (MWh)	157,768,028.11	151,135,428.72	150,274,870.54

The OM Emission Factor for the years 2008, 2009 and 2010 are calculated by dividing the total CO₂ emissions for those years (Table 11) to the Net Electricity Generation (Table 12) for the subject year. The annual OM emission factors are calculated as follows (Table 13):

Table 13: Annual OM Emission Factors

Year	OM Emission Factor
2008	0.65959
2009	0.65195
2010	0.65965

Finally, OM emission factor is calculated as a generation weighted average for the three most recent years. The resulting OM Emission Factor is;

$$EF_{\text{grid,OMsimple}} = 0.65613$$

Build margin

The gross electricity generation in year 2010 is taken as reference for determination of plants that comprise 20% of the system generation. The gross generation in year 2010 was 211,207.70 GWh (Table 12) in 2010, out of this amount 6,582.28 GWh was produced by projects that claimed VERs, excluding this number from the gross generation we end up with 204,625.42 GWh of electricity which is our AEG_{TOTAL} and 20% of that amount is calculated as 40,925.08 GWh, which is the AEG_{SET-≥20%} value. Summing up electricity the generations of all the plants added to the Turkish National Grid in 2009, and 2010, but excluding the projects that claimed VERs, their total generation is 45,570.28 GWh. This is greater than the 20% of the total generation, So only the power plants added in the last 2 years, excluding those claiming VER credits, are used in the calculations. As there is no power unit older than 10 years this number is going to be used for Build Margin Calculations.

The lists of most recent capacity additions to the grid by year and their average and firm generation capacities for the years 2010, and 2009 is available in the TEIAS statistics page. But

the annual generation capacity data for each plant is not available on the statistics page of TEİAŞ. The data for the years 2009²¹ and 2010²² are taken from the TEİAŞ Capacity Projection Reports which are also available in another section of the TEİAŞ website. For the capacity additions, the firm generation capacities of the power plants are used. The units that are taken out of the grid are not taken into consideration. All the data used for calculations could be found in Annex-2 (see Table 8a and Table8b).

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

Electric efficiency rates

In view of the fact that no power units' specific efficiency data is available in Turkey, average efficiency rates from Turkish fuel consumption and electricity generation statistics were calculated for each energy source (fuel type) and rounded up in order to be conservative. These rates were checked for plausibility by comparing them with values from the European Commission's "Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for Large Combustion Plants" (July 2006).

Two main assumptions were made in order to evaluate conservative efficiency rates:

Assumption 1: Applied electrical efficiency rates are conservative because not all recently built power plants in Turkey may apply Best Available Techniques.

Assumption 2: Applied electrical efficiency rates are conservative because they apply to power plants with a capacity higher than 300 MW and only 5 of the latest 154 recently built power plants in Turkey fall under this category.

Regarding the specific electric efficiency rates the following approach was considered conservative and appropriate to the nature of the data available for the Turkish grid:

Approach related to Fuel specific electric efficiency rates:

Lignite - 28% , The value for capacities from 100-300 MWh. The average capacity for all considered lignite fired thermal power plants (total number of 7) is 253.5MW.

²¹ TEİAŞ Capacity Projection Report 20010-2019
(<http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>)

²² <http://www.teias.gov.tr/projeksiyon/KapasiteProjeksiyonu2011.doc>

Coal - 41%, This category is mainly dominated by the 1 320 MW Iskenderun (Isken) Gr I-II coal-fired power station with a high electrical efficiency rate of 41.13%.

Fuel Oil/Diesel/Naphtha - 40% , According to the Reference Document Best Available Techniques for Large Combustion Plants, liquid oil-fired power plants have an electrical efficiency rate below 40%.

Natural Gas – 50%, In order to define an emission factor for natural gas power plants, official electrical efficiency benchmark data from the German Federal Environmental Agency (UBA) has been used . As the data refer to Best Available Technique standards in Germany, calculations based on these figures are considered to be conservative.

The parameters for the calculation of $EF_{EL,m,y}$, and its calculation is shown in Table 14 below:

Table 14: Calculation of EF_{EL} using conservative generation efficiencies.

	EF (tCO ₂ /TJ)	(EF*3,6)	Generation Efficiency % ($\eta_{m,y}$)	$EF_{EL,m,y}$ tCO ₂ /MWh
Coal	92.80	334,080	41.0%	0.857
Lignite	90.90	327,240	28.0%	0.839
Fuel Oil	75.50	271,800	40.0%	0.688
Diesel	72.60	261,360	40.0%	0.662
Naphtha	69.30	249,480	40.0%	0.416
Natural Gas	54.30	195,480	50.0%	0.326
Bitumen	73.00	262.800	60.0%	0.438

The CO₂ emissions from the most recent capacity additions are calculated by multiplying the $EF_{EL,m,y}$ values calculated for each fuel source by the annual generation of that fuel source (Table 15). The emission factor has been taken as “zero” for the renewable and wastes and the generation efficiencies for the thermal power plants type (such as Bitumen) of which are not known are taken as 60% which is generation efficiency for the combined cycle natural gas power plants. The Build Margin Emission Factor for each year is calculated by dividing the total CO₂ Emissions of the subject year by the total generation from the capacity additions of the same year.

Table 15 Annual CO₂ Emissions for Capacity Additions and Annual BM Emission Factors

Capacity Additions in 2009 (GWh)	CO ₂ Emissions	$EF_{grid,BM,2009}$
Asphaltite	945.00	413.91
Fuel Oil	1,082.08	735.27
Coal	1,923.33	1,567.19
Lignite	7.00	8.18
Natural Gas	16,512.65	6,455.79
Renewables and Wastes	1,019.66	0.00
TOTAL	21,489.72	9,180.34
		0.42720

Table 15 Continued:

Capacity Additions in 2010 (GWh)		CO ₂ Emissions	EF _{grid,BM,2008}
Coal	9,080.00	7,778.07	
Lignite	159.00	185.83	
Natural Gas	13,775.89	5,385.82	
Renewables and Wastes	1,065.66	0.00	
TOTAL	24,080.56	12,970.30	0.53862

The Build Margin Emission Factor of the grid is then calculated as a generation weighted average for the years 2009 and 2010. The resulting BM Grid is:

$$EF_{\text{grid,BM}} = 0.48608$$

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

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

$$EF_y = 0.50 * 0.65613 + 0.50 * 0.48608 = 0.5711037 \text{ tCO}_{2e}/\text{MWh}$$

$$\begin{aligned} ER_y = BE_y &= EG_{\text{facility},y} * EF_y \\ &= 107,587 \text{ MWh} * 0.5711037 \text{ tCO}_{2e}/\text{MWh} = 61,443 \text{ tCO}_{2e} \end{aligned}$$

A summary of the GHG removals by the project activity is given as follows (Table 16):

Table 16: summary of the GHG removals by the project activity

Years	Estimated baseline emissions or removals (tCO _{2e})	Estimated project emissions or removals (tCO _{2e})	Estimated leakage emissions (tCO _{2e})	Estimated net GHG emission reductions or removals (tCO _{2e})
Year 0: 2010 (Oct.1 st to Dec. 31 st)	0	15,487	0	15,487
Year 1: 2011	0	61,443	0	61,443
Year 2: 2012	0	61,443	0	61,443
Year 3: 2013	0	61,443	0	61,443
Year 4: 2014	0	61,443	0	61,443
Year 5: 2015	0	61,443	0	61,443
Year 6: 2016	0	61,443	0	61,443
Year 7: 2017	0	61,443	0	61,443
Year 8: 2018	0	61,443	0	61,443
Year 9: 2019	0	61,443	0	61,443
Year 10: 2020 (Jan. 1 st to Sept.30 th)	0	45,956	0	45,956
Total	0	614,430	0	614,430

4 MONITORING

4.1 Data and Parameters Available at Validation

The following are the data and parameters available at validation:

Data / Parameter:	$FC_{i,y}$
Data unit:	Volume Unit (cubic meter)
Description:	Amount of fuel i consumed by relevant power plants in Turkey in years, 2008, 2009, 2010.
Source of data:	Official publications at the Turkish Electricity Transmission Company (TEİAŞ) Web Site (http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/yakit46-49/47.xls)
Measurement procedures (if any):	-
Monitoring frequency:	Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation
Value applied:	Please see Annex 2-Table-1
QA/QC Procedures	-
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,OM,Simple,y}$

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/Mass or Volume Unit
Description:	Net Calorific Values for fossil fuel type i in year, for the years 2008, 2009 and 2010
Source of data:	Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/yakit46-49/49.xls http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/yakit46-49/47.xls)
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period
Value applied:	Please see Annex-2-Table-1b
QA/QC Procedures	-
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,OM,Simple,y}$. As data on the

	NCV is not published directly on the TEİAŞ website, this data is calculated using the heating values of fuels and the volume or mass of fuels consumed for each year.
--	---

Data / Parameter:	EF _{CO₂,i,y}
Data unit:	tCO ₂ /GJ
Description:	CO ₂ emission factor of fossil fuel type i in year y
Source of data:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories, (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf).
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table-2.
Justification of choice of data or description of measurement methods and procedures applied:	According to the "Tool to calculate the emission factor for an electricity system" version 02.2.1 , if values provided by the fuel supplier of the power plants in invoices or regional or national average defaults values are not available the IPCC default values at the lower limit of uncertainty must be used.
Any comment:	Data used both for the calculation of EF _{grid,OM,Simple,y} and EF _{EL,m,y}

Data / Parameter:	EG _y
Data unit:	MWh
Description:	Net electricity generated in the project electricity system in other words, net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y
Source of data:	Turkish Electricity Transmission Company Web Site http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls www.teias.gov.tr/istatistik2009/30(84-09).xls
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period (For BM VER projects are excluded).
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table 3 and Table 4.
Justification of choice of data or	Data used is taken from the TEİAŞ website, which is the

description of measurement methods and procedures applied:	website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,OM,Simple,y}$

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power unit m in year y
Source of data:	Turkish Electricity Transmission Company Web Site (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 2009 ²³ and 2010 ²⁴ , and the projects that are listed in Gold Standard Registry, VCS project Database, and Blue Registry (VER+ Standard) are deducted.
Measurement procedures (if any):	-
Monitoring frequency:	For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period
QA/QC Procedures	-
Value applied:	Please see Annex 2-Table 8a and Table 8b.
Justification of choice of data or description of measurement methods and procedures applied:	Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid.
Any comment:	Data used for the calculation of $EF_{grid,BM,y}$

Data / Parameter:	$\eta_{m,y}$
Data unit:	%
Description:	Specific electrical efficiency for all relevant energy sources (natural gas, lignite, coal/anthracite, fuel/motor oil).
Source of data:	1. Turkish Electricity Transmission Company (TEİAŞ), http://www.teias.gov.tr 2. European Commission Report (July 2006): Integrated Pollution Prevention and Control (IPPC) - Best Available Techniques for Large Combustion Plants. 3. German Federal Environmental Agency (UBA).
Measurement procedures (if any):	-
Monitoring frequency:	Once for the crediting period
QA/QC Procedures	N/A as the default values provided in Annex 1 are used.
Value applied:	See Table 14
Justification of choice of data or description of measurement methods and procedures applied:	As no plant specific efficiency data is available, average numbers were calculated with the help of statistical data from TEİAŞ.
Any comment:	Data used for the calculation of $EF_{grid,BM,y}$

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (GJ/ton)

²³ <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>

²⁴ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf>

Description:	Weighted average net calorific value of fuel type i in year y
Measured /Calculated /Default:	Default
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
Value(s) of monitored parameter:	43.3 GJ/ton
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Data will be used for Project Emission Calculations. The project emissions are those that are related to the burning of the diesel (fossil fuel) in the auxiliary power generators that produce electricity in the absence of the electricity obtained from the grid for self consumption.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Default values are used
Measuring/ Reading/ Recording frequency:	Default IPCC value is used. Any future revision of the IPCC Guidelines will be taken into account
Calculation method (if applicable):	Not Applicable as default value of the IPCC guidelines is utilized
QA/QC procedures applied:	Not Applicable as default value of the IPCC guidelines is utilized
Comments	Applicable as option B of the Methodological tool "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02) is chosen.

4.2 Data and Parameters Monitored

The following are the data and parameters monitored subsequent to validation:

Data / Parameter:	EG _{PP-self consumption, y}
Data unit:	MWh
Description:	Quantity of electricity imported by the power plant from the Grid for self consumption, in year y
Measured /Calculated /Default:	Measured
Source of data:	The primary source of data will be the Main TEIAS meters located at the Kepezkaya Powerhouse. The data read through these meters are recorded at the monthly reading protocols, the column related to electricity obtained from the Grid. There are two main meters, each record the generation of electricity from each line that transmit the electricity generated by each unit of generators, and there will be two back-up meters, for each one of these main meters. The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading UE _{CM} ²⁵ .
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters that belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid,
Frequency of monitoring/recording:	Recorded continuously, reported monthly on TEİAŞ Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied:	Will be determined at the monitoring stage

²⁵ UE_{CM}: Ulaştırılmaya Esas Çekim Miktarı-Amount of Electricity taken from the grid based on Reconciliation.

Monitoring equipment:	Unit -1 Main Electricity Meter: <i>Elster A 1500:-Serial Number: 401726</i> Unit-1 Back-up Electricity Meter: <i>Elster A 1500:-Serial Number: 401725</i> Unit -2 Main Electricity Meter: <i>Elster A 1500:-Serial Number: 401723</i> Unit-2 Back-up Electricity Meter: <i>Elster A 1500:-Serial Number: 401724</i> All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market²⁶. They have an accuracy class of Class002 indicating an accuracy range of 0,2%.
QA/QC procedures to be applied:	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class02, that is to say should be within the $\pm 0,2\%$ ($\pm 0,002$) range. The monthly reported meter readings by the unit 1 main meter with serial number 401726, will be cross-checked against the unit 1 back up meter that has the serial number 401725, and similarly the meter readings by the unit 2 main meter with serial number 401723, will be cross-checked against the unit 2 back up meter that has the serial number 401724. If the reading difference is less than $\pm 0,002$ ($\pm 0,2\%$) than the meter readings are considered to be OK, if not than the meters will be checked. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Calculation method:	Direct continuous measurement
Any comment:	Data will be used to calculate net electricity supplied to the grid.

Data / Parameter:	EG _{PP-gross, y}
Data unit:	MWh
Description:	Quantity of electricity produced by the power plant , in y
Measured /Calculated /Default:	Measured
Source of data:	The primary source of data will be the Main TEIAS meters located at the Kepezkaya Powerhouse. The data read through these meters are recorded at the monthly reading protocols, the column related to electricity supplied to the Grid. There are two main meters, each record the generation of electricity from each line that transmit the electricity generated by each unit of generators, and there will be two back-up meters, for each one of these main meters. The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading ISVM²⁷.
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid,
Frequency of monitoring/recording:	Recorded continuously, reported monthly on TEİAŞ Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied:	Will be determined at the monitoring stage

²⁶ The latest version of the communiqué (in Turkish) can be found in the following link: <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44>

²⁷ ISVM: İletim Sistemine Veriş Miktarı-Amount Supplied to the Grid

Monitoring equipment:	Unit -1 Main Electricity Meter: <i>Elster A 1500:-Serial Number: 401726</i> Unit-1 Back-up Electricity Meter: <i>Elster A 1500:-Serial Number: 401725</i> Unit -2 Main Electricity Meter: <i>Elster A 1500:-Serial Number: 401723</i> Unit-2 Back-up Electricity Meter: <i>Elster A 1500:-Serial Number: 401724</i> All meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market ²⁸ . They have an accuracy class of Class002 indicating an accuracy range of 0,2%.
QA/QC procedures to be applied:	Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class002, that is to say should be within the $\pm 0,2\%$ ($\pm 0,002$) range. The monthly reported meter readings by the unit 1 main meter with serial number 401726, will be cross-checked against the unit 1 back up meter that has the serial number 401725, and similarly the meter readings by the unit 2 main meter with serial number 401723, will be cross-checked against the unit 2 back up meter that has the serial number 401724. If the reading difference is less than $\pm 0,002$ ($\pm 0,2\%$) than the meter readings are considered to be OK, if not than the meters will be checked. The monthly reported readings will also be cross checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Calculation method:	Direct continuous measurement
Any comment:	Data will be used to calculate net electricity supplied to the grid.

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydropower plants after the implementation of the Project Activity.
Measured /Calculated /Default:	Measured
Source of data:	Project site
Description of measurement methods and procedures to be applied:	Observed via the SCADA system of the Project Activity
Frequency of monitoring/recording:	Once for each monitoring period
Value applied:	28 000 000
Monitoring equipment:	SCADA system of the Project Activity
QA/QC procedures to be applied:	Can be confirmed also by the parameter readings on the design plates of each turbine and by summing the two units.
Calculation method:	N/A
Any comment:	-

²⁸ The latest version of the communiqué (in Turkish) can be found in the following link: <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44>

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is full.
Measured /Calculated /Default:	Indirectly measured based on depth readings from the Scada system
Source of data:	Scada System of the project
Description of measurement methods and procedures to be applied:	The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.
Frequency of monitoring/recording:	Once during each monitoring period
Value applied:	166,258
Monitoring equipment:	Scada system water level readings
QA/QC procedures to be applied:	Can be checked and compared to satellite imagery available by Google Earth.
Calculation method:	-
Any comment:	-

Data unit:	$PE_{FC,i,y}$
Description:	tCO_2/yr
Measured /Calculated /Default:	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" (Version 2.00 EB 41 Report Annex 11)
Description of measurement methods and procedures to be applied:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 2.00 EB 41 Report Annex 11)
Frequency of monitoring/recording:	Once at every monitoring period
Value applied:	-
Monitoring equipment:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 2.00 EB 41 Report Annex 11)
QA/QC procedures to be applied:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 2.00 EB 41 Report Annex 11)
Calculation method:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 2.00 EB 41 Report Annex 11)
Any comment:	Used to determine Project Emissions related to use of auxiliary diesel generator at the power house of the project activity.

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit per year (tonne/yr)

Description:	Quantity of fuel type <i>i</i> combusted in process <i>j</i> during the year <i>y</i>
Measured /Calculated /Default:	Calculated
Source of data:	Onsite logs and measurements
Description of measurement methods and procedures to be applied:	N/A as option A is chosen
Frequency of monitoring/recording:	Once at every monitoring period
Value applied:	-
Monitoring equipment:	Site Manager's log book
QA/QC procedures to be applied:	Continuous
Calculation method:	1. The auxiliary diesel generator work hours are recorded precisely and the annual work hours are summed and conservatively round up to the nearest whole hour. 2. The total hours multiplied by the diesel fuel consumption of 56.8 L at 75% load factor as described in the facts sheet of Volvo TAD94 1GE model BCV 360-50 E2 Diesel generator. 3. The Mass is calculated based on the following formula: • $M=d \times V$ where : • M = Mass in kg, • d = the average density of diesel fuel (0.845 kg/L^{29}) and • V is the Volume in litres • The Mass in kg is converted to Tonnes by dividing into 1000.
Any comment:	Used for the calculation of Project Emissions related to use of auxiliary diesel generator.

Data / Parameter:	NCV_{i,y}
Data unit:	GJ per mass or volume unit (GJ/ton)
Description:	Weighted average net calorific value of fuel type <i>i</i> in year <i>y</i>
Measured /Calculated /Default:	Default
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:	Not Applicable as default value of the IPCC guidelines is utilized
Frequency of monitoring/recording:	Not Applicable as default value of the IPCC guidelines is utilized
Value applied:	43.3 GJ/ton (default value used for calculations-does not change throughout the crediting 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 utilized
Calculation method:	Not Applicable as default value of the IPCC guidelines is utilized
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 / Parameter:	EF_{CO2,i,y}
Data unit:	tCO ₂ /GJ

²⁹ The source of the fuel density is taken from the Tüpraş refinery data that is producing the diesel sold in the project activity host country : <http://www.tupras.com.tr/detailpage.en.php?strProductKey=403&IRedirectPageID=1621>

Description:	Weighted average CO ₂ emission factor of fuel type <i>i</i> in year <i>y</i>
Measured /Calculated /Default:	Default
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 Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures to be applied:	Not Applicable as default value of the IPCC guidelines is utilized
Frequency of monitoring/recording:	Not Applicable as default value of the IPCC guidelines is utilized
Value applied:	74.80 tCO 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 utilized
Calculation method:	Not Applicable as default value of the IPCC guidelines is utilized
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.

4.3 Description of the Monitoring Plan

Objectives of the monitoring program

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

Data to be monitored

Given that the emission factor is calculated on an ex-ante basis, the first data to be monitored is the electricity net supplied to the grid.

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

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.

Finally even if the amount of diesel consumption related emissions is expected to be lower than 1% of the total emission reductions, the amount of diesel consumed will also be monitored.

Monitoring procedures

The monitoring will be conducted by the Verified Emission Reduction (VER) Monitoring Team. The VER Team Members, and their position and duties for the monitoring is outlined in the following table (Table 16):

Table 17: Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Kepezkaya HPP Manager	Day to day operation of the Kepezkaya HPP, Compliance of the project activity with the host country rules and regulations Coordination of the data collection and recording for the VCS monitoring report.
Chief Electrical Engineer	Day to day follow up of electrical equipment Recording and monitoring of the electricity generation data
Accounts Manager	Data keeping for power sales Keeping the track record of PMUM/MFRC data
Chief Mechanical Engineer	Day to day operation of the power plant Keeping records of malfunctions and repairs
Carbon Consultant	Emission reduction calculations Scripting of the periodic monitoring report Follow up of the verification process

The power generation meter readings will be performed by using the main metering devices and the back-up metering devices will be used for accuracy checks only. Data from metering devices will be recorded by TEİAŞ on monthly agreed protocols and will form the basis for invoicing. In addition to the readings of the two metering devices, generation data of the Kepezkaya HPP can be cross checked, via the TEİAŞ – PMUM web site (<http://pmum.teias.gov.tr>) which is accessible by a password available to the electricity generation companies. The monthly screen shut print outs of the PMUM data will be available to the verifying DOE during the verification process for cross checking. Electricity generation data at the Market Financial Reconciliation Centre (MFRC/PMUM) web page will exhibit the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from PMUM web site needs to be multiplied by the transmission loss factor of the grid.

Monitoring equipment

Electricity meters

The main and back-up electricity meters will be bi-directional for quantifying the electricity delivered by the Project Activity to the grid.

The meters will be in compliance with the standards of the Turkish Standards Institute and will have obtained a “Type and System Approval” certificate from the Ministry of Trade and Industry. In case there are modifications to the standards, the modified standard shall be valid; and in case a valid standard is cancelled or abolished, the new standard shall be valid. The standards that will be used are TS-620 EN 60044-1 and TS718 IEC60044.2 for main and back-up meters,

respectively. The sensitivity of the main and secondary meters are $CI = 0.2$ for active and reactive energy. The meters shall be factory calibrated by the manufacturer before installation. Records of the meter (type, made, model and calibration documentation) will be retained in the quality control system.

Data collecting and recording

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

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

Meters:

A. Main Electricity Meters:

- a. Unit 1 Main Meter: ELSTER A 1500: Serial Number: 401726
- b. Unit 2 Main Meter: ELSTER A 1500: Serial Number: 401723

B. Back-up Electricity Meters:

- a. Unit 1 Back-up Meter: ELSTER A 1500: Serial Number: 401725
- b. Unit 2 Back-up Meter: ELSTER A 1500: Serial Number: 401724

These meters are placed at the Kepezkaya powerhouse where the power plant gets connected to the Turkish national grid. Those meters will provide official data, which will be read and recorded monthly by TEİAŞ officers for invoicing. TEİAŞ also conducts the calibration and maintenance of these meters and thus, ensures the accuracy and quality of the measurements. The quality standards that the meters need to comply is "The ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S)" The calibration of the meters is done and the meters will be checked continuously if there is a difference of 0.2 % in the readings of the main and the auxiliary meters, the calibration is repeated.

At the end of each month, the monthly generation will be read by both a State representative and the plant manager to determine the invoiced generation amount. In case of failure of the main meter, secondary meter is used to determine the invoiced generation amount. These readings can be on site as well as remotely by the systems that will be put in place by the grid operator TEİAŞ.

The net electricity produced ($EG_{PP-net, y}$) in year y is calculated by subtracting the total electricity consumed by the hydroelectric power plant ($EG_{PP-self\ consumption, y}$), from the gross electricity generation ($EG_{PP-gross, y}$). After obtaining the net electricity production value, the emission reductions will be calculated by multiplying the net electricity with the Ex-ante Combined Margin Emission Factor calculated above.

Measuring Installed Capacity

By means of the SCADA system established in the plant all kinds of technical parameters related with turbines and generators including installed capacity will be measured and stored in the

system on real time basis. The installed capacity of the plant will be measured from SCADA once a year while the plant is operated with full load and the related data will be stored as per the monitoring program.

Measuring Reservoir Area

The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.

Project Emissions related to Diesel Generator usage:

The project is forced to use an auxiliary diesel generator in cases when there may be a power outage. Project owner's technicians will keep a track record of the diesel consumed by the diesel generator and the hours of diesel generator usage on a day-to-day basis. The records will be evaluated at the end of each monitoring period.

Data management

At the end of each month, electricity supplied to the grid will be entered into an electronic spread sheet. The data to be measured for installed capacity and reservoir area will be entered into an electronic spread sheet at the end of each year. The electronic files will be backed up on both hard drives and on a Compact Disc (CD).

Quality Control and Assurance (QC/QA)

All of the main and back-up meters are owned and installed by the grid operator, TEIAS. The Project Owner will sign an agreement with the grid operator to specify the QA procedure for measurement and calibration to ensure the measurement accuracy of the main and back-up meters are in compliance with national regulations. The Calibrations of the electricity meters are valid for the next 10 years after calibration,

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

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

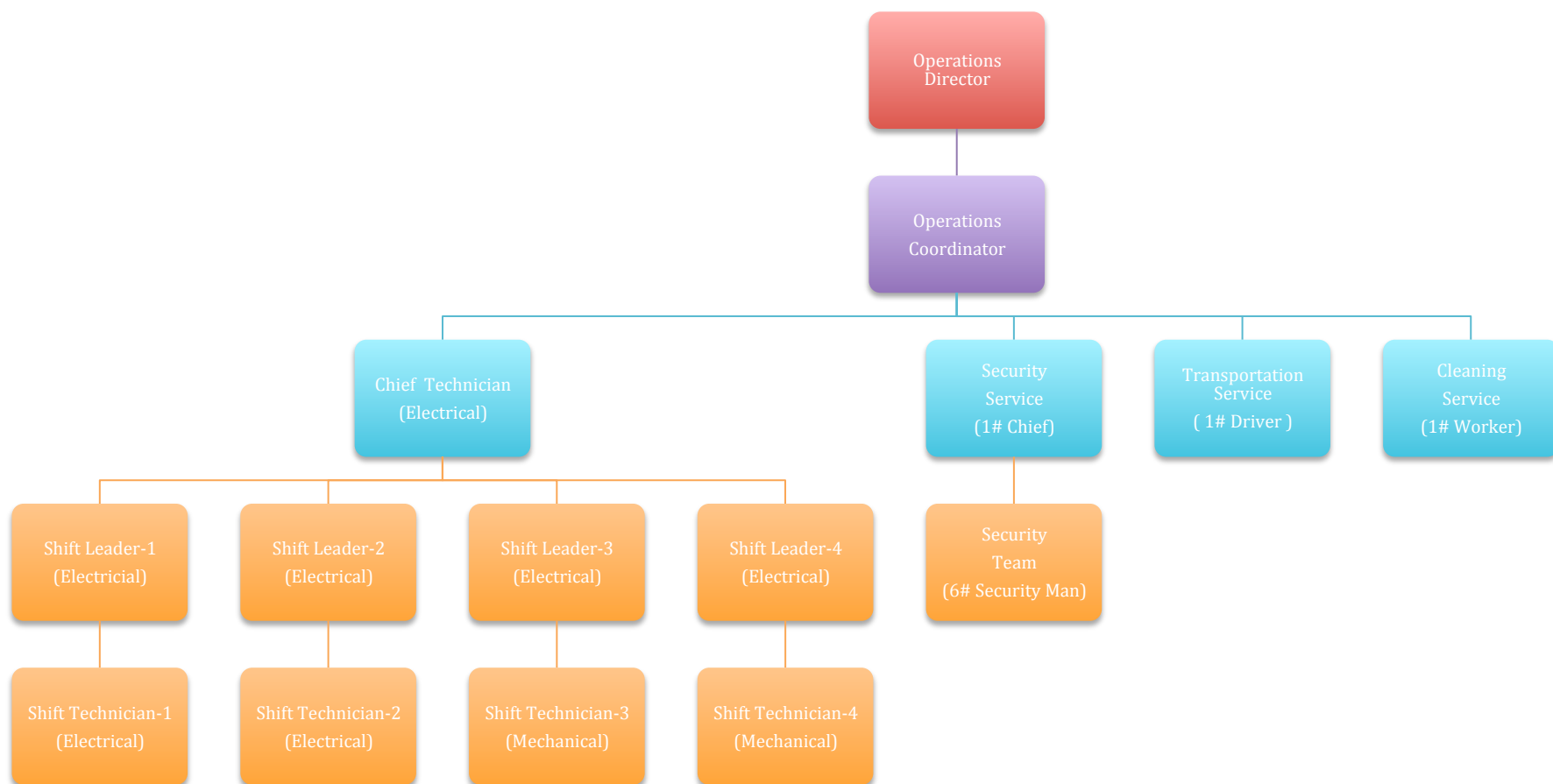
All data records will be kept for at least 2 years from the last project credited year.

Further detailed information on the monitoring procedures is presented in the following Table (Table18), and the following table (Table 19) exhibits a typical plant operation organization chart

Table 18: Table outlining the details of the monitoring Procedures

Parameter	Monitoring location	Superintendent	Procedure (monitoring and calibration)	Data collection and archiving
EG _y	Four electricity meters two main for each line and two back up for each line of measurement) would be installed for reading all the electricity delivered from the hydroelectric power plant to the local grid and the electricity consumed by the power plant. The main and secondary back-up meters will be installed at the end of the transmission line.	TEIAS inspector & Project Owner's Representative/Or remote Access by the TEIAS operator.	Continuous measuring monthly recording: On every month's last day, the production index will be taken from the main as well as the back-up meter: Meter readings shall be carried out at 00:00 on the last day of every month by authorized representatives of TEIAS or the distribution licensee in the region where the generation facility and consumers are located, in the presence of Project Owner's representative. Every month the meters will be read and recorded in the meter reading minutes. A protocol, which shows the measured data will be signed by the Project Owner's representative and a responsible person from the State Authorities (TEIAS – Turkish Electricity Transmission Company). The two meters will be calibrated directly at the installation point by the grid company (TEIAS) supplier representative. A periodic or random examination of the calibration could be held to all four of the meters, from time to time by the grid operator. Otherwise the calibration of the meters are valid for the next 10 years after calibration. The monthly meter reading can as well be remotely arranged by the grid operator and be approved by the project owner's authorized personnel via e-mail correspondence.	The reading protocol will be sent to PMUM which is "Financial Settlement Centre" a branch of system operator and is responsible for preparing of invoices reacted with market participants generation volume and the amount of electricity delivered to the system or energy purchased from the system. On the 18th of every next month, PMUM announces the settlement amount and send invoices to the energy purchasers and take the invoices from the sellers. In reference to the checked data from the protocol and the PMUM data, Project Owner will prepare the invoice for the generated electricity. The monthly meter reading documents will be stored by Project Owner and TEIAS on electronic spreadsheets with back-up files.
Cap _{PJ}	Installed capacity of the hydropower plant after the implementation of the Project Activity.	Project Owner's Assigned Technician	Using the SCADA system installed capacity will be measured automatically.	By means of the SCADA system established in the plants all kinds of technical parameters related with turbines and generators including installed capacity will be measured and stored in the system on real time basis. The installed capacity of the plants will be measured from SCADA once a year while the plants are operated with full load and the related data will be stored as per the monitoring program.
AP _J	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity when the reservoir is full	Project Owner's Assigned Technician	The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.	The Google Earth image of the reservoir at maximum operational level will be made available to the verifying DOE as a means of secondary comparison.
FC _{J,y}	Quantity of fuel type <i>i</i> combusted in process <i>j</i> during the year <i>y</i>	Project Owner's Assigned Technician	1. The auxiliary diesel generator work hours are recorded precisely and the annual work hours are summed and conservatively round up to the nearest whole hour. 2. The total hours multiplied by the diesel fuel consumption of 31 L at 50% load factor as described in the facts sheet of ACQ 350 AKSA Diesel generator. 3. The Mass is calculated based on the following formula: • $M = d \times V$ where : • M = Mass in kg, • d = the average density of diesel fuel (0.845 kg/L) and • V is the Volume in liters •The Mass in kg is converted to Tonnes by dividing into 1000.	Data will be recorded in the Kepezkaya HPP Manager's log book and will also be recorded in the relevant sheet of the excel work book that will be used to monitor all the data related to emission reduction monitoring. The excel sheet will be backed up and copied to a CD.

Table 19: Table showing a typical plant operation organization chart:



5 ENVIRONMENTAL IMPACT

In accordance with “Environmental Law” No. 2872 (Issued in 1983), Annex 2 of Environmental Impact Assessment (EIA) Regulation (issued in 1993 and revised in 2001), run-off river type Hydroelectric Power Plants with an installed capacity of 50 MW or less are not subject to a full EIA process or report preparation. Instead, for these types of projects, a preliminary EIA report including general information about the project site and general project characteristics was submitted to The Ministry of Environment and Forestry. At the end of the review of the report, the Ministry issued a certificate stating, “there is no need for an EIA report”.

Some possible environmental impacts during the construction and operating phases stated in the preliminary EIA report are summarized as follows:

The status of the area

The Project doesn't fall into any of the following categories: national park, special protected area, highly populated area, area of historical cultural or archeological importance, erosion area, landslide area, forestation area, or aquifer that should be protected in accordance with the underground waters law no. 167.

Mines

Three quarries are expected to be operated to provide the necessary building materials of the project. Bucakkışla village is located about 1km from one of the quarries. Therefore, noise and dust distribution models were conducted. It was calculated that the expected dust flow and noise levels in the vicinity of residential areas will be well within the regulatory limits. Quarry rehabilitation will be done at the end of the construction period. Excavated areas will be filled with solid materials, covered with soil, trees planted and fertilizers applied to speed up the rehabilitation process.

Excavated materials

Excavated fertile soil will be used for land reclamation in agricultural by spreading areas with a small slope grade. Other excavated materials will be collected and piled in three designated temporary areas around the regulator, tunneling system and power house, and would ultimately be used for filling and leveling for road construction and land rehabilitation.

Solid Wastes Caused by Construction

Solid waste produced during construction may include iron materials such as reinforcing iron or piping, wood, and concrete materials. The iron materials will be sold to scrap dealers; the wood will be given to the local villagers to be used for heating; and concrete materials will be used as fill materials for land rehabilitation.

Dust flow

Modeling for dust flow behavior from the various expected activities of the project in relation to the nearest residential areas revealed no significant effects. Values were well within the regulatory requirements. However, the following measures will be taken in order to minimize the amount of dust flow during all activities and to minimize the exposure of the construction workers:

1. The material loaded on trucks will be covered with canvas during transportation.
2. Loading and unloading will be made without winnowing.
3. Speed limits will be set for the vehicles.
4. The construction sites and service roads will be sprayed with water.

The provisions of "Regulations for Control of Air Pollution Caused by Industrial Facilities", announced in the Official Gazette No. 26236, dated 22/07/2006, shall be observed during this activity.

Hazardous Substances and Wastes

The residue oils and fuels from the construction equipment will be disposed of according to the Regulations for Control of Hazardous Wastes, announced in the Official Gazette No. 25755, on 14 of March 2005, and Regulations for Control of Waste Oils announced in the Official Gazette No. 25353, on 21 January 2004.

The explosive to be used in construction of the conveyance tunnel is ANFO. The explosives will be transported and used in accordance with the "Regulations of Measures to be Taken At Workplaces Operated Using Explosive, Combustive, Dangerous and Hazardous Substances" and the "Regulations Related to Procedures and Principles of Production, Import, Transportation, Preserving, Storing, Sales, Use, Disposal, Inspection of Explosive Substances, Hunting Materials and Similar Substances, Excluding Tekel", announced in the Official Gazette No. 19589 on 29 September 1987.

Hazardous waste such as rubber, batteries, cables, paints, barrels, contaminated ground by oil, oil binding filters, etc. shall be collected and sent to a licensed hazardous waste recycling or disposal plant, and treated according to the provisions given in the "Regulations for Control of Hazardous Wastes" announced in the Official Gazette No. 25755, dated 14 March 2005.

Air quality

Modeling of dust flow and emissions predict no significant effect on air quality of the nearest residential areas, and the levels are in accordance with the "Regulations for Control of Air Pollution Caused by Industrial Facilities", announced in the Official Gazette No. 26236, on the 22/07/2006.

Noise

The noise levels on Kepezkaya Regulator site, tunneling system and HES site, were modeled. It was predicted that day and night time noise levels around the nearest residential areas will be within the standards of the "Day and night noise limits for Rural Areas and Settlement Areas" in

accordance with the Article 25 of the Regulations for Evaluation and Management of Environmental Noise announced in the Official Gazette No. 25862 on 01.07.2005.

Water flow

150 lt / sec of water will be released from the weir for wildlife year-round. Between the weir and the powerhouse, agricultural land is used by the local community. Therefore, during irrigation months, an additional 200 lt / sec will be released for a total of 350 lt / sec. More water will be released if it is realized during the operation of the Project that this amount is insufficient to assure the well-being of the wildlife.

Water quality

The Project is not expected to have a material effect on water quality. The planned regulator is a small reservoir with a volume of 370.988 m³ which is enough to retain water for only a few hours. In addition, all vegetation will be cleared prior to flooding the area. Therefore, anaerobic conditions and decomposition are not expected to form and will not affect water quality and composition, or encourage methane production.

Ecology

The project area is not designated as an area for preservation. According to the available literature, there are no rare, endemic, endangered or protected species by national and/or international laws. Fauna and flora species which are included in the Bern Convention or Red Data Book categories were not found in the project area. A fish passage for fish species will be built, and once in operation, the project will not produce any air or water pollution to the surrounding environment. It is therefore concluded that the implementation of the project is expected to have only a minor impact on the surrounding environment and regional ecology.

As there was no settlement in the reservoir area, resettlement was not needed for the Project Activity.

6 STAKEHOLDER COMMENTS

A dialog meeting with stakeholders regarding the planned project was conducted in the meeting hall of Bucakkışla Köyü, Merkez ilçe, Karaman province, on October 2nd 2007³⁰. The meeting was organized and conducted by Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. Şti. This meeting was the first dialogue ever conducted with stakeholders by this large company (the largest in Turkey) which was unfamiliar with the concept and its importance. By doing so, the project contributed to the idea of establishing a dialogue with stakeholders as a common practice in other projects. To prepare for the meeting, key stakeholders were identified and notified about the event. For the participation of officials, phone calls were made to the Karaman Governorship, Provincial Environment and Forestry Directorship (of which 2 persons attended), and the Karaman Mayoralty (The mayor himself could not attend the meeting. However, a separate meeting with him was conducted after the stakeholders meeting). For the participation of the locals, a fax notification and personal invitations were sent to the Mukhtar's (village mayor) offices of Damlapınar, Güzer, Çukurköy and Buçakkışla villages inviting them and the residents of their villages. In addition, the event was advertised in both a regional and a national newspaper, calling for stakeholders to attend the meeting. The ads were published in the Anadolu Manşet Gazete (regional), and the Türkiye Gazete (national). Both ads were published on September 28th 2007 with the following wording:

"A public participation meeting in the scope of Carbon Trade procedure will be conducted for Kepezkaya and Damlapınar Regulators and Hydroelectric Plants, which are planned to be built in Karaman province, Merkez district by Cenay Elektrik Üretim İnşaat Sanayi Ticaret Ltd. Şti. and Selen Enerji Üretim A.Ş. The dialog meeting will be done in order to inform the people about the Project, learn about their opinions and concerns, answer their questions and receive suggestions. The event will be conducted in Bucakkışla Köyü village Merkez ilçe, Karaman, at 11:00 am on October 2nd. For more information, please contact the developing company Cenay Elektrik Üretim İnşaat Sanayi Ticaret Ltd. Şti. Selen Enerji Üretim A.Ş by phone: 312-467 35 03 or by fax:- 312- 467 29 51 or the organizing company: Çınar Mühendislik Müşavirlik ve Proje Hizmetleri Ltd. By phone: 312- 472 38 39 or fax: 312- 472 39 33.

42 people attended (participant information is available), and the meeting included a presentation, a dialog session, and a personal questionnaire. An informational brochure (can be provided) summarizing all the information presented was handed to all participants with contact information of a representative for any further questions and clarifications. The presentation included:

1. General principals of run-of-river type hydro plants.
2. The specific technical details of the proposed project, including information and location of each component, shown on a topographic map.
3. Environmental impact assessment of the project.

³⁰ The documents related to the Local Stake Holder Consultation Meeting is made available to the validating DOE, during the validation stage.

4. The issue of global warming and climate change.
5. The Kyoto protocol and emission reduction credits.
6. The role of the project within the context of climate change.
7. Details and contact information of the owner, and a contact person for any inquiries and clarifications.

Summary of the comments received:

A dialog meeting with the Mukhtar (local village mayor) of Buckkışla Köyü, was conducted in his house before the general stakeholders meeting, to receive his personal input and concerns regarding the planned project. The Mukhtar welcomed the Owner, saying that no new projects in this area had been constructed in over 30 years. With few job opportunities, most local young villagers emigrate to major cities or European countries in search of a better future. Consequently, the local communities are aging without replacement. The Mukhtar expressed his hope that the project will create job opportunities, lead to improvements in the infrastructure, and help revive the community. He stated that by decreasing emigration, the Project would help to preserve the local culture and traditions.

His main concerns about the Project were water rights and irrigation issues. Most villagers are farmers, and their fields are within the Project's border. They are concerned that the implementation of the Project will affect water availability. The Project Owner assured the Mukhtar that sufficient water will be left for irrigation. Moreover, realizing his genuine concern, the Owner raised the possibility that, if technically feasible, the water for irrigation will be released from the top of the penstock, increasing water pressure which will enable the local villagers to use drip irrigation. Drip irrigation systems improve agricultural yields, increase water conservation and lower work load. However, drip irrigation requires high pressure which is currently unavailable, leaving the local villagers to use inefficient irrigation methods. The Mukhtar was grateful for this initiation, stating that such a gesture would greatly improve the quality of their life, and the Project Owner promised to look into it.

After the presentation, participants were encouraged to comment on the Project, raise any concerns they may have, and ask for clarifications or questions. The villagers expressed their overall satisfaction and enthusiasm regarding the implementation of such a project in their region. The following issues were discussed:

- 1) The main concerns were related to water right and irrigation issues. Their concern was that the implementation of the project may affect water availability for both irrigation and wildlife, especially in drought years.
- 2) Another issue was future employment possibilities, and
- 3) Whether local villages may receive their electricity directly from the power plant, rather than the national grid.

The following table (Table 19) summarizes the results of the questionnaires. 26 questionnaires were filed. The mean age was 47.2 years of age. All participants were male.

The results suggest that the locals think that the most urgent problem of the region is unemployment. Droughts, loss of biodiversity and habitats destruction are perceived as urgent environmental issues that need to be addressed by the government. All people see clear signs for climate change in the region in recent years.

The villagers are not satisfied with the electricity infrastructure and prices, and they believe that the Project may contribute to improving the situation. The large majority of the people support hydroelectric projects because they can help meeting the increasing energy demand, and see hydro as preferable mean for electricity production. All people believed that the presentation was clear, and the majority believed that the presented information was genuine. The Project received high ranking for overall satisfaction as having positive contribution to solving global and local environmental problems, and for solving general local issues.

The summary of the questionnaire results are provided below in Table: 19

Table 20: Summary of the Stake Holder Consultation Questionnaire Results

	Unemployment	Insufficient land	Health	Poverty	Land Degradation
Most urgent problems of the region (%)	42	18	16	16	5
Profound environmental problems (%)	Droughts	Loss of Biodiversity	Habitat Destruction	Water Pollution	Land Erosion
	24	21	18	11	11
Responsibility of solving environmental problems (%)	Government	Municipality	Private Entities		
	84	8	8		
	Yes (%)	No (%)			
Did you notice any evidences for climate change? (Such as decrease in precipitations and river flow, or temperature increase)	100	0			
Are electricity outages occur often?	68	32			
Are electricity prices too high?	64	36			
Do you support hydroelectric Plants in general?	96	4			
If so, why?	All answered: Insufficient energy				
The most preferable mean of electricity production (%)	Hydro	Nuclear	Thermal		
	95	5	0		
Was the presentation clear?	Yes (%)	No (%)			
	100	0			
Do you believe that the information presented was genuine? (with no hidden information)	76	24			
	From 1-5				
The contribution of the project to reducing greenhouse gas emissions?	4,42				
Contribution of the project to the environment	4,58				
Will the project help solve unemployment problems?	4,75				
Overall support of the project	4,73				

How due account was taken of any comments received:

The following is the reply of the project owner to the issues above

- 1) The Project Owner assured the villagers that in all scenarios, enough water will be left in the river for irrigation and wildlife, and that irrigation, domestic use and water for wildlife, have priority over energy production, as stated in the water rights agreement with DSI.
- 2) The Project Owner replied that the name was given by the government and thus it is impossible to change it.
- 3) The Project Owner promised that when hiring unqualified workers during construction and operation, priority will be given to local villagers.

ANNEX-1: THE LEGAL FRAMEWORK OF THE HOST COUNTRY THAT BINDS THE PROJECT

Turkish Environmental Legislation

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

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

- Environmental Impact Assessment Regulation, Official Gazette No. 26939 dated July 17, 2008.
- Water Pollution Control Regulation, Official Gazette No. 25687 dated December 31, 2004 and revised in Official Gazette No. 26786 dated February 13, 2008;
- Regulation on Construction of Cesspits where there is no Wastewater Collection System, Official Gazette No. 13783 dated March 13, 1971;
- Hazardous Chemicals Regulation, Official Gazette No. 21634 dated July 11, 1993 and revised in Official Gazette No. 27092 dated December 26, 2008;
- Regulation on General Principles of Waste Management, Official Gazette No. 26927 dated July 5, 2008;
- Hazardous Wastes Control Regulation, Official Gazette No. 25755 dated March 14, 2005;
- Waste Oil Control Regulation, Official Gazette No. 26952 dated July 30, 2008 and revised Official Gazette No. 27304 dated July 31, 2009;
- Vegetative Waste Oil Control Regulation, Official Gazette No. 25791 dated April 19, 2005; and revised Official Gazette No. 27305 dated July 31, 2009
- Solid Waste Control Regulation, Official Gazette No. 20814 dated March 14, 1991 and revised in Official Gazette No. 25777 dated April 5, 2005;
- Medical Waste Control Regulation, Official Gazette No. 25883 dated July 22, 2005;
- Environmental Audit Regulation, Official Gazette No. 27061 dated November 21, 2008;
- Packaging Waste Control Regulation, Official Gazette No. 26562 dated June 24, 2007 and revised in Official Gazette No. 27046 dated November 6, 2008; and
- Waste Batteries and Accumulators Control Regulation, Official Gazette No. 25569 dated August 31, 2004 and revised in Official Gazette No. 25744 dated March 03, 2005;
- The Excavation, Construction and Demolition Waste Control Regulation, Official Gazette No. 25406 dated March 18, 2004;
- Soil Pollution Control Regulation, Official Gazette No. 25831 dated May 31, 2005;

- Regulation Related to Workplace Opening and Operation Permits, Official Gazette No. 25902 dated August 10, 2005 and revised in Official Gazette No. 26492 dated April 13, 2007;
- Industrial Air Pollution Control Regulation, Official Gazette No. 27277 dated July 3, 2009
- Air Quality Assessment and Management Regulation, Official Gazette No. 26898 dated June 6, 2008 and revised in Official Gazette No. 27219 and dated May 5, 2009;
- Air Pollution Control Regulation For Heating Sources, Official Gazette No. 25699 dated January 13, 2005 and revised in Official Gazette No. 27134 dated February 07, 2009;
- Exhaust Gases Emission Control Regulation, Official Gazette No. 27190 dated April 04, 2009; and
- Regulation on Protection of Wetlands, Official Gazette No. 25818 dated May 17, 2005.
- In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the proposed project. The project will comply with the 4857 numbered Labour Law and its regulations stated below:
- Occupational Health and Safety Statute, Official Gazette No. 14765 dated April 11, 1974;
- Health and Safety Regulation for Construction Works, Official Gazette No. 25325 dated December 23, 2003;
- Regulation on Health and Safety Regarding Temporary Works, Official Gazette No. 25463 dated May 15, 2004.

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

- 5346 numbered Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy;
- Regulation on Protection and Usage of Agricultural Lands, Official Gazette No. 25766 dated March 25, 2005;
- 2863 numbered Law on Protection of Cultural and Natural Heritage (revised by 5226 numbered Law);
- 4342 numbered Pasture Law;
- 6831 numbered Forestry Law (amended by 5192 numbered Revision in Forestry Law);
- Regulation on Buildings located on the Disaster Areas, Official Gazette No. 26582 dated July 14, 2007;

Annex-2: Baseline Information

Table 1

TÜRKİYE TERMİK SANTRALLARINDA KULLANILAN YAKIT MİKTARLARININ ÜRETİCİ KURULUŞLARA DAĞILIMI (BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL) FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES (FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)						
			Birim(Unit):Ton/Gaz(gas) 10 ³ m ³			
			2007	2008	2009	
EÜAŞ VE BAĞLI ORTAKLIKLARI	Taşkömürü	Hard Coal	1,707,037	1,636,566	1,664,859	
	Linyit	Lignite	55,232,102	60,284,929	57,850,129	
	TOPLAM	TOTAL	56,939,139	61,921,495	59,514,988	
	Fuel-Oil	Fuel Oil	Asıl Yakıt Main Fuel	551,217	832,635	239,410
		Yrd. Yakıt Auxiliary Fuel	166,815	154,307	134,007	
EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	TOPLAM	TOTAL	718,032	986,942	373,417	
	Asıl Yakıt Main Fuel		3,617	0	45,364	
	Motorin Diesel Oil	Yrd. Yakıt Auxiliary Fuel	46,354	83,041	72,956	
	TOPLAM	TOTAL	49,971	83,041	118,320	
	TOPLAM	TOTAL	768,003	1,069,983	491,737	
MOBİL SANTRALLAR MOBILE POWER PLANTS	Doğal Gaz	Natural Gas	4,932,282	5,789,269	5,091,011	
	Fuel-Oil	Fuel Oil	170,285	67,762	0	
	Motorin	Diesel Oil	0	0	0	
	TOPLAM	TOTAL	170,285	67,762	0	
	OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	4,322,106	4,633,442	4,956,318
Linyit		Lignite	5,991,719	6,089,191	5,770,389	
TOPLAM		TOTAL	10,313,825	10,722,633	10,726,707	
Fuel-Oil		Fuel Oil	1,362,369	1,118,667	1,220,904	
Motorin		Diesel Oil	262	48,165	62,537	
LPG	LPG	0	0	111		
Nafta	Naphta	11,441	10,606	8,077		
TOPLAM	TOTAL	1,374,072	1,177,438	1,291,629		
Doğal Gaz	Natural Gas	15,525,511	15,818,366	15,887,029		
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	6,029,143	6,270,008	6,621,177	
	Linyit	Lignite	61,223,821	66,374,120	63,620,518	
	TOPLAM	TOTAL	67,252,964	72,644,128	70,241,695	
	Fuel-Oil	Fuel Oil	2,250,686	2,173,371	1,594,321	
	Motorin	Diesel Oil	50,233	131,206	180,857	
LPG	LPG	0	0	111		
Nafta	Naphta	11,441	10,606	8,077		
TOPLAM	TOTAL	2,312,360	2,315,183	1,783,366		
Doğal Gaz	Natural Gas	20,457,793	21,607,635	20,978,040		
Not:Ayrıca Otoprodüktör santrallarda kullanılan Ağaç Kabuğu, Talaş,Sıvı Kükürt, Siyah Likör, Katran, Kükürt keki , Kok Gazı, YF Gazı Rafineri gazı,Biogaz ve Endüstriyel atık ile ilgili miktarlar tabloda yer almamaktadır.						
Note: Quantities of Wood Wastes, Liquid Sulphur, Black Liquor, Bitumen Pyrite,Sulphur Cake etc. and Natural Gas,Coke Oven Gas , Blast Furnace Gas and Refinery Gas values used by autoproducers are not included in the table.						

Not:Ayrıca Otoprodüktör santrallerde kullanılan Ağaç Kabuğu, Talaş, Sıvı Kükürt, Siyah Likör, Katran, Kükürt keki, Kok Gazı, YF Gazı Rafineri gazı,Biogaz ve Endüstriyel atık ile ilgili miktarlar tabloda yer almamaktadır.

Note: Quantities of Wood Wastes, Liquid Sulphur, Black Liquor, Bitumen Pyrite, Sulphur Cake etc. and Natural Gas,Coke Oven Gas, Blast Furnace Gas and Refinery Gas values used by autoproducers are not included in the table.

<http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls>

Table-2: IPCC Default CO₂ Emission Factors

Fuel Type:	EF (tCO ₂ /TJ)
Coal	92.80
Lignite	90.90
Fuel Oil	75.50
Diesel	72.60
LPG	61.60
Naphta	69.30
Natural Gas	54.30
Bitumen	73.00

Version 3

Table-3

<http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls>

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

			Birim(Unit): Tcal		
EÜAŞ VE BAĞLI ORTAKLIKLARI	Taşkömürü Linyit TOPLAM	Hard Coal Lignite Total	2008	2009	2010
			5,514	5,452	4,990
			94,045	83,356	80,967
			99,559	88,809	85,957
EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Fuel-Oil Fuel Oil	Asıl Yakıt Main Fuel Yrd. Yakıt Auxiliary Fuel TOPLAM TOTAL	7,993 1,481 9,474	2,301 1,286 3,587	162 1,009 1,171
	Motorin Diesel Oil	Asıl Yakıt Main Fuel Yrd. Yakıt Auxiliary Fuel TOPLAM TOTAL	0 855 855	467 751 1,219	0 195 195
	TOPLAM	TOTAL	10,329	4,806	1,366
	Doğal Gaz	Natural Gas	47,744	42,335	37,354
	TOPLAM	TOTAL	157,632	135,949	124,676
	Fuel-Oil	Fuel Oil	649	0	0
	Motorin	Diesel Oil			
	TOPLAM	TOTAL	649	0	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	27,796	29,677	34,556
	Linyit	Lignite	14,182	14,295	15,584
	TOPLAM	Total	41,978	43,973	50,141
	Fuel-Oil	Fuel Oil	10,484	11,573	7,398
	Motorin	Diesel Oil	473	612	15
	Lpg	Lpg	0	1	0
	Nafta	Naphta	113	84	105
	TOPLAM	TOTAL	11,070	12,270	7,518
TÜRKİYE TURKEY	Doğal Gaz	Natural Gas	141,313	143,931	157,134
	TOPLAM	TOTAL	183,291	187,904	207,275
	Taşkömür+İthal kömür	Hard Coal+Imported Coal	33,310	35,130	39,546
	Linyit	Lignite	108,227	97,652	96,551
	TOPLAM	Total	141,537	132,781	136,097
	Fuel-Oil	Fuel Oil	20,607	15,160	8,569
	Motorin	Diesel Oil	1,328	1,830	209
	Lpg	Lpg	0	1	0
	Nafta	Naphta	113	84	105
	TOPLAM	TOTAL	22,048	17,076	8,884
	Doğal Gaz	Natural Gas	189,057	186,266	194,487
	TOPLAM	TOTAL	352,642	336,123	339,468

Not 1 :Ayrıca Ağaç kabuğu,talaş,sıvı kükürt,siyah likör,katran,kok gazı,YF gazı,rafineri gazı v.b otoprodüktör santrallarda kullanılan yakıtların ısı değerleri tabloda yer almamaktadır.

Note 1: Heating values of wood wastes,liquid sulphur,black liquor,bitumen,coke oven gas,blast furnace gas,refinery gas used by autoproducers are not included in the table.

Source: <http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls>

Table 4:

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ (BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL) HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES (FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED) 1cal = 4,1868 Joule					
Birim(Unit): Gjoule					
EÜAŞ VE BAĞLI ORTAKLIKLARI			2008	2009	2010
	Taşkömürü	Hard Coal	23,086,015	22,828,163	20,892,383
	Linyit	Lignite	393,747,606	348,995,433	338,990,622
	TOPLAM	Total	416,833,621	371,823,595	359,883,005
	Fuel-Oil Fuel Oil	Asıl Yakıt Main Fuel	33,465,092	9,632,696	679,656
		Yrd. Yakıt Auxiliary Fuel	6,200,651	5,386,180	4,223,229
	TOPLAM TOTAL		39,665,743	15,018,876	4,902,885
	Motorin Diesel Oil	Asıl Yakıt Main Fuel	0	1,956,278	159
		Yrd. Yakıt Auxiliary Fuel	3,579,714	3,146,162	815,082
	TOPLAM TOTAL		3,579,714	5,102,441	815,241
	TOPLAM	TOTAL	43,245,457	20,121,317	5,718,126
	Doğal Gaz	Natural Gas	199,894,579	177,247,713	156,392,061
	TOPLAM	TOTAL	659,973,658	569,192,626	521,993,192
MOBİL SANTRALLAR MOBIL POWER PLANTS	Fuel-Oil	Fuel Oil	2,717,233	0	0
	Motorin	Diesel Oil	0	0	0
	TOPLAM	TOTAL	2,717,233	0	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	116,376,293	124,253,075	144,680,890
	Linyit	Lignite	59,377,198	59,852,102	65,249,084
	TOPLAM	Total	175,753,490	184,105,177	209,929,975
	Fuel-Oil	Fuel Oil	43,894,411	48,452,601	30,974,336
	Motorin	Diesel Oil	1,980,356	2,560,350	61,818
	Lpg	Lpg	0	5,158	0
	Nafta	Naphta	473,108	352,524	440,154
	TOPLAM	TOTAL	46,347,876	51,370,633	31,476,308
	Doğal Gaz	Natural Gas	591,649,268	602,609,967	657,887,178
	TOPLAM	TOTAL	767,402,759	786,715,144	867,817,153
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	139,462,308	147,081,237	165,573,274
	Linyit	Lignite	453,124,804	408,847,535	404,239,706
	TOPLAM	Total	592,587,112	555,928,772	569,812,980
	Fuel-Oil	Fuel Oil	86,277,388	63,471,478	35,877,221
	Motorin	Diesel Oil	5,560,070	7,662,790	877,059
	Lpg	Lpg	0	5,158	0
	Nafta	Naphta	473,108	352,524	440,154
	TOPLAM	TOTAL	92,310,566	71,491,950	37,194,434
	Doğal Gaz	Natural Gas	791,543,848	779,857,681	814,279,239
	TOPLAM	TOTAL	1,476,441,526	1,407,278,403	1,421,286,653

Source: Computed based on the data in p. 44.

Table-5

NET CALORIFIC VALUES OF FUELS CONSUMED IN THE THERMAL POWER PLANTS					
Unit: TJ/KT					
			2008	2009	2010
EÜAŞ VE BAĞLI ORTAKLIKLARI EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ	Taşkömürü	Hard Coal	14.11	13.71	13.36
	Linyit	Lignite	6.53	6.03	6.76
	TOPLAM	TOTAL	6.73	6.25	6.96
	Fuel-Oil	Fuel Oil	40.19	40.24	40.30
		Asıl Yakıt Main Fuel	40.18	40.19	40.19
		Yrd. Yakıt Auxiliary Fuel	40.19	40.22	40.21
	Motorin	Diesel Oil	0.00	0.00	1.00
		Asıl Yakıt Main Fuel	43.11	43.12	43.12
		Yrd. Yakıt Auxiliary Fuel	43.11	43.12	43.12
	TOPLAM	TOTAL	40.42	40.92	40.60
MOBİL SANTRALLAR MOBILE POWER PLANTS	Doğal Gaz	Natural Gas	34.53	34.82	34.81
	Fuel-Oil	Fuel Oil	40.10	0.00	0.00
	Motorin	Diesel Oil			
	TOPLAM	TOTAL	40.10	0.00	0.00
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ	Taşkömür+İthal kömür	Hard Coal+Imported Coal	25.12	25.07	24.71
	Linyit	Lignite	9.75	10.37	9.94
	TOPLAM	TOTAL	16.39	17.16	16.90
	Fuel-Oil	Fuel Oil	39.24	39.69	40.23
	Motorin	Diesel Oil	41.12	40.94	42.66
	LPG	LPG	0.00	0.00	1.00
	Nafta	Naphta	44.61	43.65	33.50
	TOPLAM	TOTAL	39.36	39.77	40.13
	Doğal Gaz	Natural Gas	37.40	37.93	38.05
TÜRKİYE TURKEY	Taşkömür+İthal kömür	Hard Coal+Imported Coal	22.24	22.21	22.32
	Linyit	Lignite	6.83	6.43	7.13
	TOPLAM	TOTAL	8.16	7.91	8.89
	Fuel-Oil	Fuel Oil	39.70	39.81	40.23
	Motorin	Diesel Oil	42.38	42.37	43.09
	LPG	LPG	0.00	0.00	1.00
	Nafta	Naphta	44.61	43.65	33.50
	TOPLAM	TOTAL	39.87	40.09	40.20
	Doğal Gaz	Natural Gas	36.63	37.17	37.38

Computed based on the data in page 45

PROJECT DESCRIPTION: VCS Version 3

Table-6:

Data Source: <http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls>

TÜRKİYE BRÜT ELEKTRİK ENERJİSİ ÜRETİMİNİN ÜRETİCİ KURULUŞLAR VE BİRİNCİL ENERJİ KAYNAKLARINA DAĞILIMI TURKEY'S GROSS ELECTRICITY GENERATION BY PRIMARY ENERGY RESOURCES AND THE ELECTRIC UTILITIES			Birim(Unit) : GWh		
ÜRETİM KARAKTERİSTİĞİ Generation Characteristics			2008	2009	2010
E Ü A Ş	TAŞKÖMÜRÜ	Hard Coal	1,882.4	1,851.1	1,882.7
	LİNYİT	Lignite	22,433.3	22,395.3	20,646.7
	KÖMÜR TOPLAMI	Coal Total	24,315.7	24,246.4	22,529.4
	FUEL-OİL	Fuel Oil	3,365.1	974.4	62.2
	MOTORİN	Diesel oil	0.4	0.2	0.0
	SIVI TOPLAMI	Liquid Total	3,365.5	974.6	62.2
	DOĞAL GAZ	Natural Gas	18,818.5	17,225.5	15,289.4
	TERMİK TOPLAM	Thermal Total	46,499.7	42,446.5	37,881.0
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	Hydro+Geothermal+Wind Total	28,419.4	28,338.2	41,377.4
	TOPLAM	Total	74,919.1	70,784.8	79,258.3
BAĞLI ORTAKLIKLAR Affiliated partnerships Of EÜAŞ	LİNYİT	Lignite	14,802.7	11,974.5	10,524.2
	DOĞAL GAZ	Natural Gas	7,995.1	6,694.4	5,749.9
	TERMİK TOPLAM	Thermal Total	22,797.8	18,668.9	16,274.1
MOBİL SANTRALLAR MOBILE P.P.	FUEL-OİL	Fuel Oil	330.5	0.0	0.0
	MOTORİN	Diesel oil			0.0
	TERMİK TOPLAM	Thermal Total	330.5	0.0	0.0
OTOPRODÜKTÖRLER ÜRETİM ŞRK. İŞLETME HAKKI DEV. Autoproducers Production Comp. TOOR	TAŞKÖMÜRÜ+İTHAL KÖMÜR	Hard Coal+Imported Coal	13,975.1	14,744.5	17,221.6
	LİNYİT	Lignite	4,622.1	4,719.6	4,771.2
	KÖMÜR TOPLAMI	Coal Total	18,597.2	19,464.1	21,992.8
	FUEL-OİL	Fuel Oil	3,513.0	3,465.4	2,081.6
	MOTORİN	Diesel oil	265.9	345.6	4.3
	LPG	LPG	0.0	0.4	0.0
	NAFTA	Naphtha	43.6	17.6	31.9
	SIVI TOPLAMI	Liquid Total	3,822.5	3,829.0	2,117.8
	DOĞAL GAZ	Natural Gas	71,871.7	72,174.8	77,104.5
	YENİLENEBİLİR+ATIK	Renewables and wastes	219.9	340.1	457.0
	TERMİK TOPLAM	Thermal Total	94,511.3	95,808.0	101,672.5
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	Hydro+Geothermal+Wind Total	5,859.3	9,551.2	14,002.8
	TOPLAM	Total	100,370.6	105,359.2	115,675.3
TÜRKİYE TURKEY	TAŞKÖMÜRÜ+İTHAL KÖMÜR	Hard Coal+Imported Coal	15,857.5	16,595.6	19,104.3
	LİNYİT	Lignite	41,858.1	39,089.5	35,942.1
	KÖMÜR TOPLAMI	Coal Total	57,715.6	55,685.1	55,046.4
	FUEL-OİL	Fuel Oil	7,208.6	4,439.8	2,143.8
	MOTORİN	Diesel oil	266.3	345.8	4.3
	LPG	LPG	0.0	0.4	0.0
	NAFTA	Naphtha	43.6	17.6	31.9
	SIVI TOPLAMI	Liquid Total	7,518.5	4,803.5	2,180.0
	DOĞAL GAZ	Natural Gas	98,685.3	96,094.7	98,143.7
	YENİLENEBİLİR+ATIK	Renewables and wastes	219.9	340.1	457.5
	TERMİK TOPLAM	Thermal Total	164,139.3	156,923.4	155,827.6
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	Hydro+Geothermal+Wind Total	34,278.7	37,889.5	55,380.1
	TÜRKİYE TOPLAMI	TURKEY'S TOTAL	198,418.0	194,812.9	211,207.7

Table 7

[http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim\(22-45\)/33\(84-10\).xls](http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls)

TÜRKİYE ELEKTRİK ENERJİSİ ÜRETİM - TÜKETİM VE KAYIPLARININ YILLAR İTİBARIYLA GELİŞİMİ ANNUAL DEVELOPMENT OF ELECTRICITY GENERATION- CONSUMPTION AND LOSSES IN TURKEY (1984-2010)																
http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls																
YILLAR YEARS	BRÜT ÜRETİM GROSS GEN.	ARTIŞ % INCREASE	İç İhtiyaç INTERNAL CONSUMPTION	%	NET ÜRETİM NET GEN.	İTHALAT IMPORTS	ŞEBEKEYE VERİLEN ¹⁾ SUPPLIED TO THE NETWORK ²⁾	İLETİM TRANSMISSION	%	DAĞITIM DISTRIBUTION	%	TOPLAM TOTAL	%	İHRACAT ³⁾ EXPORTS ³⁾	NET TÜKETİM NET CONS.	ARTIŞ % INCREASE
1984	30613.5	11.9	1890.7	6.2	28722.8	2853.0	31375.8	1577.4	5.0	2163.2	6.9	3740.6	11.9		27835.2	13.0
1985	34216.9	11.8	2306.8	6.7	31912.1	2142.4	34054.5	1811.4	4.7	2734.5	8.0	4345.9	12.8		29708.6	7.5
1986	38694.8	16.0	2815.0	7.1	36879.8	776.6	37656.4	1344.3	3.6	4102.4	10.9	5446.7	14.5		32209.7	8.4
1987	44352.9	11.7	2807.7	5.9	41745.2	572.1	42317.3	1627.4	3.8	3982.6	9.4	5620.0	13.3		36697.3	13.9
1988	48048.8	8.3	2400.0	5.0	45648.8	381.2	46030.0	2016.6	4.4	4291.9	9.3	6308.5	13.7		39721.5	8.2
1989	52043.2	8.3	3234.5	6.2	48808.7	558.5	49367.2	1544.0	3.1	4703.2	9.5	6247.2	12.7		43120.0	8.6
1990	57543.0	10.6	3311.4	5.8	54231.6	175.5	54407.1	1787.2	3.3	4893.1	9.0	6690.3	12.3	908.8	48820.0	8.6
1991	60246.3	4.7	3656.2	6.1	56591.1	759.4	57350.5	1437.8	2.5	6123.4	10.7	7561.2	13.2	508.4	49282.9	5.3
1992	67342.2	11.8	4237.3	6.3	63104.9	188.8	63293.7	1342.9	2.1	7851.9	12.1	8994.8	14.2	314.2	53984.7	9.5
1993	73807.5	9.6	3943.1	5.3	69864.4	212.9	70077.3	1634.9	2.3	8816.7	12.3	10251.6	14.6	588.7	59237.0	9.7
1994	78321.7	6.1	4539.1	5.8	73782.6	31.4	73814.0	1800.3	2.4	10042.7	13.6	11843.0	16.0	570.1	61400.9	3.7
1995	86247.4	10.1	4388.8	5.1	81858.6	0	81858.6	2034.9	2.5	11733.9	14.3	13768.8	16.8	685.9	67363.9	9.8
1996	94861.7	10.0	4777.3	5.0	90084.4	270.1	90354.5	2461.7	2.7	13383.1	14.8	15854.8	17.5	343.1	74156.8	10.0
1997	103295.8	8.9	5050.2	4.9	98245.6	2492.3	100737.9	2935.5	2.9	15948.4	15.5	18581.9	18.4	271.0	81885.0	10.4
1998	111022.4	7.5	5523.2	5.0	105499.2	3296.5	108795.7	3337.1	3.1	17457.8	16.0	20794.9	19.1	288.2	87704.8	7.1
1999	118438.9	4.9	5738.0	4.9	112701.9	2330.3	115032.2	2985.1	2.6	18559.9	16.4	21545.0	19.1	285.3	91201.9	4.0
2000	124821.6	7.3	6224.0	5.0	118697.6	3791.3	122488.9	3181.8	2.6	20574.1	16.8	23755.9	19.4	437.3	98295.7	7.8
2001	122724.7	-1.8	6472.6	5.3	116252.1	4579.4	120831.5	3374.4	2.8	19954.3	16.5	23328.7	19.3	432.8	97070.0	-1.2
2002	129389.5	5.4	5672.7	4.4	123716.8	3566.2	127315.0	3440.7	2.7	20491.2	16.1	23831.9	18.6	435.1	102948.0	6.1
2003	140580.5	8.6	5332.2	3.8	135248.3	1158.0	136406.3	3330.7	2.4	20722.0	15.2	24052.7	17.6	587.6	111786.0	8.6
2004	150898.3	7.2	5632.6	3.7	145265.7	463.5	145729.2	3422.8	2.4	19820.2	13.6	23243.0	16.0	1144.3	121141.9	8.4
2005	161956.2	7.5	6487.1	4.0	155469.1	835.9	156305.0	3895.3	2.4	20348.7	13.0	24044.0	15.4	1738.1	130262.9	7.5
2006	176299.8	8.9	6756.7	3.8	169543.1	573.2	170116.3	4543.8	2.7	19245.4	11.3	23789.2	14.0	2235.7	144091.4	10.6
2007	191558.1	8.7	8218.4	4.3	183339.7	864.3	184204.0	4523.0	2.5	22123.6	12.0	28846.8	14.5	2422.2	155135.2	7.7
2008	198418.0	3.6	8656.1	4.4	189761.9	789.4	190551.3	4368.4	2.3	23093.1	12.1	27481.5	14.4	1122.2	161947.6	4.4
2009	194812.9	-1.8	8193.6	4.2	186619.3	812.0	187431.3	3873.4	2.1	25018.0	13.3	28691.4	15.5	1545.8	158894.1	-3.1
2010	211207.7	8.4	8181.6	3.9	203026.1	1143.8	204169.9	5690.5	2.8	24531.2	12.0	30221.7	14.8	1917.8	172050.6	9.7

1) Şebekeye Verilen = Net Üretim İthalat

2) İhracat, sınırda teslim edilmesi göre yapıldığından, ihracat ile ilgili şebeke kayıtları, iletim kayıtlarında yer almazlar.

* Kaynak : Türkiye Elektrik Dağıtım ve Tüketim İstatistikleri, 1984-2010

1) Supplied to the Network = Net Generation Import

2) As the export is made on delivery at border basis, its issues are included in the section for transmission network losses.

* Source : Electricity Distribution and Consumption Statistics of Turkey, 1984-2010

Source: [http://www.teias.gov.tr/istatistik2009/30\(84-09\).xls](http://www.teias.gov.tr/istatistik2009/30(84-09).xls)

Table-8a:

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (Mw)	Firm Generation Capacity (GWh)	VER Status
Silopi Elektrik Üretim A.Ş.	Prod.Comp.	Bitumen	135	945.00	
Habaş (Bilecik)(Paşalar)	Prod.Comp.	Fuel Oil	18	144.00	
Habaş (İzmir)(Habaş)	Prod.Comp.	Fuel Oil	36	288.00	
Hayat Kağıt	Prod.Comp.	Fuel Oil	7.5	56.30	
Silopi Elektrik Üretim A.Ş.(Esenboğa)	Prod.Comp.	Fuel Oil	44.8	315.00	
Tire- Kutsan (Tire)	AutoProducer	Fuel Oil	8	37.00	
TUPRAŞ O.A.RAFİNERİ(Kırıkkale)(Düzeltilme)	AutoProducer	Fuel Oil	10	70.00	
Tüpraş Rafineri(Aliağa/İzmir)	AutoProducer	Fuel Oil	24.7	171.78	
İçdaş Çelik (İlave)	Prod.Comp.	Imported Coal	270	1,923.33	
Alkim Alkali Kimya (Cihanbeyli/Konya)	Autoproducer	Lignite	0.4	3.00	
Konya Şeker San. Tic. A.Ş.	Autoproducer	Lignite	1.6	4.00	
Ak Gıda San. Ve Tic. A.Ş. (Pamukova)	Autoproducer	Natural Gas	7.5	61.00	
Aksa Akrilik Kimya Sn. A.Ş. (Yalova)	Prod.Comp.	Natural Gas	70	539.00	
Aksa Enerji (Antalya) (Güç Değişikliği)	Prod.Comp.	Natural Gas	16.2	127.72	
Aksa Enerji (Antalya) (İlave)	Prod.Comp.	Natural Gas	300	2310.00	
Aksa Enerji (Antalya) (İlave)	Prod.Comp.	Natural Gas	300	2310.00	
Aksa Enerji (Manisa) (İlave)	Prod.Comp.	Natural Gas	52.4	414.93	
Aksa Enerji (Manisa) (İlave)	Prod.Comp.	Natural Gas	10.5	83.14	
Anadolu Elektrik (Çakırlar Hes)	Prod.Comp.	Natural Gas	16.2	28.00	
Antalya Enerji (İlave)	Prod.Comp.	Natural Gas	41.8	302.10	
Arenko Elektrik Üretim A.Ş. (Denizli)	Prod.Comp.	Natural Gas	12	84.00	
Bil Enerji (Dg+M) (Balgat)	Prod.Comp.	Natural Gas	36.6	255.00	
Cam İş Elektrik (Mersin) (İlave)	Prod.Comp.	Natural Gas	126.1	1008.00	
Çelikler Taah. İnş. (Rixox Grand)	Autoproducer	Natural Gas	2	16.00	
Dalsan Alçı San. Ve Tic. A.Ş.	Autoproducer	Natural Gas	1.2	9.00	
Delta Enerji Üretim Ve Tic.A.Ş.	Prod.Comp.	Natural Gas	47	365.82	
DELTA ENERJİ ÜRETİM VE TİC.A.Ş. (İlave)	Prod.Comp.	Natural Gas	13	101.18	
DESA ENERJİ ELEKTRİK ÜRETİM A.Ş.	Prod.Comp.	Natural Gas	9.8	70.00	
E.Şehir End. Enerji (Dg+M)(Eskişehir-2)	Prod.Comp.	Natural Gas	59	451.80	
Ege Birleşik Enerji (Lpg+Dg+M)(Aliağa)	Prod.Comp.	Natural Gas	12.8	107.00	
Entek Köseköy(İztek) (Düzeltilme)	Prod.Comp.	Natural Gas	36.3	288.87	
Entek Köseköy(İztek) (Düzeltilme)	Prod.Comp.	Natural Gas	0.8	6.37	
Erdemir(Ereğli-Zonguldak)	Prod.Comp.	Natural Gas	39.2	237.88	
Falez Elektrik Üretimi A. Ş.	Prod.Comp.	Natural Gas	11.7	88.00	
Global Enerji (Pelitlik)	Prod.Comp.	Natural Gas	8.6	155.00	
Gül Enerji Elkt. Üret. Sn. Ve Tic. A.Ş.	Prod.Comp.	Natural Gas	24.3	170.00	
Habaş Aliağa	Prod.Comp.	Natural Gas	224.5	1796.00	
Kasar Dual Tekstil San. A.Ş. (Çorlu)	Autoproducer	Natural Gas	5.7	38.00	

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (Mw)	Firm Generation Capacity (GWh)	VER Status
Ken Kipaş Elektrik Üretim (Karen)	Prod.Comp.	Natural Gas	41.8	180.00	
Ken Kipaş Elektrik Üretim (Karen) (Kahramanmaraş)	Prod.Comp.	Natural Gas	17.5	75.36	
Maksi Enerji Elektrik Üretim A.Ş.	Prod.Comp.	Natural Gas	7.7	55.00	
Marmara Pamuklu Mens. Sn.Tic.A.Ş.	Prod.Comp.	Natural Gas	34.9	275.15	
Mauri Maya San. A.Ş.	Autoproducer	Natural Gas	2.3	20.00	
Modern Enerji (B.Karıştıran)	Prod.Comp.	Natural Gas	96.8	680.00	
Mosb Enerji Elektrik Üretim Ltd. Şti.	Prod.Comp.	Natural Gas	84.8	434.00	
Nuh Çimento San. Tic. A.G.(Nuh Çim.) (İlave)	Prod.Comp.	Natural Gas	47	329.00	
Petkim Aliğa (Aliğa)	Autoproducer	Natural Gas	222	1188.00	
Petkim Aliğa (Aliğa)(Düzeltilme-İlave)	Autoproducer	Natural Gas	52	278.27	
Rasa Enerji (Van)	Prod.Comp.	Natural Gas	78.6	500.00	
Şahinler Enerji (Çorlu/Tekirdağ)	Prod.Comp.	Natural Gas	26	185.00	
Selkasan Kağıt Paketleme Malz. İm.	Autoproducer	Natural Gas	9.9	73.00	
Sönmez Elektrik(Uşak) (İlave)	Prod.Comp.	Natural Gas	8.7	67.06	
Süperfilm (Gaziantep)	AutoProducer	Natural Gas	25.3	203.00	
Tav İstanbul Terminal İşletme. A.Ş.	Autoproducer	Natural Gas	3.3	27.61	
Tav İstanbul Terminal İşletme. A.Ş.	Autoproducer	Natural Gas	6.5	54.39	
Tesko Kipa Kitle Paz. Tic. Ve Gıda A.G.	Autoproducer	Natural Gas	2.3	18.00	
Yurtbay Elektrik Üretim A.Ş. (D.G.+M)	Prod.Comp.	Natural Gas	6.9	50.00	
Zorlu Enerji (B.Karıştıran) (İlave)	Prod.Comp.	Natural Gas	49.5	396.00	
Cargill Tarım Ve Gıda San. Tic. A.Ş.	AutoProducer	R-Biogas	0.1	0.70	
Gürmat Elekt. (Gürmat Jeotermal)	Prod.Comp.	R-Geothermal	47.4	313.00	
Akçay Hes Elektrik Ur. (Akçay Hes)	Prod.Comp.	R-HPP	28.8	45.00	
Akua Enerji (Kayalık Reg. Ve Hes)	Prod.Comp.	R-HPP	5.8	20.00	
Bağışli Reg. Ve Hes (Ceykar Elekt.)	Prod.Comp.	R-HPP	0	0.00	VCS 657
Bağışli Reg. Ve Hes (Ceykar Elekt.)	Prod.Comp.	R-HPP	0	0.00	VCS 658
Bereket Enerji (Koyulhisar Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 713
Beyobasi En. Ur. A.Ş. (Sirma Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 603
Cindere Hes (Denizli)	Prod.Comp.	R-HPP	19.1	30.00	
Değirmenüstü En. (Kahramanmaraş)	Prod.Comp.	R-HPP	12.9	17.38	
Denizli Elektrik (Ege I Hes)	Prod.Comp.	R-HPP	0.9	2.00	
Elestaş Elektrik (Yaylabel Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 582
Elestaş Elektrik (Yazi Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 583
Erva Enerji (Kabaca Reg. Ve Hes)	Prod.Comp.	R-HPP	4.2	7.50	
Erva Enerji (Kabaca Reg. Ve Hes)	Prod.Comp.	R-HPP	4.2	7.50	
Filyos Enerji (Yalınızca Reg. Ve Hes)	Prod.Comp.	R-HPP	0	0.00	GS 618
Kalen Enerji (Kalen I - li Hes)	Prod.Comp.	R-HPP	15.7	23.58	
Karel Enerji (Pamukova)	Prod.Comp.	R-HPP	0	0.00	GS 1073
Kayen Alfa Enerji (Kaletepe Hes)	Prod.Comp.	R-HPP	10.2	17.00	
Kisik	EUAŞ	R-HPP	9.6	20.00	

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (Mw)	Firm Generation Capacity (GWh)	VER Status
Lamas Iii - Iv Hes (Tgt Enerji Üretim)	Prod.Comp.	R-HPP	35.7	71.00	
Obruk Hes	EUAŞ	R-HPP	212.4	337.00	
Ozgür Elektrik (Azmak Ii Reg.Ve Hes)	Prod.Comp.	R-HPP	0	0.00	VCS554
OZTAY ENERJİ (Günayge REG.VE HES)	Prod.Comp.	R-HPP	0	0.00	GS636
Ozyakut Elek. Ur.A.Ş. (Güneşli Hes)	Prod.Comp.	R-HPP	1.8	4.00	
Reşadiye 3 Hes (Turkon Mng Elekt.)	Prod.Comp.	R-HPP	0	0.00	GS645
Sarıtepe Hes (Genel Dinamik Sis.El.)	Prod.Comp.	R-HPP	0	0.00	?
Sarıtepe Hes (Genel Dinamik Sis.El.)	Prod.Comp.	R-HPP	0	0.00	?
Şirikçioğlu El.(Kozak Bendi Ve Hes)	Prod.Comp.	R-HPP	4.4	7.00	
Taşova Yenidereköy Hes (Hameka A.Ş.)	Prod.Comp.	R-HPP	2	6.00	
Tektuğ (Erkenek)	Prod.Comp.	R-HPP	0	0.00	VCS 693
Tektuğ (Erkenek) (Ilave)	Prod.Comp.	R-HPP	0	0.00	VCS 694
Tocak I Hes (Yurt Enerji Uretim Sn.)	Prod.Comp.	R-HPP	4.8	6.00	
Tüm Enerji (Pinar Reg. Ve Hes)	Prod.Comp.	R-HPP	30.1	65.00	
Uzunçayır Hes (Tunceli)	Prod.Comp.	R-HPP	0	0.00	VCS 762
Yapısan (Karica Reg. Ve Darica I Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 506
Yapısan (Karica Reg. Ve Darica I Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 506
Yeşilbaş Enerji (Yeşilbaş Hes)	Prod.Comp.	R-HPP	0	0.00	VCS 806
Ypm Gölova Hes (Suşehri/Sivas)	Prod.Comp.	R-HPP	1.1	2.00	
Ypm Sevindik Hes (Suşehri/Sivas)	Prod.Comp.	R-HPP	5.7	18.00	
İtc-Ka Enerji (Sincan)	Prod.Comp.	R-Waste	0	0.00	GS 765
İtc-Ka Enerji Mamak Kati Atik Top.Merk.	Prod.Comp.	R-Waste	0	0	GS 440
Ortadoğu Enerji (Kömürcüoda)	Prod.Comp.	R-Waste	0	0.00	GS 707
Ortadoğu Enerji (Oda Yeri) (Ilave)	Prod.Comp.	R-Waste	0	0	GS 707
Ortadoğu Enerji (Oda Yeri) (Ilave)	Prod.Comp.	R-Waste	0	0	GS 707
Ak Enerji (Ayyıldız Res)	Prod.Comp.	R-WPP	0	0	GS 634
Alize Enerji (Çamseki Res)	Prod.Comp.	R-WPP	0	0.00	GS 399
Alize Enerji (Keltepe Res)	Prod.Comp.	R-WPP	0	0.00	GS 437
Alize Enerji (Sarıkaya Res) (Şarköy)	Prod.Comp.	R-WPP	0	0.00	GS 577
Ayen Enerji A.Ş. Akbük Rüzgar	Prod.Comp.	R-WPP	0	0.00	GS 436
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR (Ilave)	Prod.Comp.	R-WPP	0	0.00	GS 437
Baki Elektrik Şamli Rüzgar	Prod.Comp.	R-WPP	0	0.00	GS?
Baki Elektrik Şamli Rüzgar	Prod.Comp.	R-WPP	0	0.00	GS?
Belen Elektrik Belen Rüzgar-Hatay	Prod.Comp.	R-WPP	0	0.00	GS 390
Belen Elektrik Belen Rüzgar-Hatay	Prod.Comp.	R-WPP	0	0.00	GS 390
Borasko Enerji (Bandırma Res)	Prod.Comp.	R-WPP	0	0.00	GS 744?
Borasko Enerji (Bandırma Res)	Prod.Comp.	R-WPP	0	0.00	GS 744?
Datça Res (Datça)	Prod.Comp.	R-WPP	0	0.00	GS 428
Datça Res (Datça)	Prod.Comp.	R-WPP	0	0.00	GS 428
Datça Res (Datça) (Ilave)	Prod.Comp.	R-WPP	0	0.00	GS 428

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (Mw)	Firm Generation Capacity (GWh)	VER Status
Kores Kocadağ Res (Urla/Izmir)	Prod.Comp.	R-WPP	0	0.00	GS 601
Mazi-3 Res Elekt.Ur. A.G. (Mazi-3 Res)	Prod.Comp.	R-WPP	0	0.00	GS 388
Mazi-3 Res Elekt.Ur. A.G. (Mazi-3 Res)	Prod.Comp.	R-WPP	0	0.00	GS 388
Rotor Elektrik (Osmaniye Res)	Prod.Comp.	R-WPP	0	0.00	GS 474
Rotor Elektrik (Osmaniye Res)	Prod.Comp.	R-WPP	0	0.00	GS 474
Rotor Elektrik (Osmaniye Res)	Prod.Comp.	R-WPP	0	0.00	GS 474
Sayalar Rüzgar (Doğal Enerji)	Prod.Comp.	R-WPP	0	0.00	GS 1090
Soma Enerji Uretim (Soma Res)	Prod.Comp.	R-WPP	0	0.00	GS 398
Soma Enerji Uretim (Soma Res)	Prod.Comp.	R-WPP	0	0.00	GS 398
Soma Enerji Uretim (Soma Res)	Prod.Comp.	R-WPP	0	0.00	GS 398
Utopya Elektrik (Düzova Res)	Prod.Comp.	R-WPP	0	0.00	GS 672
Total 2009			2,765.90	21,489.72	

Table- 8b

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf>

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (MW)	Firm Generation Capacity (GWh)	VER Status
Silopi Elektrik Ür. A.Ş. (Esenboğa)	Prod. Comp.	Fuel Oil	(44.78)	0.00	
AK TEKSTİL-1 (G.Antep)	Autoproducer	Fuel-Oil	-13	0	
Eren Enerji Elektrik Ür. A.Ş. (İlave)	Prod. Comp.	Imported Coal	600.00	4005.88	
Eren Enerji Elektrik Ür. A.Ş. (İlave)	Prod. Comp.	Imported Coal	600.00	4005.88	
Eren Enerji Elektrik Üretim A.Ş.	Prod. Comp.	Imported Coal	160.00	1068.24	
Eti Soda Üre.Paz.Nak.Ve Elk.Üre.San.	Autoproducer	Lignite	24.00	144	
Konya Şeker San. Ve Tic. A.Ş.	Autoproducer	Lignite	6	15.00	
AK-ENERJİ (UŞAK OSB)(Uşak-Ak.En.)	Prod. Comp.	Lng+N.Gas	(15.24)	0.00	
Ak-Enerji(Dg+N) (Deba-Denizli)	Prod. Comp.	Lng+N.Gas	(15.60)	0.00	
Ataer Enerji Elektrik Üretim A.Ş.	Prod. Comp.	Lng+N.Gas	49.00	277.89	
Akbaşlar (İlave)	Autoproducer	N.Gas	1.54	80	
Altınmarka	Autoproducer	N.Gas	4.6	66	
Can Tekstil (Çorlu/Tekirdağ)	Autoproducer	N.Gas	7.832	100	
Flokser Tekstil (Çerkezköy/Tekirdağ)	Autoproducer	N.Gas	5.172	42	
International Hospital İstanbul Aş.	Autoproducer	N.Gas	0.77	6	
Keskinoğlu Tavukçuluk Ve Dam. İşl.	Autoproducer	N.Gas	3.495	65	
KIRKA BORAKS(Kırka) (Eti Maden İşl.) (İlave)	Autoproducer	N.Gas	10	120.00	
Kurtoğlu Bakır Kurşun San. A.Ş.	Autoproducer	N.Gas	1.585	65	
Marmara Pamuklu Mensucat (İlave)	Autoproducer	N.Gas	26	543	
Polyplex Europa Polyester Film	Autoproducer	N.Gas	8	61	
Rb Karesi İthalat İhracat Tekstil	Autoproducer	N.Gas	8.6	65	
Tüpraş Rafineri (İzmit) (Düzeltilme)	Autoproducer	N.Gas	-39	0	
Tüpraş Rafineri (İzmit) (İlave)	Autoproducer	N.Gas	40	255	
Yalova Elyaf	Autoproducer	N.Gas	-12	0	
Yıldız Entegre Ağaç (Kocaeli)	Autoproducer	N.Gas	12.368	120	
Soktaş (N+Lpg) (Aydın)	Autoproducer	Nafta	-4.5	0	
Aksa Enerji (Antalya)	Prod. Comp.	Natural Gas	25.00	192.50	
Aksa Enerji (Antalya)	Prod. Comp.	Natural Gas	25.00	192.50	
Aliağa Çakmaktepe Enerji (İlave)	Prod. Comp.	Natural Gas	69.84	557.92	
Altek Alarko Elektrik Santralleri	Prod. Comp.	Natural Gas	60.10	415.57	
Altek Alarko Elektrik Santralleri	Prod. Comp.	Natural Gas	21.89	151.36	
Binatom Elektrik Üretim A.Ş.	Prod. Comp.	Natural Gas	2.00	13.00	
Can Enerji Elektrik Ür. A.Ş.(Tekirdağ)	Prod. Comp.	Natural Gas	29.10	203.00	

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (MW)	Firm Generation Capacity (GWh)	VER Status
Cengiz Enerji San. Ve Tic. A.Ş. (Tekkeköy)	Prod. Comp.	Natural Gas	101.95	802.00	
Cengiz Enerji San. Ve Tic. A.Ş. (Tekkeköy)	Prod. Comp.	Natural Gas	101.95	802.00	
Enerji-Sa (Bandirma)	Prod. Comp.	Natural Gas	1000.00	7540.00	
Enerji-Sa (Bandirma) (Düzeltilme)	Prod. Comp.	Natural Gas	(69.20)	0.00	
Global Enerji (Pelitlik)	Prod. Comp.	Natural Gas	3.54	27.06	
Rasa Enerji (Van)	Prod. Comp.	Natural Gas	26.19	166.62	
Rasa Enerji (Van) (İlave)	Prod. Comp.	Natural Gas	10.12	64.41	
Sönmez Enerji Üretim (Uşak)	Prod. Comp.	Natural Gas	33.24	256.30	
Sönmez Enerji Üretim (Uşak) (İlave)	Prod. Comp.	Natural Gas	2.56	19.77	
Uğur Enerji Ür. Tic.Ve San. A.Ş. (İlave)	Prod. Comp.	Natural Gas	12.00	100.86	
Uğur Enerji Üretim Tic. Ve San. A.Ş.	Prod. Comp.	Natural Gas	48.20	405.14	
Flokser Tekstil (Çatalça-İstanbul) (Suetser Tesisi)	Autoproducer	Natural Gas	-2,128	0	
Simko Kartal Doğalgaz	Autoproducer	Natural Gas	-2.054	0	
CEV ENERJİ ÜRETİM (GAZİANTEP ÇÖP Biogasi)	Prod. Comp.	R-Biogaz	0.00	0	GS745
Fritolay Gıda San.Ve Tic A.Ş. (İlave)	Autoproducer	R-Biogaz	0.33	2	
Fritolay Gıda San.Ve Tic A.Ş.	Autoproducer	R-Biogaz	0.65	4	
Menderes Geotermal Dora-2	Prod. Comp.	R-Geothermal	0.00	0	GS445
Tuzla Jeotermal	Prod. Comp.	R-Geothermal	0.00	0	GS353
Akim Enerji (Cevizlik Reg. Ve Hes)	Prod. Comp.	R-Hepp	0.00	0.00	VCS753
Alakir Hes (Yurt Enerji Üretim)	Prod. Comp.	R-Hepp	2.06	4.00	
ASA ENERJİ (KALE REG.Ve HES)	Prod. Comp.	R-Hepp	0.00	0.00	GS637
Azmak-li Reg. Ve Hes (Düzeltilme)	Prod. Comp.	R-Hepp	(18.07)	0.00	
Bayburt Hes (Bayburt Enerji Üret.)	Prod. Comp.	R-Hepp	14.63	24.00	
Beytek El. Ür. A.Ş. (Çataloluk Hes)	Prod. Comp.	R-Hepp	9.54	17.00	
Birim Hidr. Üretim Aş. (Erfelek Hes)	Prod. Comp.	R-Hepp	3.23	5.50	
Birim Hidr. Üretim Aş. (Erfelek Hes)	Prod. Comp.	R-Hepp	3.23	5.50	
Bulam Reg. Ve Hes (Mem Enerji Elk.)	Prod. Comp.	R-Hepp	7.03	19.00	
Burç Bendi Ve Hes (Akkur Enerji)	Prod. Comp.	R-Hepp	0.00	0.00	VCS419
Çakit Hes (Çakit Enerji A.Ş.)	Prod. Comp.	R-Hepp	0.00	0.00	VCS685
Çamlıkaya Reg. Ve Hes	Prod. Comp.	R-Hepp	5.65	11.00	
Ceyhan Hes (Berkman Hes)(Enova En.)	Prod. Comp.	R-Hepp	0.00	0.00	VCS810
Ceyhan Hes (Berkman Hes)(Enova En.)	Prod. Comp.	R-Hepp	0.00	0.00	VCS810

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (MW)	Firm Generation Capacity (GWh)	VER Status
Ceyhan Hes (Oşkan Hes) (Enova En.)	Prod. Comp.	R-Hepp	0.00	0.00	VCS810
Cindere Hes (İlave)	Prod. Comp.	R-Hepp	9.07	16.07	
Damlapınar Hes (Cenay Elektrik Ür.)	Prod. Comp.	R-Hepp	0.00	0.00	VCSunderd ev
Dim Hes (Diler Elektrik Üretim)	Prod. Comp.	R-Hepp	38.25	70.00	
Dinar Hes (Elda Elektrik Üretim)	Prod. Comp.	R-Hepp	4.44	9.00	
Doğubay Elektrik (Sarimehmet Hes)	Prod. Comp.	R-Hepp	3.10	6.00	
Egemen 1 Hes (Enersis Elektrik)	Prod. Comp.	R-Hepp	0.00	0.00	GS755
Egemen 1b Hes (Enersis Elektrik)	Prod. Comp.	R-Hepp	0.00	0.00	GS755
Erenköy Reg. Ve Hes (Türkerler)	Prod. Comp.	R-Hepp	21.46	49.00	
Erenler Reg. Ve Hes (Bme Bir.Müt.En.)	Prod. Comp.	R-Hepp	45.00	48.00	
Erikli-Akocak Reg. Ve Akocak Hes	Prod. Comp.	R-Hepp	41.25	0	VCS 535
Erikli-Akocak Reg. Ve Akocak Hes	Prod. Comp.	R-Hepp	0.00	0	VCS 535
Feki 2 Barajı Ve Hes (Akkur Enerji)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 534
Firtina Elektrik Ür. A.Ş. (Sümer Hes)	Prod. Comp.	R-Hepp	21.60	39.00	
Gök Reg. Ve Hes (Gök Enerji El. San.)	Prod. Comp.	R-Hepp	10.01	24.00	
Güdü I Reg. Ve Hes (Yaşam Enerji)	Prod. Comp.	R-Hepp	2.36	8.00	
Güzelçay-I Hes (İlk Elektrik Enerji)	Prod. Comp.	R-Hepp	3.14	9.30	
Güzelçay-II Hes (İlk Elektrik Enerji)	Prod. Comp.	R-Hepp	4.96	14.70	
Hetaş Hacisalihoğlu (Yıldızlı Hes)	Prod. Comp.	R-Hepp	1.20	3.00	
Kahraman Reg. Ve Hes (Katircioğlu)	Prod. Comp.	R-Hepp	1.42	3.00	
Kahta I Hes (Erdemyıldız Elek. Ürt.)	Prod. Comp.	R-Hepp	7.12	20.00	
Kale Reg. Ve Hes (Kale Enerji Ür.)	Prod. Comp.	R-Hepp	34.14	66.00	
Kalkandere Reg. Ve Yokuşlu Hes	Prod. Comp.	R-Hepp	14.54	36.00	
Kar-En Karadeniz El.A.Ş. Aralık Hes	Prod. Comp.	R-Hepp	0.00	0.00	GS663
Karadeniz El. (Uzundere-1 Hes)(İlave)	Prod. Comp.	R-Hepp	31.08	46.50	
Karadeniz El.Üret. (Uzundere-1 Hes)	Prod. Comp.	R-Hepp	31.08	46.50	
Karşıyaka Hes (Akua Enerji Üret.)	Prod. Comp.	R-Hepp	1.59	5.00	
Kayabükü Reg. Ve Hes (Elite Elekt.)	Prod. Comp.	R-Hepp	0.00	0.00	GS726
Kirpilik Reg. Ve Hes (Özgür Elektrik)	Prod. Comp.	R-Hepp	6.24	13.00	
Kozan Hes (Ser-Er Enerji)	Prod. Comp.	R-Hepp	4.00	5.00	
Kulp Iv Hes (Yıldızlar)	Prod. Comp.	R-Hepp	12.30	23.00	

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (MW)	Firm Generation Capacity (GWh)	VER Status
En.Elç.Ür.Aş.)					
Murgul Bakir (Ç.Kaya) (İlave)	Prod. Comp.	R-Hepp	19.60	31.59	
Narinkale Reg. Ve Hes (Ebd Enerji)	Prod. Comp.	R-Hepp	3.10	6.00	
Nisan E.Mekanik En. (Başak Reg. Hes)	Prod. Comp.	R-Hepp	6.85	12.00	
Nuryol Enerji (Defne Reg. Ve Hes)	Prod. Comp.	R-Hepp	7.23	13.00	
Özgür Elektrik (Azmak I Reg.Ve Hes)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 554
Özgür Elektrik (Azmak I Reg.Ve Hes)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 554
Paşa Reg. Ve Hes (Özgür Elektrik)	Prod. Comp.	R-Hepp	0.00	0.00	GS 681
Peta Mühendislik En. (Mursal li Hes)	Prod. Comp.	R-Hepp	4.50	11.00	
Reşadiye 1 Hes (Turkon Mng Elekt.)	Prod. Comp.	R-Hepp	0.00	0.00	GS 643
Reşadiye 2 Hes (Turkon Mng Elekt.)	Prod. Comp.	R-Hepp	0.00	0.00	GS 644
Sabunsuyu li Hes (Ang Enerji Elk.)	Prod. Comp.	R-Hepp	7.35	12.00	
Selen Elektrik (Kepezkaya Hes)	Prod. Comp.	R-Hepp	0.00	0.00	VCSunderd ev
Selimoğlu Reg. Ve Hes	Prod. Comp.	R-Hepp	0.00	0.00	GS 635
Tektuğ Elektrik (Andirin Hes)	Prod. Comp.	R-Hepp	40.50	60.00	
Uluabat Kuvvet Tüneli Ve Hes	Prod. Comp.	R-Hepp	0.00	0	VCS 536
Uluabat Kuvvet Tüneli Ve Hes (İlave)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 536
Umut lii Reg. Ve Hes (Nisan Elektr.)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 536
Uzunçayir Hes (Tunceli) (İlave)	Prod. Comp.	R-Hepp	0.00	0.00	VCS 762
Uzunçayir Hes (Tunceli) (İlave)	Prod. Comp.	R-Hepp	0.00	0	VCS 762
Yavuz Reg. Ve Hes (Masat Enerji)	Prod. Comp.	R-Hepp	0.00	0.00	GS 651
Yedigöze Hes (Yedigöze Elektrik)	Prod. Comp.	R-Hepp	155.33	268.00	
Aksa Enerji (Demirtaş/Bursa)	Prod. Comp.	R-Waste	0.00	0.00	GS1068
İtc Adana Biokütle Sant.	Prod. Comp.	R-Waste	0.00	0.00	GS715
İtc Adana Biokütle Sant. (Düzeltilme)	Prod. Comp.	R-Waste	0.00	0.00	GS715
İtc-Ka Enerji (Sincan)	Prod. Comp.	R-Waste	0.00	0.00	GS765
Ortadoğu Enerji (Oda Yeri) (Eyüp/İst.)	Prod. Comp.	R-Waste	0.00	0.00	GS707
Aksa Enerji (Demirtaş/Bursa)	Prod.Comp.	R-Waste	-1.4	0	
Akdeniz Elektrik (Mersin Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS753
Alize Enerji (Keltepe Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS437
Asmakinsan (Bandırma 3 Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS683
Asmakinsan (Bandırma 3 Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS683
Bakras En. Elçt.Ür. A.Ş. Şenbük Res	Prod. Comp.	R-Wpp	0.00	0	GS733

Plant Name	Electricity Utilities	Fuel Type	Installed Capacity (MW)	Firm Generation Capacity (GWh)	VER Status
Belen Elektrik (Belen Res) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS390
Bergama Res En. Ür. A.Ş. Aliağa Res	Prod. Comp.	R-Wpp	0.00	0.00	GS735
Bergama Res En. Ür. A.Ş. Aliağa Res	Prod. Comp.	R-Wpp	0.00	0.00	GS735
Borasko Enerji (Bandırma Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS744
Boreas Enerji (Boreas I Enez Res)	Prod. Comp.	R-Wpp	0.00	0	GS704?
Deniz Elektrik (Sebenoba Res)	Prod. Comp.	R-Wpp	0.00	0	VCS 553
Kuyucak Res (Alize Enerji Ür.) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS576
Kuyucak Res (Alize Enerji Üret.)	Prod. Comp.	R-Wpp	0.00	0.00	GS576
Mazi-3 Res Elektrik (Mazi-3 Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS388
Rotor Elektrik (Gökçedağ Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS?
Rotor Elektrik (Gökçedağ Res) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS?
Rotor Elektrik (Osmaniye Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS474
Rotor Elektrik (Osmaniye Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS474
Rotor Elektrik (Osmaniye Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS474
Sares Res (Garet Enerji Üretim)	Prod. Comp.	R-Wpp	0.00	0.00	GS963
Soma Enerji Üretim (Soma Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS398
Soma Enerji Üretim (Soma Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS398
Soma Enerji Üretim (Soma Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS398
Soma Enerji Üretim (Soma Res)	Prod. Comp.	R-Wpp	0.00	0.00	GS398
Soma Enerji Üretim (Soma Res) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS398
Soma Res (Bilgin Wpp San. En.Ür.)	Prod. Comp.	R-Wpp	0.00	0.00	GS655
Soma Res (Bilgin Wpp San.) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS655
Soma Res (Bilgin Wpp San) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS655
Turguttepe Res (Sabaş Elektrik Ür.)	Prod. Comp.	R-Wpp	0.00	0.00	GS610
Ütopya Elektrik (Düzova Res) (İlave)	Prod. Comp.	R-Wpp	0.00	0	GS672
Ziyaret Res (Ziyaret Res Elek.) (İlave)	Prod. Comp.	R-Wpp	0.00	0.00	GS617
Ziyaret Res (Ziyaret Res Elektrik)	Prod. Comp.	R-Wpp	0.00	0.00	GS617
Total 2010			1,418.45	24,080.56	

Annex-3: Certificate of EIA not Needed

T.C.
Çevre ve Orman
Bakanlığı



T.C.
ÇEVRE ve ORMAN BAKANLIĞI
ÇEVRESEL ETKİ DEĞERLENDİRMESİ VE PLANLAMA
GENEL MÜDÜRLÜĞÜ

Karar Tarihi : 13.12.2007
Karar No :

ÇED GEREKLİ DEĞİLDİR BELGESİ

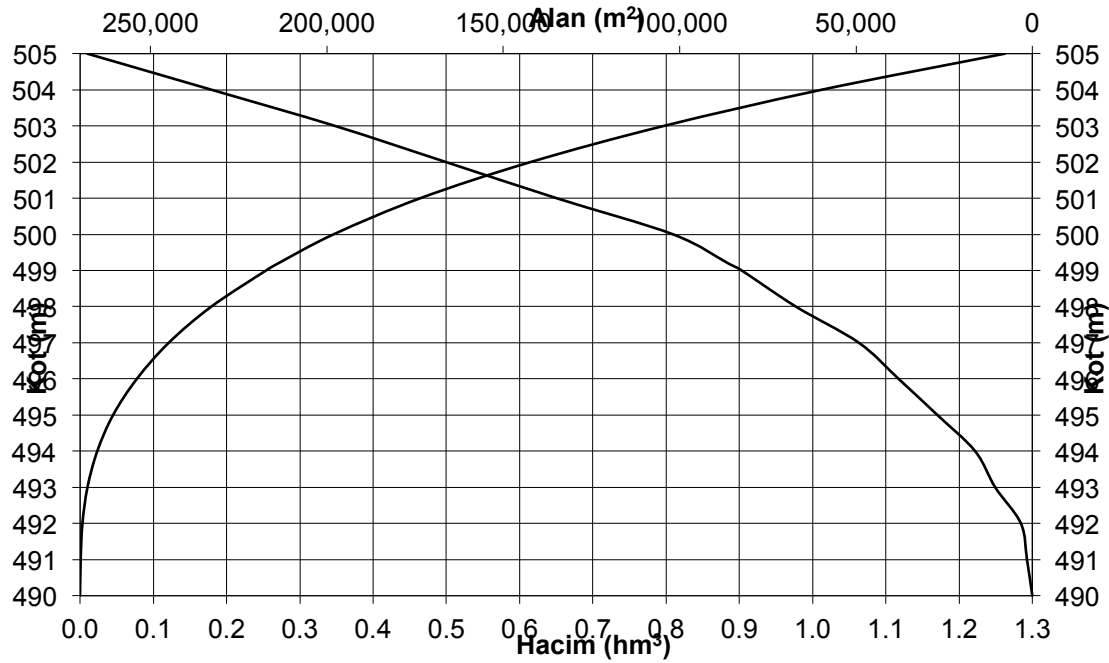
16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 17. maddesi gereğince "Kepezkaya Regülatörü, Hidroelektrik Santrali ve Malzeme Ocakları" projesi hakkında "Çevresel Etki Değerlendirmesi Gerekli Değildir" kararı verilmiştir.

Osman TÜZÜN
Bakan a.
Genel Müdür

Proje Sahibi : Selen Elektrik Üretim A.Ş.
Projenin Yeri : Karaman İli, Kazımkarabekir İlçesi



Annex-4: Volume vs Area Curve



Annex-5: Electricity Generation License of the project


T.C.
ENERJİ PİYASASI DÜZENLEME
KURUMU

ÜRETİM LİSANSI

*Bu Lisans kapsamındaki üretim tesisi
Yenilenebilir Enerji Kaynağı kullanmaktadır.*

Lisans No : EÜ/1245-6/897

Tarih : 05/07/2007

Bu Lisans, Selen Elektrik Üretim Anonim Şirketi'ne, Karaman İli'nde kurulacak olan Kepezkaya Hidroelektrik Santrali üretim tesisinde 05/07/2007 tarihinden itibaren 48 yıl 2 ay 15 gün süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu, 5625 sayılı Kanun ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 05/07/2007 tarihli ve 1245-6 sayılı Kararı ile verilmiştir.

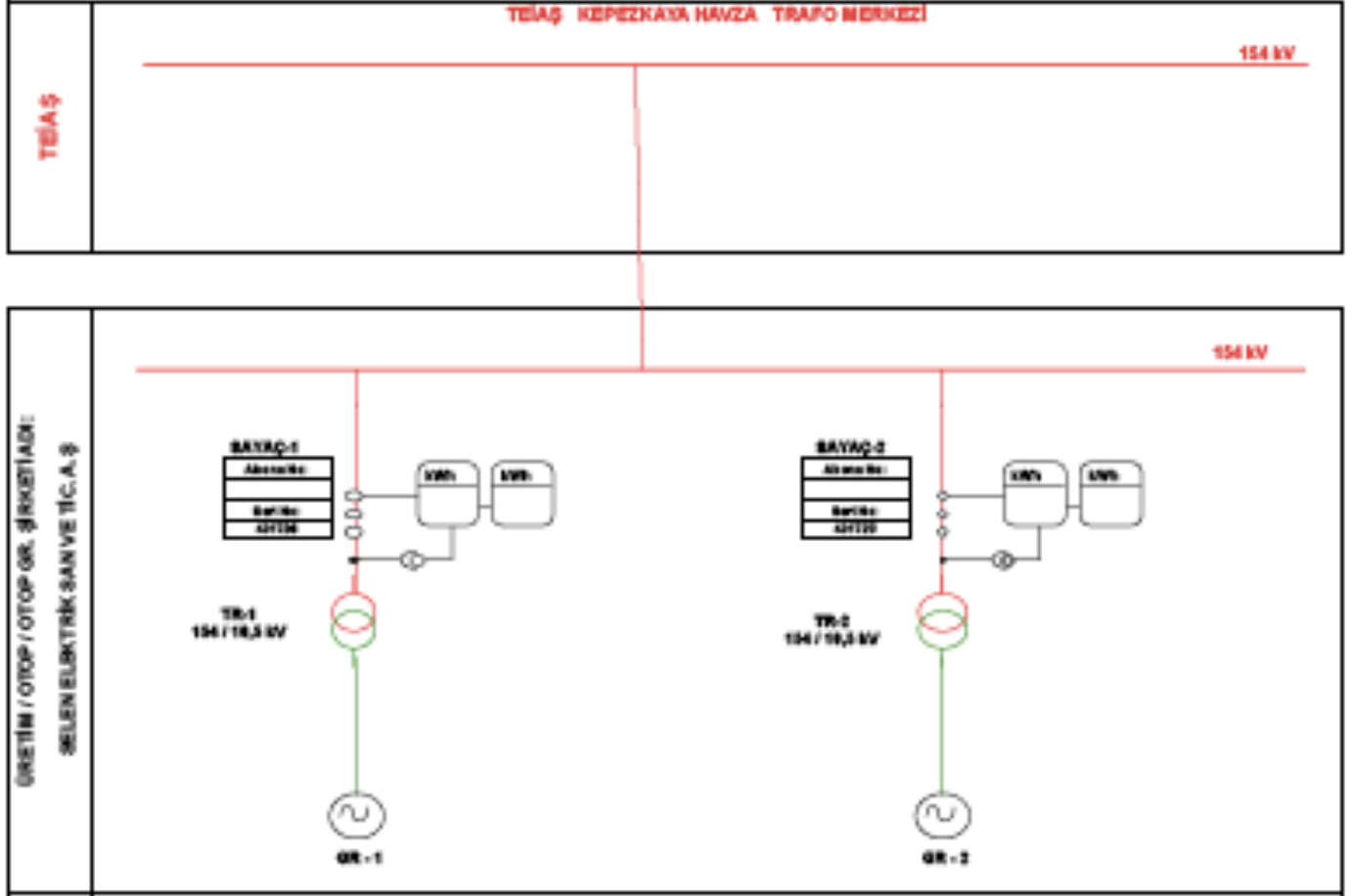

Yusuf GÜNAY
Başkan

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

Annex-6: Circuit Single Line Diagram of Kepezkaya HPP

FORM NO: K.03.01

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



SAYAÇ KODU *	SAYAÇ BİRİM NO	TK	Pa	Pca	HK	Çevre Sayısı	İletken Tipi	Uzunluk	Kablo	İletim Sistemi Kayıt *	Dağıtım Sistemi Kayıt ÇGR	Dağıtım Sistemi Kayıt AGR
		BİREK/ANAK			SİSTEMLER		AL/Cu					
	401726	HAYIR			HAYIR	1	AL	1.050	242 mm			
	401723	HAYIR			HAYIR	1	AL	1.050	242 mm			

TK: Trafo Kayıt, HK: Hat Kayıt

TK ve HK "Evet" olarak işaretlenmesi ilgili bölümlerle koordineli olarak.

* Bu bölümler, PMÜM tarafından doldurulmalıdır.

NOT

1. Devletin tebliği ile ilgili, sayı, sayı, 154 ve 10.5 kV seviyeleri olmak olarak gösterilmiştir. Formatı bozulmadan tebliğin durumuna göre sadece mevcut olan satırda esas sayılar girilmelidir.
2. Yukarıdaki tablolardaki satır sayı, sayı sayıya göre artırılabılır.

** İLETİM SİSTEMİ YETKİLİ KİŞİLER		TARİH	İMZA	İLETİM SİSTEMİ MÜHÜRÜ
1.	İMZA			
1.	ECERAN ÖZCAN / OLÇU SÖZ GRUP BAŞMOH.	10/14/10		
2.	MUSTAFA BÜYÜK / OLÇU SÖZ GRUP BAŞMOH.	10/14/10		

** İletim sistemi yetkilisi ve id yetkilisi kişi imzası olmayan form geçerli değildir.
Formatteki etiket ve yansıma bilgileri nedeniyle değiştirilecek maddeli hatalardan İletim sistemi yetkilisi sorumludur.