TATAR HYDRO ELECTRICITY POWER PLANT

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PROJECT DETAILS

1.1 Summary Description of the Project

Darenhes Elektrik Üretimi A.Ş. is planning to construct Tatar Hydro Electric Power Plant (HEPP) on the Peri Stream, within the jurisdiction of Tunceli and Elazığ Provinces. The purpose of the project is electricity production using the potential energy of Peri Stream as a renewable resource. Therefore, the electricity is going to be produced without causing airborne pollutants or Green House Gas (GHG) emissions. The construction and operation of the Tatar Hydro Electric Power Plant (HEPP) will be delaying the addition of conventional thermal power plants to the Turkish National Electricity Grid.

The set capacity of Tatar HEPP is 128.22 MWe, with 2 turbines of 64.11 MWe each. Based on the available water and of the total capacity of the project, the project is indicated to produce 421,270 MWh of electricity per year, based on revised feasibility studies, and as indicated on the Energy Market Regulatory Authority (EMRA) issued official electricity production license of the project activity.

On the EMRA issued electricity production license, the project activity is indicated to have a set capacity of 128.22 MWe, and both on the third party feasibility report[1], and on the DSI approval letter of the Feasibility report the amount of electricity expected to be produced annually is indicated to be maximum 429,560 MWh, therefore the plant load factor of the project calculates to be, 38.24 %, as shown in the below calculation:

$$\frac{429{,}560\ MWh}{128.22\ MWe \times 365 \times 24\ h} = \frac{429{,}560}{1{,}123{,}207.2} = 0.382441 = 38.24\ \%$$

Based on Turkey's Combined Margin Emission Factor of 0.53985 tCO_{2e}/MWh, the project is expected to produce 231,898 tonnes of CO_{2e} GHG reductions each year.

The environmental impacts of the project will be kept at a minimum level and all the regulations that are in act in the host country, Turkey, will be obeyed during the construction and operation stages of the Tatar HEPP project. At the planning stage these impacts have been investigated and were presented to the Ministry of Environment and Forestry (MoEF now renamed and structured as Ministry of Environment and Urban Planning -MoEUP), in the form of a EIA report[2]. The report was examined by an EIA evaluation committee coordinated by MoEUP and it was decided that the project could proceed, so they have granted an EIA Affirmative certificate (See Annex-3). Considering that the project will be using the water resource that is also essential for the aquatic life in the area, there will be a fish ladder (fish passage way)[3] within the regulator for the downstream and upstream movement of the fish, to facilitate fish migration. In addition to this, the minimum water (considered as 10 % of the average flow according to the water usage agreement with DSI-State Water Works) necessary for the sustainability of the aquatic life in the river will always be released.

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

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[1] Hydrocon Engineering prepared a new feasibility report, dated August 2011, and this report has DSI (State Water Works, host country's authority responsible from the surface and graound waters) , on 10.11.2011.

[2] The Environmental Impact Assessment (EIA) Report) in the original language is presented to the validating DOE.

[3] The plans of the fish ladder are provided to the validating DOE

Table 1: Major Milestones of Tatar HEPP Project

Date	Milestone	Reference
February-04	First Feasibility Study Report Was prepared	FS Report
06-Feb-05	Electricity Production License issued by Energy Market Regulatory Authority (EMRA) (Updated on 17-Nov-2011)	EMRA License
10-Feb-06	Stakeholders Meeting Announced in Local news papers	EIA Report p. 117
15-Feb-06	Stake Holder Consultation Meeting Held at Karakoçan Town of Elazığ	EIA Report p. 116
16-Feb-06	Stake Holder Consultation Meeting Held at Elmalı Village of Mazgirt -Tunceli	EIA Report p. 116
October-2006	EIA Final Report submitted to the MoEF for Approval	EIA Report
15-Nov-06	EIA Affirmative Certificate issued	See Annex-3
10-Jan-2008	Expropriation Approval issued by EMRA	Approval Letter
01-Apr-10	Carbon Finance considered	Board Decision
11-11-2011	Construction (re)-Started	Construction Contract Amendment
27-Jun-11	Ekobil Contracted for Carbon Finance	Contract
Sept-2011	Revised Feasibility Study Report Submitted to DSI	Revised FSR
10-Nov-2011	The Revised Feasibility Study Report Approved by DSI	Approval letter of DSI
18-Nov-2011	Water Usage Agreement amended by DSI to fit the capacity improvement	Water Usage Agreement
14-Dec-11	Validating DOE Contracted	Mail Order
16-Feb-12	PDD submitted to DOE	E-mail
24-Feb-12	Site Visit for Validation	DOE Testimonial

The Tatar HEPP is to be constructed at the downstream of two state owned dam, namely Özlüce Dam[4] (170 MW) and Kiğı Dam[5] (140 MW), two privately owned dams namely, Seyrantepe (57 MWe) and Pembelik (127 MWe)[6], dams, that are aimed for energy production purposes. Among these Pembelik and Kığı HEPP are under construction and they are expected to finish before Tatar HEPP, and Seyrantepe is operational. Pembelik and Seyrantepe electricity production licenses also belongs to Darenhes A.Ş.

The water that will be regulated by the upstream Pembelik HEPP will reach the reservoir lake of the Tatar HEPP, than it will reach the water intake body of the Tatar HEPP and it will be passed to the regulators via the penstock, the electricity will be produced and trough the generators it will go to the switch gear area and transformers, and will be connected to the Turkish electricity Grid via two transmission substations namely, 154kV Seyrantepe TM and 154 kV, Ferrokrom TM[7]. The excess water from the reservoir and the water used to produce electricity will be transferred to the tail water canal and will be left to the Peri Stream to reach to the Keban Dam.

4 http://www2.dsi.gov.tr/bolge/dsi9/bingol.htm
5 http://www2.dsi.gov.tr/bolge/dsi9/bingol.htm#kig%FD
6 http://www.bilgin.com.tr/darenhes.asp?ide=darenhes
7 The connection points are also certified at the electricity production licence provided to the validating DOE

These five dams that are being constructed behind each other are intended to reduce the sediment flow to the Keban Dam (the first large dam in Turkey's history) and was planned in 70s, but they were not possible to construct until now.

How the project activity will be operating , and the boundary of the project activity (indicated in broken red line) is shown schematically below in Figure 1:

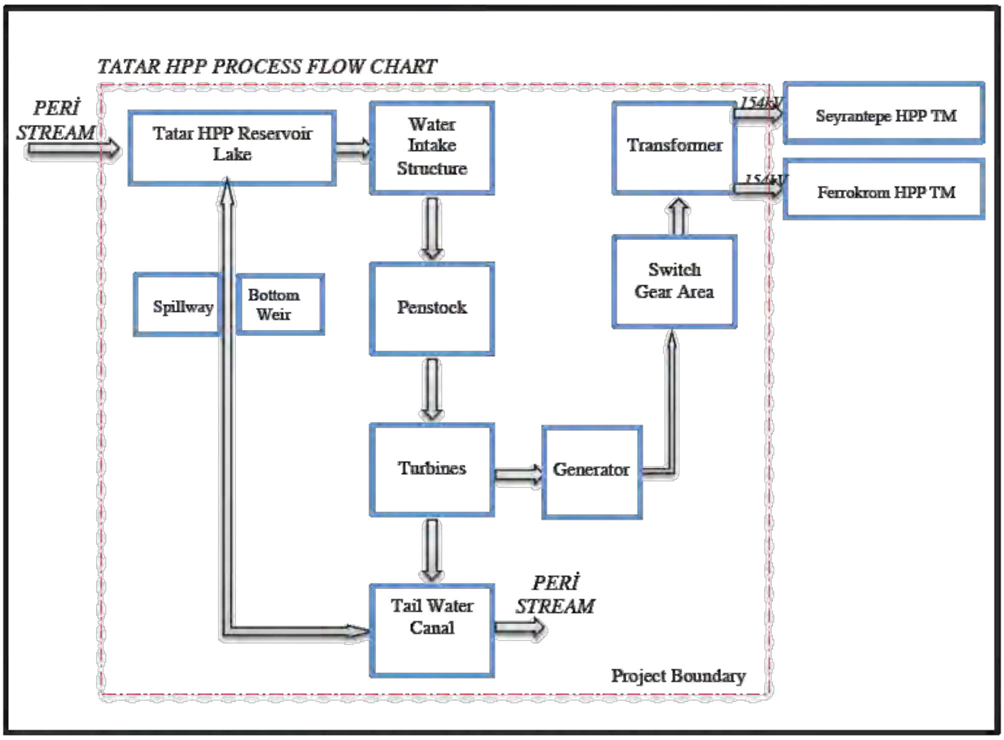

Figure 1: Flow chart showing the basic operational principles of the project activity, and the project boundary.

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
Darenhes Elektrik Üretimi A.Ş.	Project Owner – Implementation of the Project	Kuleli Sk. No:87/3 06700 G.O.P./ANKARA *T: +90 312 436 06 40* *F: +90 312 436 06 55* *e-mail: contact@bilgin.com.tr*

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1.4 Other Entities Involved in the Project

Other Entities Involved	Role and Responsibility	Contact Information
Ekobil Çevre Hizmetleri Dananışmanlık.Eğt.Tar. Hayv.Mad. İnş. İth. İhr.Tur. ve Tic. Ltd. Şti.	Preparation of the Project Description Document	Güneykent Sitesi 1839 Sk. No: 56 Ahlatlıbel-ANKARA-06805 TURKEY T:+90 312 489 13 38 E-mail:info@ekobil.com

1.5 Project Start Date

Project Start Date is: 1.11.2013. (Or the commercial operation date, which ever happens first)

1.6 Project Crediting Period

The project crediting period is 10 years: 1.11.2013-31.10.2023 (both days inclusive). The crediting period is renewable twice.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	☑
Large project	☐

Years	Estimated GHG emission reductions or removals (tCO2e)
Year 0: 1.11.2013 to 31.12.2013	38,755
Year 1: 2014	231,898
Year 2: 2015	231,898
Year 3: 2016	231,898
Year 4: 2017	231,898
Year 5: 2018	231,898
Year 6: 2019	231,898
Year 7: 2020	231,898
Year 8: 2021	231,898
Year 9: 2022	231,898
Year.10: 2023 (01.01.2023 to 31.10.2023)	193,143
Total estimated ERs	2,318,980
Total number of crediting years	10
Average annual ERs	231,898

1.8 Description of the Project Activity[8]

Tatar HEPP will be on Peri Stream, which is a branch of the Euphrates River. The catchment area of the Upper Euphrates River covers an area of about 127,000 km^2.

Tatar HEPP with 128.22 MWe installed capacity, is the 5th stage dam at the down stream part of the Peri Stream. A set of Five dams (Kiğı , Özlüce, Seyrantepe and Pembelik HEPPs at the upstream

[8] Information provided in this chapter is taken from the Revised feasibility report, September 2011. DSI-Host country's authority on hydroelectric power plants approved this report, on 10.November.2011..

direction of Tatar HEPP) were designed, including the Tatar HEPP, to reduce the sediment inflow towards the Keban Dam that was the Largest Dam of the Country when it was built.

The Tatar HEPP is designed to have a maximum water level drop to maximize the firm energy production. Therefore the difference between the maximum (915 m) and the minimum (909.5 m) operation levels of the Peri stream is not very much, but only 5.5 m. The Tatar HEPP is designed with the following operational principles in mind:

a) Maximization of the firm energy output
b) Maximization of the net fall
c) Minimization of the water discharged via spill weir.

The Tatar HEPP is designed as an impoundment hydroelectric power plant, with 128.22 MWe capacity and is expected to produce 429,560 MWh of electricity per year. The Tatar HEPP has a clay core zoned Dam, with a fish ladder, the thalweg elevation is 846 m and the elevation from the base is 854m. The elevation of the dam body from Talweg level is 74m and from the base is 82m.

The Tatar HEPP will be connecting to the Turkish National Power Grid via two of Transformer Substations by 27 km long 154 kV transmission line, at the Seyrantepe HEPP and at the Ferrokrom TM. As the project will be operational, a reliable, continuous, independent from imported fossil fuels, and an uninterrupted high quality power at 154 kV voltage level will be supplied to consumers in Turkey. Thus, the implementation of the project will positively affect both Turkey's and the region’s economy.

The project will involve collecting of water, at the 815 m level, by the help of a Dam and a water intake body. After that the water will be transferred to the water intake body from which it will flow to the turbine units via the penstocks. The project has two turbine units, with 64.11MWe MW capacity each. The two turbines will be housed within the Hydroelectricity Power Plant (HEPP) building. The water that will hit these two turbines, will then leave the turbines via the tail water canal and a spillway which is going to be located at a level of 845 m.

The following are the facilities to be constructed:

- The Tatar Dam, (equipped with a fish ladder) to be constructed at approximately 920 m elevation level
- Water intake body and the settling tank
- Penstock
- Hydroelectricity Power Plant building
- Tail water canal and spillway
- The switch gear area and the transformers
- 25 km 154 kV transmission line

General technical characteristics of Tatar HEPP are given in Table 2.

Table 2: General technical characteristics of Tatar HEPP

General Characteristics	
	Peri Stream
Drainage Area	5,379 km^2
Average Annual Natural Flow	2704.22 hm^3
Flood water level	916.61 m
Characteristics of the Dam	
Place	Over the Peri stream, approximately 20 km NW of Kovancılar Town, about 2500 m upstream with respect to the Nişankaya Road's Bridge, below Tatar Village at 846m thalweg elevation.
Purpose	According to water flow direction, collecting water and diverting the Peri Stream's water to water intake structure.
Type	Clay Fill Zoned
Thalweg elevation:	846 m
Minimum operational water level :	909,5 m
Maximum operational water level:	915 m
Flooding Elevation	916,61 m
Dam Crest Level :	920 m
Height from the Thalweg :	74 m
Height from the basement :	82 m
Dead Reservoir Volume :	241,27 hm^3
Active Reservoir Volume :	58,30 hm^3
Total Reservoir Volume :	299,57 hm^3
Flood Volume :	17,44 hm^3
Spillway	
Capacity :	30 m3/s
Approaching tunnel length :	300 m
Bottom Weir	
Entrance Hydrography Peak :	5741 m3/s
Exit Hydrography peak :	4893 m3/s
Level of Approaching canal :	893 m
Threshold level:	898 m
Number of Gates :	3
Dimensions of the Radial Gate:	14 m x 17,25 m
Chute channel width :	52 m
Chute channel length :	405 m
Length of the energy breaking pond :	150 m
Penstock	
Penstock Length :	380 m
Pipe diameter :	7 m
Maximum Flow Rate :	189,7 m3/s
Maximum Flow velocity:	4,93 m/s
Power House	
Tail water canal elevation :	845 m
Maximum net fall :	69 m (at maximum reservoir operation elevation)
Minimum net fall :	63,5 m (at minimum reservoir operation elevation)
Average net fall :	65,86 m
Maximum project flow rate :	173.75 m3/s
Number of Turbines :	2
Turbine Power :	64,11 MW
Firm Energy :	32,95 MW
Capacity :	128.22 MW
Firm energy to be produced:	288,644 GWh

Secondary energy to be produced:	75,588 GWh	
Total energy to be produced :	364,252 GWh	
Load factor :	0.415	
Amount of water that passes via the turbines:	2334,61 hm3	
Regulating ratio:	0,863	
Dimensions of the Powerhouse :	60 m x 100 m	
Elevation of Switchgear area :	860 m	
Switch Gear Area Dimensions :	80 m x 120 m	
Turbines		
Type :	Vertical axis, Francis	
Number :	2	
Power :	2 x 64 220 kW	
Design fall :	65,86 m (net)	
Flow rate :	173,75 m3/s total (86,88 m3/s per unit)	
Maximum Net Fall:	69 m	
Minimum. Net Fall:	63,5 m	
Revolutions per minute:	167,67 rev/min	
Specific rotation number :	188,34	
Number of poles :	18 even (36 od)	
Turbine efficiency :	0,92	
Generators		
Type :	3 phased synchronous	
Number :	3	
Power :	3 x 37 150 kVA	
Frequency :	50 Hz	
Revolution number :	167,67	
Generator efficiency :	0,96	
Transformers		
	Unit Transformers	Internal use transformers
Numbers:	3	3
Type :	External type, 3 phased	Internal type , 3 phased
Continuous power :	3 x 40000 kVA	630 kVA
Frequency :	50 Hz	50 Hz
Connection group :	0,98	Dyn 5

The project will be using Vertical type 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 was 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 2), for a schematic explanation of working principles of a Francis Turbine.

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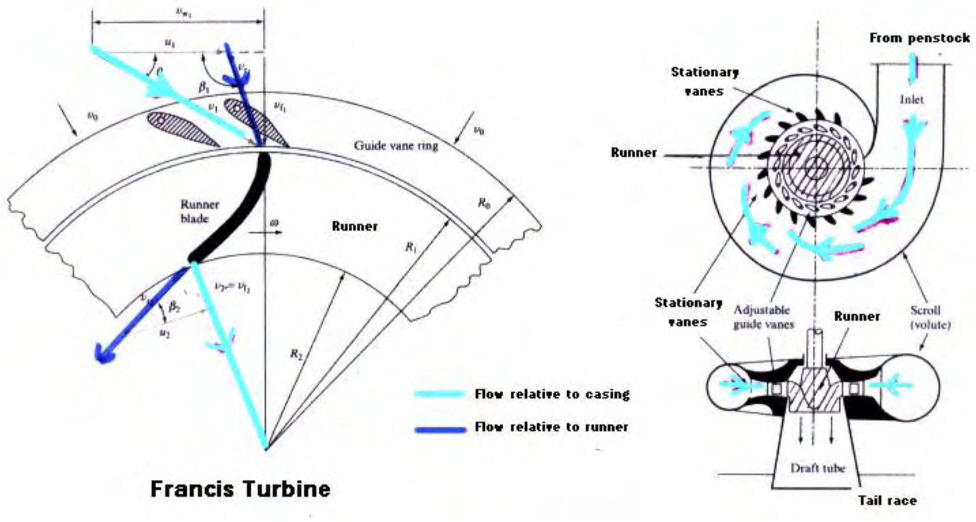

Figure 2:The working principle of a Vertical Axis Francis type turbine.

The project owner is granted a production license for 49 years[9] including the 6.5 years (indicated as 78 months in the license) of construction period and the 2 years of pre construction period. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report[10] 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 years[11]. As a result the project life time is estimated to be about **20 years**.

The project is expected to produce 429,560 MWh of electricity per year. 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 is located at the East Anatolian geographical region of Turkey within the jurisdictions of Elazığ and Tunceli Provinces. The project is located at the Northern Euphrates Catchment over the Peri Stream, between 38°91' Northern Latitudes and 39°87' Eastern Longitudes, as can be seen in the following location Map (Figure 3). The coordinates of the Dam Body and the Powerhouse are given below (see Table 3):

Table 3: Coordinates of the dam body and the powerhouse

	Dam Body		Power House	
	Latitude	Longitude	Latitude	Longitude
Point 1	38°51'57.78"N	39°49'14.58"E	38°52'0.28"N	39°49'1.37"E
Point 2	38°51'55.77"N	39°49'4.80"E	38°51'58.11"N	39°48'58.24"E

[9] According to the production licence dated 02/06/2005
[10] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.25 (Last visited on 3/3/2011)
[11] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26 (Last visited on 3/3/2011)

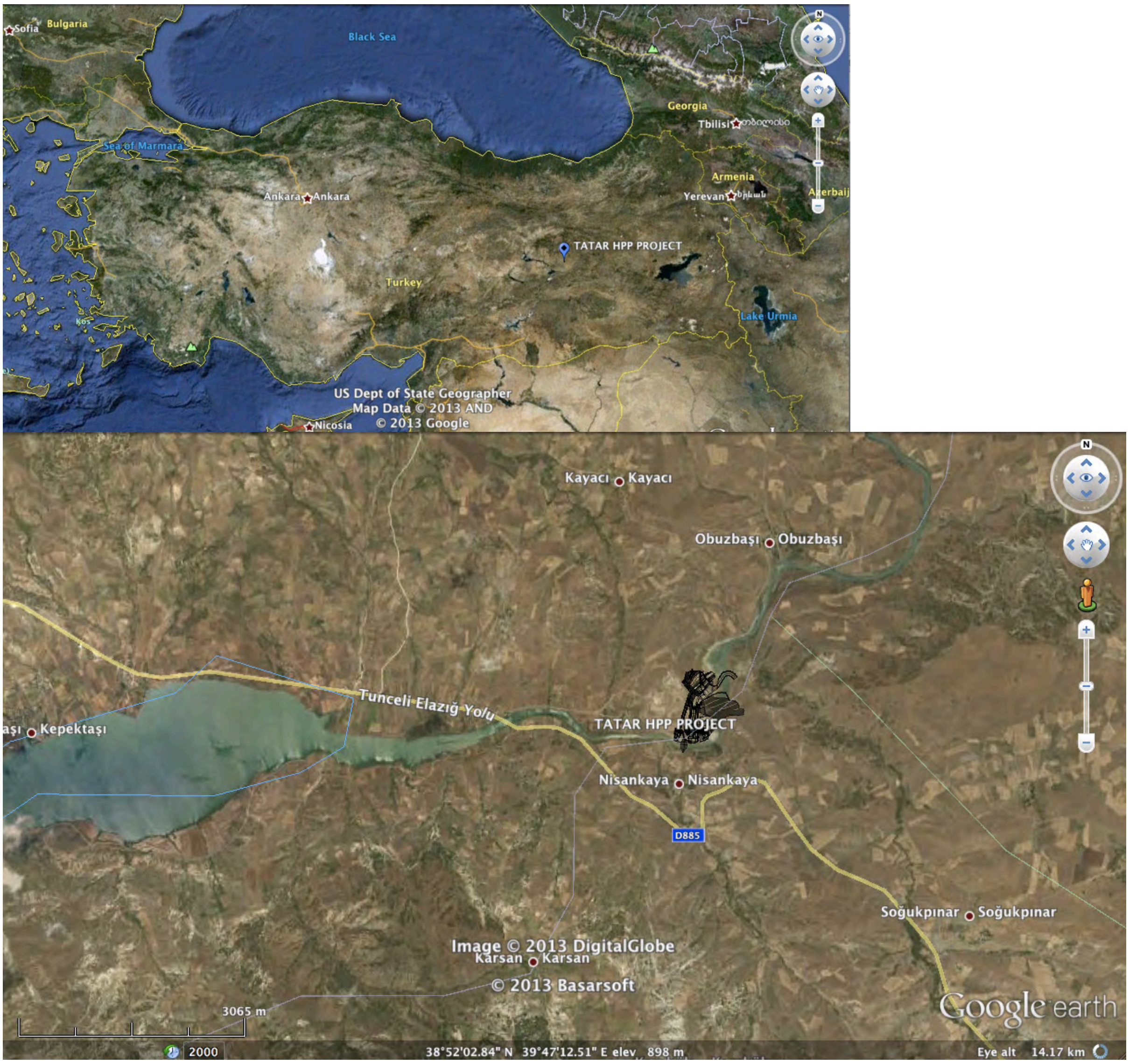

Figure 3: Satellite image showing the location of the project area (http://goo.gl/maps/tE6Yi).

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 Right of Use

Ownership of the plant, equipment and electricity generation licence belongs to Darenhes Elektrik Üretimi 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 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[12] 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.3.3 has taken effect on 04.10.2012, accordingly the Project is eligible to use this version.
- VCS v.3.3requires 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.3.3 accepts all six Kyoto gases. The Project Activity aims to reduce CO_2, which is one of these six Kyoto gases.

[12] Turkey is a party to UNFCCC and listed in Annex -1, but the Marrakesh Accord at COP 7, "*Invites* the Parties to recognize the special circumstances of Turkey, which place Turkey, after becoming a Party, in a situation different from that of other Parties included inAnnex I to the Convention." As a result, even though Turkey has ratified Kyoto Protocol, she does not have a binding target under Annex-B, and as a result Turkey can not host CDM or JI projects.

- VCS v.3.3 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.3.3 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 per ACM0002/ Version 13.0.0 page 10.

"*No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.*"

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 UNFCCC 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 07.0.0)

"Tool to calculate the emission factor for an electricity system". (Version 03.0.0)

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

"Combined tool to identify the baseline scenario and demonstrate additionality" (Version 5.0.0).

Only the following tools are utilized:

"Tool for the demonstration and assessment of additionality" (Version 07.0.0)

"Tool to calculate the emission factor for an electricity system". (Version 03.0.0)

2.2 Applicability of Methodology

The ACM0002 (version 13.0.0) methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The choice of methodology ACM0002, Version 13.0.0, is justified as the project activity meets the following applicability criteria:

Reference page in ACM0002 (version 13.0.0)	Applicability Criteria	Justification
2	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;	The Tatar HEPP project activity is the Installation of a new hydro power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield power plant)
3	• 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 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.	Not applicable as the project is not a capacity addition
3	In case of hydro power plants, one of the following conditions must apply:	
3	The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or	Not Applicable as the project activity is the addition of a new hydro power plant thus a new reservoir.
3	The project activity is implemented in an existing single	Not Applicable as the project activity is the addition of a new hydro power plant thus a new reservoir.

<table>
<tr><td></td><td>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/m2; or</td><td></td></tr>
<tr><td>3</td><td>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/m2; or</td><td>Not Applicable as the project activity is the addition of a new hydro power plant thus a new reservoir.</td></tr>
<tr><td>3</td><td>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.</td><td>The project activity results in new reservoirs and the power density of the project activity is 11.84 W/m^2 which is greater than 4 W/m^2 as shown in the following calculation:
<table>
<tr><td><u>Project Activity</u></td><td><u>Installed Capacity</u></td><td>/</td><td><u>Reservoir Area</u>[13]</td><td>=</td><td><u>Power Density</u></td></tr>
<tr><td>Tatar HEPP</td><td>128,220,000 W</td><td>/</td><td>10,830,000 m^2</td><td>=</td><td>11.84 W/m^2</td></tr>
</table></td></tr>
<tr><td>3</td><td>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 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[14] that collectively constitute the generation capacity of the combined power plant;
Water flow between multiple reservoirs is not</td><td>Not Applicable as the project activity is going to result in only one single reservoir.</td></tr>
</table>

[13] The reservoir volume Area curve that indicates the aerial extent of the reservoir at maximum operation level is provided in Annex 5.

[14] This requirement can be demonstrated, for example: (i) by the fact that water flow from upstream power units spilling directly to the downstream reservoir; or (ii) through the analysis of the water balance. Water balance is the mass balance of water fed to power units, with all possible combinations of multiple reservoirs and without the construction of reservoirs. The purpose of such water balance is to demonstrate the requirement of specific combination of multiple reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum three years prior to implementation of CDM project activity.

	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 15 MW; • 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.	
4	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[15] 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/m^2.	The project activity is eligible because it is not involving switching from fossil fuel It is not a biomass powered power plant Project activity is resulting in the creation of a new reservoir but the power density is not less than 4 W/m^2. But instead it is greater than 4 W/m^2.
4	In the case of retrofits, replacements, or capacity additions, the ACM0002 (version 13.0.0) 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”.	Not applicable as the project activity is the installation of a new hydro power plant and all the equipment that will be installed will be brand new.
Footnote 3	The condition in the “Combined	

15 The ACM002 (version 13.0.0) indicates that “…project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology”.. ;In the case of the project activity as the power density is greater than 4 W/m^2, there is no need for such a claim or revision request. .

pg.4	tool to identify the baseline scenario and demonstrate additionality that all potential alternative scenarios to the proposed project activity must be available options to project participants "does not apply to this methodology, as this methodology only refers to some steps of this tool.	

2.3 Project Boundary

Table 3 exhibits the gases included in the project boundary. CO_2 emission is included in the baseline but the project activity does not emit any of the gases listed, in Table 3.

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 4: 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_2O	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_2O	No	Minor emission source
		Other	N.A.	N.A.
	Back-up or Emergency Diesel Generator	CO_2	No	Neglected[16]
		CH_4	No	Minor emission source
		N_2O	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.3.0.0)*."*

Since the proposed project activity is going to be connected to the Turkish national grid, , via the Seyrantepe HEPP TM and Ferrokrom TM (see Figure 1), the baseline scenario of the proposed

[16] ACM0002 Version 13.0.0 indicates that "...The use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected."

project activity 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 (EFy) is calculated as the Combined Margin (CM), of which the breakdown and detailed description is given below in chapter 3.

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 7.0.0*" and the numbering in this section reflects the Tool's Guidelines provided at EB 70, Annex 8.

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

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

The tool notifies that "Project activities that apply this tool in context of approved consolidated methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity."

The project alternative can be defined as follows:

> 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 Continuation of the current situation, without any project undertaken.

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.

***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. As the **IRR** is normally easier to understand than the result of a discounted cash flow (DCF) analysis (i.e. the net present value or NPV) for non-financial executives, it is often used to explain and justify investment decisions.

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 7.0.0 and its 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 62[17], 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 such as Armenia, from this point of view a reasonable and appropriate benchmark to compare the Equity IRR can be taken as 12.50 %.

[17] 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 4) and supplementary parameters are provided in the "TatarFinancialAnalysis" workbook and submitted to the validating DOE.

Table 5: Major parameters taken into account for the financial analysis and determination of the Equity IRR of the Tatar HEPP Project:

Parameter	Value	Unit	References
Installed Capacity	128.22	MW	Production Licence
Expected Annual Electricity Generation	429,560	MWh	Production Licence
Expected Annual Emission Reduction(ER)	231,898	tCO_2e	Calculated (see Chapter 3 for details)
Expected VCS-SCS-VCU sales price	7.00	USD/t CO_2e	State of the Voluntary Markets 2010[18]
Total Investment	383,577,822	USD	Page 15 of the approved EIA Report
Annual Operation Costs	$2,995,343.70	USD	Judgement based on experience gained in similar projects detailed references are provided to the validating DOE.
Loan	Confidential	USD	Loan term sheet
Loan Period	9	years	Loan term sheet
Electricity Sales Price	0.080	USD/KWh	EMRA report for year 2010 p.64 (See Figure 5-4)
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 $137,064,913.17 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. The "Tool to determine the remaining lifetime of equipment" (EB 50 Report, Annex 15 version 0.1), suggests 150,000 hours of technical lifetime for a hydro turbine. Dividing the default technical lifetime hours with the annual expected work hours of the project activity:

150,000h/3180 h= 47 years.

Yet, based on the experts' committee report[19] 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 years[20]. The technical lifetime of the project activity is longer than the crediting period (10 years, renewable twice), therefore as the investment analysis guideline (version 5, EB 62 Report, Annex 5) suggests "Both project IRR and equity IRR calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime), or - if a shorter period is chosen- include the fair value of the project activity assets at the end of the assessment period." We have taken into account this fair book value of the project, and as

[18] 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.
[19] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.25 (Last visited on 3/3/2011)
[20] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26 (Last visited on 3/3/2011)

suggested by the investment analysis guideline: " In general a minimum period of 10 years and a maximum of 20 years will be appropriate." Therefore, the financial analysis of the project activity is 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 8.47 % which is below the bench mark of 12.50%.

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 effect 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 ±10% fluctuations in the above parameters. The figures in the following table (Table 6) 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 4).

Table 6: Sensitivity analysis for the Equity IRR without carbon revenue for the project (Benchmark: 12.50%)

Change	-10%	-5%	5%	10%	Exceed Benchmark?
Investment Cost	11.5%	9.8%	7.4%	6.4%	No
Operating Cost	8.6%	8.5%	8.4%	8.4%	No
Electricity Revenue	7.0%	7.7%	9.2%	10.0%	No

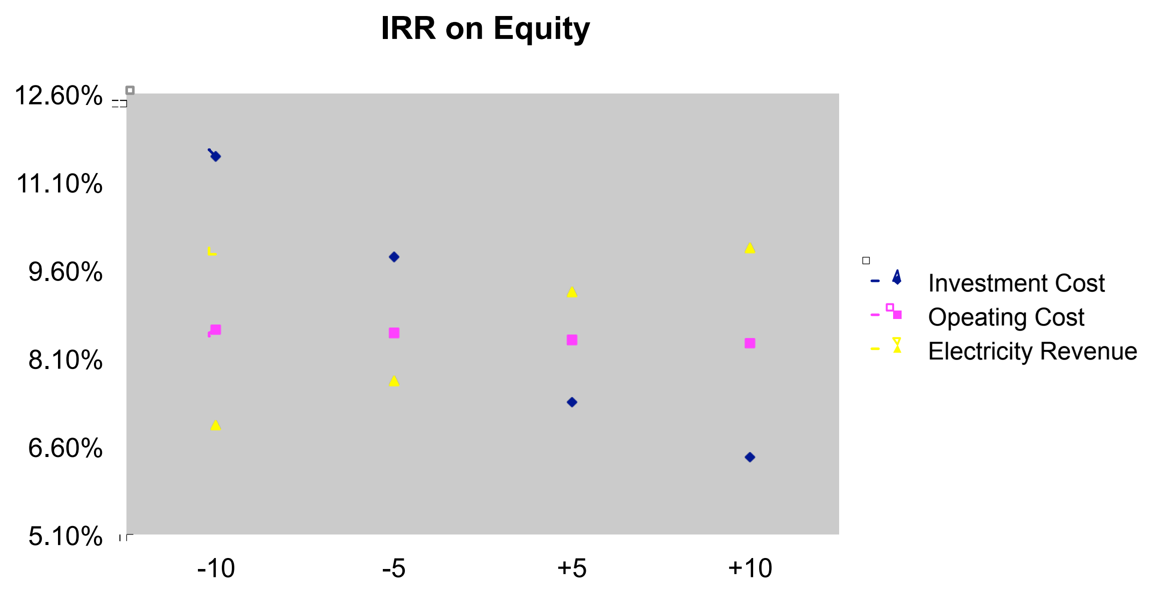

Figure 4: Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by ±10%

To exceed the benchmark, the electricity revenue must increase by about 26.60% over the life of the project, or the investment cost must be reduced by about 12.30%. As the Renewable energy law only guaranties a minimum price of USD 0.073 per kWh, the price of 0.08 USD per kWh, we have chosen for our financial analysis is already very high for such an increase in the future, the former is unlikely. As the feasibility report considers the firm and secondary energy to be produced based on the available water flow data of the last 50 years, and 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 26,30%. In addition to that the feasibility report also considers that the amount of electricity production can reduce to 421,270 MWh when the upstream power plants will be developed in the region. 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 the lowest possible cost and it was the cost of the investment before the design change which increases the costs rather than reducing them. Therefore a decrease in the estimated investment cost is also very unlikely.

Outcome of Step 2:

Without the VER revenue the Internal Rate of Return of the project can not get close to the benchmark of 12.50 %, with an equity internal rate of return of 8.47%. A fluctuation of ± 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 project activity.

Step.4. Common practice analysis

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 02), common practice analysis is presented through the following 5 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 128.22 MW of the proposed project activity is selected as the design capacity. Therefore, the range from 64.11 to 192.33 MW is considered as applicable capacity.

Common Practice tool Step 2: identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

The project activity is located within the borders of the 21st water catchment that is designated as the Euphrates Catchment (See Figure 5). The investment conditions and the water regimes are similar in this area that this is considered to be the applicable geographic area. The range from 64.11 to 192.33 MW, the hydroelectric power plant projects that are within this range, operational within the borders of the Euphrates Catchment are given below in table 7:

Figure 5: The map showing the catchment boundaries within Turkey. The project is located within the borders of the Euphrates Catchment, which is the biggest catchment, divided in to Upper (green), Middle (light Blue) and Lower (Pink) Euphrates Catchment.

Table 7: Projects that are commissioned before the project activity, within the borders of the Euphrates catchment.[21]

Name of Power House	Status	Capacity (MW)	Firm Production (MWh)	Province	Basin Name	DSİ Region	Year Commissioned	VER Status
Karkamış	DSİ	180	462	63 Urfa	21 Fırat	15 Urfa	1999	
Özlüce-Peri	DSİ	170	290	12 Bingöl	21 Fırat	09 Elazığ	1999	
Uzunçayır	Private	82	182	62 Tunceli	21 Fırat	09 Elazığ	2009	VCS 762

Common Practice tool Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

As explained above, considering the Euphrates basin and checking all the power plants within the capacity range determined in Step 2, and looking projects that have started commercial operation before the start date of the project activity, it is revealed that there are only 2 power plants operational in the Turkish grid with a capacity ranging between 64.11 to 192.33 MW (See Table8). Therefore the number of N_{all} is 2.

Table 8: Projects that are commissioned before the project activity, within the borders of the Euphrates catchment, excluding those that benefit from VER revenue.[22]

Name of Power House	Status	Capacity (MW)	Firm Production (MWh)	Province	Basin Name	DSİ Bölgesi	Year Commissioned
Karkamış	DSİ	180	462	63 Urfa	21 Fırat	15 Urfa	1999
Özlüce-Peri	DSİ	170	290	12 Bingöl	21 Fırat	09 Elazığ	1999

Common Practice tool Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

Common Practice tool Sub-step 4a:

When we consider the project listed in Table 9, these projects are different from Tatar HEPP in the following aspects:

- All these projects were developed and operated by government, and therefore since they were developed considering public benefit, the conditions and economical motivations, thus the investment climate in developing them are very different than the project activity.

Conclusion of Common Practice tool Sub- Step 4b is N_{diff}=2

[21] A Complete list of the projects that are operational within the Turkish grid are provided in the capacity projection reports published by TEIAS (http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2011.pdf), the location and catchment related data is obtained from the DSI web sites (http://www2.dsi.gov.tr/skatablo/Tablo1.htm).
[22] A Complete list of the projects that are operational within the Turkish grid are provided in the capacity projection reports published by TEIAS (http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2011.pdf), the location and catchment related data is obtained from the DSI web sites (http://www2.dsi.gov.tr/skatablo/Tablo1.htm).

Common Practice tool Step 5: 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-(2/2)

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

$N_{all}-N_{diff}$ =2-2=0 <3 in that case the Tatar HEPP 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.

Outcome: The Tatar Hydroelectric Power Plant project is additional for three main reasons:

1. The Tatar HEPP project faces significant investment barriers. As shown by the benchmark analysis it is not the financially most viable option. Furthermore, the financial analysis may prove to be optimistic over time due to the negative effects of climate change.
2. The Tatar HEPP project is not common practice..

Carbon finance is essential to bring the project activity closer to the benchmark values and is essential for the implementation of the project activity by supplying a further stream of revenue, over and above the electricity revenue, to cover the loss of production due to the technical barriers the project is facing at the operation and maintenance of the open canal system. The carbon revenue reduces the risk to the project investor by providing increased revenue to pay back the increased amount of equity required to fund the project costs.

2.6 Methodology Deviations

The UNFCCC methodology of ACM0002/ Version 13.0.0 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".*

The Project therefore applies the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 3.0.0) as follows:

Step 1 -*Identify the relevant electricity systems*

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 6):

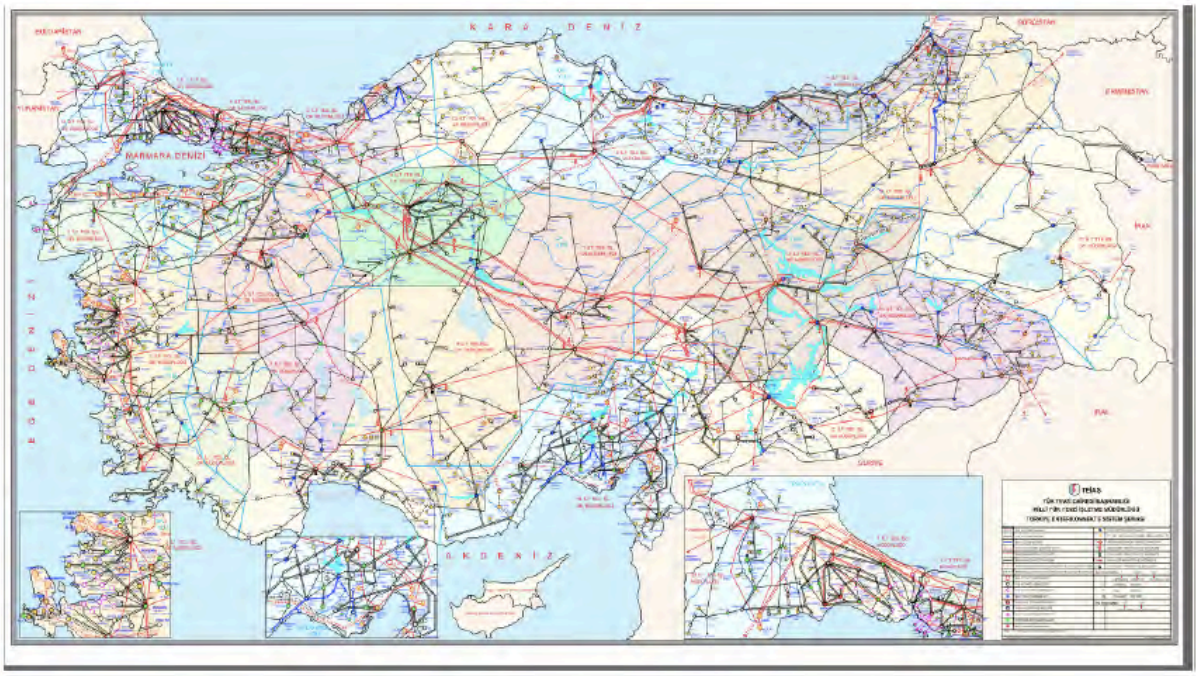

Figure 6: The Map showing the boundaries of Turkish Electricity Grid (Source Electricity Market Report 2010, by Electricity Market Regulatory Authority http://www.epdk.gov.tr/documents/10157/48dd12d4-74da-4dcf-9f48-86983146c0d8)

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

> For the purpose of determining the operating margin emission factor, the tool directs us to use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:
>
> 0 tCO2/MWh; or (a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 (d) below; or (b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 (a), if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or (c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4 (b) below.
>
> For imports from connected electricity systems located in Annex I country(ies), the emission factor is 0 tons CO_2 per MWh.
>
> And the tool also notes that the …"Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors."

In our case the host country (imports electricity mainly from Annex -1 countries, so the emission factor related to imports is considered to be zero"0".

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 a method to determine the operating margin (OM);

According to the "Tool to calculate the emission factor for an electricity system", version 3.0.0 in calculating the Operating Margin grid emission factor for a given year y (EFgrid,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**[23]

	2006	2007	2008	2009	2010
Thermal	74.78	81.02	82.72	80.5	73.78
Hydro	25.10	18.72	16.77	18.46	24.52
Wind & Geothermal	0.12	0.26	0.51	0.99	1.70
Total	100.00	100.00	100.00	100.00	100.00

Since the Simple OM calculation (option (A)) is selected, the emission factor is calculated by the generation-weighted average emissions per electricity unit (tCO_2/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 EFgrid, 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.

---

[23] 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)

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 CO_2 emissions per unit of net electricity generation (tCO_2/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 CO_2 emission factor of each power unit; or

- 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 type[24],
- Annual heating values for fuels consumed for electricity generation[25],
- Annual electricity generation by fuel type, import and export[26]

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 CO_2 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_{y,grid}} \qquad (7)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

$FC_{i,y}$ = Amount of fossil fuel type *i* consumed in the project electricity 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)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)

EG_y = 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)

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[24] 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)

[25] 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).

[26] 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).

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 ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, 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 ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

From $SET_{5\text{-units}}$ 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_{sampl}e 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.

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 (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$\mathrm{EF}_{grid,BM,y} = \frac{\sum_m \mathrm{EG}_{m,y} \times \mathrm{EG}_{EL.m.y}}{\sum_m \mathrm{EG}_{m,y}}$$

Where:

$EF_{grid,BM,y}$	= Build margin CO2 emission factor in year y (tCO2/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 (tCO2/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 CO_2 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 $EF_{EL,m,y}$. For this calculation the generation efficiencies are taken from Annex 1 of the Tool.

The CO_2 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 (see 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 CO_2 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 a generation weighted average for the years 2008, 2009 and 2010, as explained in the part where the actual calculations are shown, the assessed capacities added in these two years constitutes our $SET_{sample.}$

Step 6 - Calculate the combined margin (CM) emission 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 ($EF_{grid,BM,y}$):

$$\mathrm{EF}_{grid,CM,y} = \mathrm{EF}_{\mathrm{grid,OM,y}} \times \mathrm{w}_{OM} + \mathrm{EF}_{\mathrm{grid,BM,y}} \times \mathrm{w}_{\mathrm{BM}}$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year *y* (tCO_2/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* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emissions factor in year *y* (tCO_2/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:

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2)
BE_y	=	Baseline emissions in year *y* (tCO_2)
$PE_{,y}$	=	Project Emissions in year *y* (tCO_2)
L_y	=	Leakage emissions in year *y* (tCO_2)

As methodology states the PEy and Ly in case of a hydro power project to be zero hence ERy = BEy

3.2 Project Emissions

As the methodology states the PEy 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 CH_4 and CO_2 emissions from the reservoir, estimated as follows:"

"...the power density of the project activity (PD) is greater than 4 W/m^2 and less than or equal to 10 W/m^2:"

As shown by the following calculation, the project activity has a power density of 11.84 W/m^2, this is greater than 10 W/m^2,

Project Activity	Installed Capacity	/	Reservoir Area[27]	=	Power Density
Tatar HEPP	128,220,000 W	/	10,830,000 m^2	=	11.84 W/m^2

therefore

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

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_2e/yr)

There will be two diesel generators installed within the project boundary (one at the power house one at the dam body). These are only going to be utilized as back-up or emergency generators, therefore, the emissions from these back up generators have been deemed negligible as per the ACM0002 (version 13.0.0) methodology.

3.3 Leakage

There are no leakage emissions related to the 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 PDD 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 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:

[27] The reservoir volume Area curve that indicates the aerial extent of the reservoir at maximum operation level is provided in Annex 5.

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	39.70	39.81	40.23
Diesel Oil	42.38	42.37	43.09
LPG	0.00[28]	46.47	0.00[13]
Naphtha	44.61	43.65	33.50
Natural Gas	44.61	43.65	33.50

The emission factors of fuels required are taken from IPCC 2006 guidelines for GHG inventories[29]. 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 CO_2 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	317.74	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 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.

[28] It is shown as zero as in year 2008 and 2010 there was no LPG consumption in the grid.
[29] 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)

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	203,046.10
Gross Generation	198,418.00	194,812.90	211,207.70
Net/Gross Ratio	0.9563744	0.9579412	0.9613575
Net Thermal Generation	156,978.63	150,323.43	149,806.03
Electricity Imports	789.40	812.00	734.26
EG_y (GWh)	157,768.03	151,135.43	150,949.83
EG_y (MWh)	157,768,028.11	151,135,428.72	150,949,827.21

The OM Emission Factor for the years 2008, 2009 and 2010 are calculated by dividing the total CO_2 emissions for those years (Table11) 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	0.65670

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

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

<u>Build margin</u> (BM)

As mentioned above we have preferred the Option 1, calculating the Build Margin Emission factor, "ex ante", for the first crediting period.

Between the $SET_{5\text{-units}}$ 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.

The amount of electricity produced by the $SET_{5\text{-units}}$ is calculated to be 4,288.65 GWh. (= $AEG_{SET\text{-}5\text{-}units}$).

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 7,053.40 GWh was identified[30] to be produced by projects that

[30] A list of units providing electricty to the year 2010 Turkish Electricity Grid is provided as an Annex 1 to the most recent Capacity Projection report published by TEIAS (http://212.175.131.171/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf). We have checked and identified the ones that have claimed VERs by comparing the list to the Gold Standard registry (https://gs2.apx.com/myModule/rpt/myrpt.asp?r=111) and VCS Project Database (http://www.vcsprojectdatabase.org). This list is provided to the validating DOE.

claimed VERs, excluding this number from the gross generation we end up with 195,992.70 GWh of electricity which is our AEG_{TOTAL} and 20% of that amount is calculated as 39,198.54 GWh.

Comparing the $AEG_{SET\text{-}5\text{-}units}$ and 20% of AEG_{TOTAL}, it is seen that 20% of AEG_{TOTAL}, is higher than $AEG_{SET\text{-}5\text{-}units}$.

Therefore the 20% of AEG_{TOTAL} with a value of 39,198.54 GWh is to be compared to the capacity additions in the recent years.

Summing up electricity the generations of all the plants added to the Turkish National Grid in 2010 and 2009, but excluding the projects that claimed VERs, their total generation is 47,745.76 GWh. The total generation by the power plants added in year 2010 is 26,256.04 GWh which is still less than the 20% of AEG_{TOTAL} value of 39,198.54 GWh, however we are unable to identify the date of addition of the units that are added to the Grid in year 2009 to complete the amount of electricity added to the Grid by year 2010 power plants. Therefore, with a conservative approach we are considering all the units added in year 2009 and the $AEG_{SET\ Sample}$ value we are using in our BM calculation is 47,745.76 GWh and 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 being 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 are available as Annex-2 to the capacity projection reports published in the TEIAS web page. Also the annual generation capacity data for each plant is not available on the statistics page of TEİAŞ. The data for the years 2009[31] and 2010[32] 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

There is no complete and up-to-date data regarding the electrical efficiency of thermal power plants that supply electricity to the Turkish National Grid system. Therefore the default values provided in Annex 1(Default efficiency factors for power plants) of the Methodological Tool to calculate the emission factor for an electricity system (Version 3.0.0) (EB 70, Annex 22) is utilised, in a very

[31] TEİAŞ Capacity Projection Report 20010-2019 (http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf)
[32] http://www.teias.gov.tr/projeksiyon/KapasiteProjeksiyonu2011.doc

conservative manner, considering that we are unable to differentiate the units that were commissioned before year 2000, and we cannot differentiate their technologies, all the coal and lignite fired thermal power plants are considered to operate with 50% efficiency, all the oil fired power plants are considered to operate with 46% efficiency, and all the Natural Gas fired power plants are considered to operate at 60 % efficiency. For the diesel powered thermal power plants the efficiency is considered to be 45%. Since the default values are not provided for Naphtha, it is considered to behave like oil and its efficiency is considered as 46%, and Bitumen is considered to behave like coal and its efficiency is considered to be 50%. The efficiency values considered in BM calculations can be summarized as follows (Table 14):

Table 14: Default Electric efficiency rates taken from Annex 1 of the Methodological Tool to calculate the emission factor for an electricity system (Version 3.0.0) (EB 70, Annex 22).

Fuel Type	Average Electric efficiency rate
Coal	50.0%
Lignite	50.0%
Fuel Oil	46.0%
Diesel	46.0%
Naphtha	46.0%
Natural Gas	60.0%
Bitumen	50.0%

The calculation of $EF_{EL,m,y}$ is shown in Table 15 below:

Table 15: Calculation of EF_{EL} using default generation efficiencies based on the default values provided in Annex 1 of the Methodological Tool to calculate the emission factor for an electricity system (Version 03.0.0) (EB 70 Report Annex 22)

	EF (tCO2/TJ)	(EF*3,6)	Generation Efficiency %	$EF_{EL,m,y}$ tCO_2/MWh
Coal	92.80	334,080	50.0%	0.668
Lignite	90.90	327,240	50.0%	0.654
Fuel Oil	75.50	271,800	46.0%	0.591
Diesel	72.60	261,360	46.0%	0.568
LPG	61.60	221,760	60.0%	0.370
Naphtha	69.30	249,480	46.0%	0.542
Natural Gas	54.30	195,480	60.0%	0.326
Bitumen	73.00	262.800	50.0%	0.526

The CO_2 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 16). 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 CO_2 Emissions of the subject year by the total generation from the capacity additions of the same year.

Table 16 Annual CO_2 Emissions for Capacity Additions and Annual BM Emission Factors

Capacity Additions in 2009 (GWh)		CO_2 Emissions	$EF_{grid,BM,2009}$
Asphaltite	945.00	496.69	
Fuel Oil	1,082.08	639.37	
Coal	1,923.33	1,285.09	
Lignite	7.00	4.58	
Natural Gas	16,512.65	5,379.82	
Renewables and Wastes	1,019.66	0.00	
TOTAL	21,489.72	7,805.56	0.36322
Capacity Additions in 2010 (GWh)		CO_2 Emissions	$EF_{grid,BM,2010}$
Coal	12,017.64	8,029.71	
Lignite	180.00	117.81	
Natural Gas	13,108.53	4,270.76	
Renewables and Wastes	949.86	0.00	
TOTAL	**26,256.04**	**12,418.28**	**0.472997**

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:

$$EF_{grid,BM} = 0.42357$$

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;

$EF_y = 0.50 * 0.65613 + 0.50 * 0.42357 = 0.53985\ tCO_{2e}/MWh$

$ER_y = BE_y \quad = EG_{facility,y} * EF_y$

$= 429{,}560\ MWh * 0.53985\ tCO_{2e}/MWh = 231{,}898\ tCO_{2e}$

A summary of the GHG removals by the project activity is given as follows (Table 17):

Table 17: Summary of GHG reductions 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})
2013 (1st November to 31st December)	38,755	0	0	38,755
2014	231,898	0	0	231,898
2015	231,898	0	0	231,898
2016	231,898	0	0	231,898
2017	231,898	0	0	231,898
2018	231,898	0	0	231,898
2019	231,898	0	0	231,898
2020	231,898	0	0	231,898
2021	231,898	0	0	231,898
2022	231,898	0	0	231,898
2023 (1st January – 31st October)	193,143	0	0	193,143
Total	2,318,980	0	0	2,318,980

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4 MONITORING

4.1 Data and Parameters Available at Validation

The following are the data and parameters available at validation:

Data Unit / 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 (TEIAŞ) Web Site (http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/47.xls)
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 Unit / 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-çiçek%20kitap/yakıt46-49/49.xls http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/47.xls)
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 Unit / 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
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 Unit/ Parameter:	EG_y

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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-çiçek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls www.teias.gov.tr/istatistik2009/30(84-09).xls
Value applied:	Please see Annex 2-Table 3 and Table 4.
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 Unit / 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 2008[33], 2009[34] and 2010[35].
Value applied:	Please see Annex 2-Table 8.
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 Unit/ Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit m in year y
Source of data:	The default values provided at the Annex 1 of the “Tool to calculate emission factor for an electricity sector (Version 02.2.1)” are used
Value applied:	Please see Annex 1 of the “Tool to calculate emission factor for an electricity sector (Version 3.0.0)”
Justification of choice of data or description of measurement methods and procedures applied:	According to the “tool to calculate emission factor for an electricity system if documented manufacturer’s specifications or data from the utility, the dispatch centre or official records are not available then the default values given in annex 1 of the tool shall be used. The first two options are not available for the power plants supplying the Turkish grid, therefore the default values are used.
Any comment:	Data used for the calculation of EFgrid,BM,y

[33] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf
[34] http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf
[35] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf

4.2 Data and Parameters Monitored

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

Data Unit/ Parameter:	$EG_{PP\text{-self consumption, y}}$
Data unit:	MWh
Description:	Quantity of electricity imported by the power plant from the Grid for self consumption, in year y
Source of data:	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity obtained from the Grid. The main meter has the serial number: The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading UECM[36].
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid,
Frequency of monitoring/recording:	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied:	Will be determined at the monitoring stage
Monitoring equipment:	Main Electricity Meter: Back-up Electricity Meter: Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[37]. 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 ±0,2% (±0,002) range. The monthly reported meter readings by the main meter with serial number 53030781, will be cross-checked against the back up meter that has the serial number 53030782, if the reading difference is less than ±0,002 (±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 Unit / Parameter:	$EG_{PP\text{-gross, y}}$
Data unit:	MWh
Description:	Quantity of electricity produced by the power plant , in y
Source of data:	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to gross electricity supplied to the Grid.

[36] UEÇM: Uzlaştırmaya Esas Çekim Miktarı-Amount of Electricity based on Reconciliation.
[37] 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

	The main meter has the serial number:. The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading ISVM[38].
Description of measurement methods and procedures to be applied:	Measurements are to be made by electricity meters. That belong to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid,
Frequency of monitoring/recording:	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied:	Will be determined at the monitoring stage
Monitoring equipment:	Main Electricity Meter: Back-up Electricity Meter: Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market[39]. They have an accuracy class of Class 002 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 ±0,2% (±0,002) range. The monthly reported meter readings by the main meter with the serial number 53030781, will be cross-checked against the back up meter, that has the serial number 53030782. if the reading difference is less than ±0,002 (±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 Unit/ Parameter:	$\mathbf{Cap_{PJ}}$
Data unit:	W
Description:	Installed capacity of the hydropower plants after the implementation of the Project Activity.
Source of data:	Project site
Description of measurement methods and procedures to be applied:	Observed as the sum of the values indicated over the turbine name plates and also via the SCADA system of the Project Activity
Frequency of monitoring/recording:	Once for each monitoring period
Value applied:	127,340,000
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:	-

[38] ISVM: İletim Sistemine Veriş Miktarı-Amount Supplied to the Grid
[39] 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 Unit / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is full.
Source of data:	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:	10,830,000
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:	-

4.3 Description of the Monitoring Plan

The Monitoring Plan for the project consists mainly of 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 meters:

1. Main Electricity Meter: TEIAS will install and seal a metering device that satisfies the regulations.

2. Back-up Electricity Meter: TEIAS will install and seal a metring device that satisfies the regulations.

These meters are placed on the switchgear station 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, either remotely or onsite, for the purpose of recording amount of electricity sold to the grid. 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. The net electricity produced ($EG_{PP\text{-}net,\ y}$) in year y is calculated by subtracting the total electricity consumed by the hydroelectric power plant ($EG_{PP\text{-}self\ consumption,\ y}$) , from the gross electricity generation ($EG_{PP\text{-}gross,\ y}$) . After obtaining the net electricity production value, the emission reductions will be calculated by multiplying the net electricity with the Combined Margin calculated above.

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 18):

Table 18: Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Tatar HEPP Manager	• Day to day operation of the Tatar HEPP, • 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/control metering devices for accuracy checks only. Data from metering devices will be recorded by TEİAŞ on monthly agreed protocols and will form the basis for electricity sales. In addition to the readings of the two metering devices, generation data of the Tatar HEPP 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 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.

In addition to the net electricity generation, the aerial extent of the reservoir (A_{pj}) and the project capacity CAP_{pj}, will also be monitored.

All the data collected during the monitoring and verification will be kept by the project owner for at least two years after the entire crediting period.

5 ENVIRONMENTAL IMPACT

As also stated in the Environmental Impact Assessment report of the Tatar HEPP, According to the items numbered 14 and 33 of the Annex-I of the "Environmental Impact Assessment (EIA) regulation" published in the official Gazette dated 16.12.2003 and numbered 25318 Tatar HEPP is listed amongst the project where an EIA needs to be implemented. Accordingly the project has undergone an environmental impact assessment study and received EIA Affirmative Certificate on 15 November 2006. This Certificate is attached as Annex-3.
The following is the summary of the impacts and the mitigation actions outlined in the EIA Report approved by the EIA Report Evaluation Committee members:

Air Quality: Necessary precautions, such as watering roads, careful loading and unloading and covering the top of loaded trucks by tarpaulin; will be taken in order to minimize the dust formed during excavation.

Water & Wastewater Management: Water for domestic use will be supplied by tankers to the site and wastewater will be collected in septic tanks which will be emptied regularly. The wastewater will be discharged in accordance with Water Pollution Control Regulations.

The waste oil: Any kind of waste oil that may result during construction or operation stages, will be collected in impermeable containers and transferred to recycling centres in accordance with Hazardous Waste Control Regulations and Waste Oil Control Regulations.
Solid Waste: Solid waste will be collected and recyclables will be separated to be sent to recycling centres. The rest will be disposed to the nearest landfill site in coordination with Kovancılar Municipality.

Biodiversity: The field surveys and studies performed in the region has shown no species under conservation by international conventions. Necessary precautions will be taken if any such flora or fauna elements are seen on the site. Also a fish passage/ladder will be constructed to ease up and down stream movements of the fish living in Peri Stream.
Expropriation: At the Euphrates catchment area in general villages are preferred to be established at the close proximity of the rivers. As a result, whenever there is a hydroelectric power project developed there will be some settlements that are effected. These can be listed as follows:

- Tatarköy village: 13 houses and 1 school
- Obuzbaşı village 38 houses
- Alayağmur village 37 houses
- Uçankuş district 9 houses
- Kilizkumu district (Zil region); 8 houses

The EIA Report also summarizes the rules and regulations that the project has to comply with. These are also presented as Annex-1, to this document.

6 STAKEHOLDER COMMENTS

The project owner have organized two stake holders meetings within the framework of the EIA process. The first meeting was held on 15 February, 2006 at 10:00 o'clock in the town hall of the Karakoçan Municipality, Elazığ, and the second meeting was held the next day on 16th February

2006, at 14:00 o'clock, next to the Elmalık village Gendarme station, in Munzur Kebap Restaurant (the Place of Hüseyin Usta) in Elmalık village – Mazgirt / TUNCELİ.

Both meetings were declared in National and Local news papers, were announced on the local boards of the Municipalities and District governors house, at the Muhtar's (village head's) announcement boards and were announced from the general announcement loudspeakers of relevant settlements.

On the meeting days the project owner have organized transportation to bring local stakeholders from their villages. In the meetings the issues related to the project and its environmental aspects have been explained and questions that have raised by the local stakeholders have been answered by the qualified staff of Selin Inşaat Ltd. Şti that have conducted the EIA process.
Here is a summary of those questions and answers:

Question From Public: The transit shed place for the deposition of the excavated earth and rock determined by the project owner was a place where they were grazing their animals. If that particular site would have been used for temporary dumping they would be forced to move their animals to a distant meadow and this was not convenient for the Nişankaya village people. Therefore they asked the project owner to re-consider their plan and find a place that would not effect their case.
Answer by SELİN: The site determined for this purpose would be re-considered at the final design stage and the view of the Nişankaya village people will be considered seriously.
Question From Public: Public asked information about the expropriation process. They asked about when their land will be expropriated and when which parts of the land and settlements would be staying under water.

Answer by SELİN: It is explained that the construction would start around December 2006, and the expropriation process cannot start before the EIA Affirmative certificate is granted to the Project Owner. It is also explained that the expropriation process would be realized according to the regulations by EMRA, but the project owner would pay the amount determined. As the landowners explained their worries about he moneys they would get for their properties, they have been explained that a committee of experts would do the entire process, and would determine the fair land or property values.

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

http://www.teias.gov.tr/istatistık2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls

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

			2008	2009	2010
EÜAŞ VE BAĞLI ORTAKLIKLARI / *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	Taşkömürü	*Hard Coal*	1,636,566	1,664,859	1,563,792
	Linyit	*Lignite*	60,284,929	57,850,129	50,123,941
	TOPLAM	*TOTAL*	**61,921,495**	**59,514,988**	**51,687,733**
	Fuel-Oil *Fuel Oil*	Asıl Yakıt *Main Fuel*	832,635	239,410	16,864
		Yrd. Yakıt *Auxiliary Fuel*	154,307	134,007	105,073
		TOPLAM *TOTAL*	**986,942**	**373,417**	**121,937**
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	0	45,364	4
		Yrd. Yakıt *Auxiliary Fuel*	83,041	72,956	18,901
		TOPLAM *TOTAL*	**83,041**	**118,320**	**18,905**
	TOPLAM	*TOTAL*	**1,069,983**	**491,737**	**140,842**
	Doğal Gaz	*Natural Gas*	5,789,269	5,091,011	4,493,275
MOBİL SANTRALLAR / *MOBILE POWER PLANTS*	Fuel-Oil	*Fuel Oil*	67,762	0	0
	Motorin	*Diesel Oil*	0	0	0
	TOPLAM	*TOTAL*	**67,762**	**0**	**0**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* / *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	4,633,442	4,956,318	5,855,911
	Linyit	*Lignite*	6,089,191	5,770,389	6,565,451
	TOPLAM	*TOTAL*	**10,722,633**	**10,726,707**	**12,421,362**
	Fuel-Oil	*Fuel Oil*	1,118,667	1,220,904	769,845
	Motorin	*Diesel Oil*	48,165	62,537	1,449
	LPG	*LPG*	0	111	0
	Nafta	*Naphta*	10,606	8,077	13,140
	TOPLAM	*TOTAL*	**1,177,438**	**1,291,629**	**784,434**
	Doğal Gaz	*Natural Gas*	15,818,366	15,887,029	17,290,139
TÜRKİYE / *TURKEY*	Taşkömür+İthal kömür	*Hard Coal+Imported Coal*	6,270,008	6,621,177	7,419,703
	Linyit	*Lignite*	66,374,120	63,620,518	56,689,392
	TOPLAM	*TOTAL*	**72,644,128**	**70,241,695**	**64,109,095**
	Fuel-Oil	*Fuel Oil*	2,173,371	1,594,321	891,782
	Motorin	*Diesel Oil*	131,206	180,857	20,354
	LPG	*LPG*	0	111	0
	Nafta	*Naphta*	10,606	8,077	13,140
	TOPLAM	*TOTAL*	**2,315,183**	**1,783,366**	**925,276**
	Doğal Gaz	*Natural Gas*	**21,607,635**	**20,978,040**	**21,783,414**

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.

*

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

Table-2: IPCC Default CO_2 Emission Factors

Fuel Type:	EF (tCO2/TJ)
Coal	92.80
Lignite	90.90
Fuel Oil	75.50
Diesel	72.60
LPG	61.60
Naphtha	69.30
Natural Gas	54.30
Bitumen	73.00

-

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

			2008	2009	2010
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**Taşkömürü**	*Hard Coal*	5,514	5,452	4,990
	Linyit	*Lignite*	94,045	83,356	80,967
	TOPLAM	*Total*	**99,559**	**88,809**	**85,957**
	Fuel-Oil *Fuel Oil*	**Asıl Yakıt** *Main Fuel*	7,993	2,301	162
		Yrd. Yakıt *Auxiliary Fuel*	1,481	1,286	1,009
		TOPLAM *TOTAL*	**9,474**	**3,587**	**1,171**
	Motorin *Diesel Oil*	**Asıl Yakıt** *Main Fuel*	0	467	0
		Yrd. Yakıt *Auxiliary Fuel*	855	751	195
		TOPLAM *TOTAL*	**855**	**1,219**	**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**
MOBİL SANTRALLAR *MOBIL POWER PLANTS*	**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**
	Doğal Gaz	*Natural Gas*	**141,313**	**143,931**	**157,134**
	TOPLAM	*TOTAL*	**183,291**	**187,904**	**207,275**
TÜRKİYE *TURKEY*	**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

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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

			2008	2009	2010
EÜAŞ VE BAĞLI ORTAKLIKLARI / *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**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.

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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*	Asıl Yakıt *Main Fuel*	40.19	40.24	40.30
		Yrd. Yakıt *Auxiliary Fuel*	40.18	40.19	40.19
		TOPLAM *TOTAL*	**40.19**	**40.22**	**40.21**
	Motorin *Diesel Oil*	Asıl Yakıt *Main Fuel*	0.00	0.00	1.00
		Yrd. Yakıt *Auxiliary Fuel*	43.11	43.12	43.12
		TOPLAM *TOTAL*	**43.11**	**43.12**	**43.12**
	TOPLAM	*TOTAL*	**40.42**	**40.92**	**40.60**
	Doğal Gaz	*Natural Gas*	34.53	34.82	34.81
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	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

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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
	TAŞKÖMÜRÜ	*Hard Coal*	1,882.4	1,851.1	1,882.7
E	LİNYİT	*Lignite*	22,433.3	22,395.3	20,646.7
	KÖMÜR TOPLAMI	*Coal Total*	24,315.7	24,246.4	22,529.4
Ü	FUEL-OİL	*Fuel Oil*	3,365.1	974.4	62.2
	MOTORİN	*Diesel oil*	0.4	0.2	0.0
A	SIVI TOPLAMI	*Liquid Total*	3,365.5	974.6	62.2
	DOĞAL GAZ	*Natural Gas*	18,818.5	17,225.5	15,289.4
Ş	TERMİK TOPLAM	*Thermal Total*	46,499.7	42,446.5	37,881.0
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	*Hydro+Jeothermal+Wind Total*	28,419.4	28,338.2	41,377.4
	TOPLAM	*Total*	74,919.1	70,784.8	79,258.3
BAĞLI ORTAKLIKLAR	LİNYİT	*Lignite*	14,802.7	11,974.5	10,524.2
Affiliated partnerships Of EÜAŞ	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	FUEL-OİL	*Fuel Oil*	330.5	0.0	0.0
MOBILE P.P.	MOTORİN	*Diesel oil*			0.0
	TERMİK TOPLAM	*Thermal Total*	330.5	0.0	0.0
	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
OTOPRODÜKTÖRLER	MOTORİN	*Diesel oil*	265.9	345.6	4.3
ÜRETİM ŞRK.	LPG	*LPG*	0.0	0.4	0.0
İŞLETME HAKKI DEV.	NAFTA	*Naphtha*	43.6	17.6	31.9
	SIVI TOPLAMI	*Liquid Total*	3,822.5	3,829.0	2,117.8
Autoproducers	DOĞAL GAZ	*Natural Gas*	71,871.7	72,174.8	77,104.5
Production Comp.	YENİLENEBİLİR+ATIK	*Renewables and wastes*	219.9	340.1	457.0
TOOR	TERMİK TOPLAM	*Thermal Total*	94,511.3	95,808.0	101,672.5
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	*Hydro+Jeothermal+Wind Total*	5,859.3	9,551.2	14,002.8
	TOPLAM	*Total*	100,370.6	105,359.2	115,675.3
	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
TÜRKİYE	LPG	*LPG*	0.0	0.4	0.0
	NAFTA	*Naphtha*	43.6	17.6	31.9
TURKEY	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+Jeothermal+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

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Table 7

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

TÜRKİYE ELEKTRİK ENERJİSİ ÜRETİM - TÜKETİM VE KAYIPLARININ YILLAR İTİBARİYLE GELİŞİMİ
ANNUAL DEVELOPMENT OF ELECTRICITY GENERATION- CONSUMPTION AND LOSSES IN TURKEY
(1984-2009)

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

								ŞEBEKE KAYBI — NETWORK LOSSES								
YILLAR *YEARS*	BRÜT ÜRETİM *GROSS GEN.*	ARTIŞ % *INCREASE*	İÇ İHTİYAÇ *INTERNAL CONSUMPTION*	%	NET ÜRETİM *NET GEN.*	İTHALAT *IMPORTS*	ŞEBEKEYE VERİLEN(1) *SUPPLIED TO THE NETWORK(1)*	İLETİM *TRANSMISSION*	%	DAĞITIM *DISTRIBUTION*	%	TOPLAM *TOTAL*	%	İHRACAT(2) *EXPORTS(2)*	NET TÜKETİM *NET CONS.*	ARTIŞ % *INCREASE*
1984	30613.5	11.9	1890.7	6.2	28722.8	2653.0	31375.8	1577.4	5.0	2163.2	6.9	3740.6	11.9		27635.2	13.0
1985	34218.9	11.8	2306.8	6.7	31912.1	2142.4	34054.5	1611.4	4.7	2734.5	8.0	4345.9	12.8		29708.6	7.5
1986	39694.8	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	2607.7	5.9	41745.2	572.1	42317.3	1627.4	3.8	3992.6	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	6680.3	12.3	906.8	46820.0	8.6
1991	60246.3	4.7	3655.2	6.1	56591.1	759.4	57350.5	1437.8	2.5	6123.4	10.7	7561.2	13.2	506.4	49282.9	5.3
1992	67342.2	11.8	4237.3	6.3	63104.9	188.8	63293.7	1342.9	2.1	7651.9	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	8616.7	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	695.9	67393.9 *	9.8
1996	94861.7	10.0	4777.3	5.0	90084.4	270.1	90354.5	2461.7	2.7	13393.1 *	14.8	15854.8	17.5	343.1	74156.6 *	10.0
1997	103295.8	8.9	5050.2	4.9	98245.6	2492.3	100737.9	2935.5	2.9	15646.4 *	15.5	18581.9	18.4	271	81885.0 *	10.4
1998	111022.4	7.5	5523.2	5.0	105499.2	3298.5	108797.7	3337.1	3.1	17457.8 *	16.0	20794.9	19.1	298.2	87704.6 *	7.1
1999	116439.9	4.9	5738.0	4.9	110701.9	2330.3	113032.2	2985.1	2.6	18559.9 *	16.4	21545.0	19.1	285.3	91201.9 *	4.0
2000	124921.6	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	129399.5	5.4	5672.7	4.4	123726.8	3588.2	127315.0	3440.7	2.7	20491.2 *	16.1	23931.9	18.8	435.1	102948.0 *	6.1
2003	140580.5	8.6	5332.2	3.8	135248.3	1158	136406.3	3330.7	2.4	20722.0 *	15.2	24052.7	17.6	587.6	111766.0 *	8.6
2004	150698.3	7.2	5632.6	3.7	145065.7	463.5	145529.2	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	635.9	156105.0	3695.3	2.4	20348.7 *	13.0	24044.0	15.4	1798.1	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	26646.6	14.5	2422.2	155135.2 *	7.7
2008	198418.0	3.6	8656.1	4.4	189761.9	789.4	190551.3	4388.4	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	3973.4	2.1	25,018.00 *	13.3	28991.4	15.5	1545.8	156894.1 *	-3.1
2010	211207.7	8.4	8521.3	4.0	202686.356	734.26	203420.616	5690.5	2.8					753.21		

1)Şebekeye Verilen = Net Üretim+İthalat

2) İhracat,Sınırda teslim esasına göre yapıldığından,ihracat ile igili şebeke kaybı,iletim kaybının içinde yer almaktadır.

* Kaynak : Türkiye Elektrik Dağıtım ve Tüketim İstatistikleri ,1994-2008

1)Supplied to the Network = Net Generation+Import

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

** Source : Electricity Distribution and Consumption Statistics of Turkey ,1994-2008*

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Table-8:
Source: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf

PLANT NAME	ELECTRICITY UTILITIES	FUEL TYPE	INSTALLED CAPACITY (MW)	FIRM GENERATION CAPACITY (GWh)
				2008 CAPACITY ADDITIONS
KARKEY(SILOPI-5) (154 kV) (Addition)	Prod. Comp.	Fuel Oil	14.78	103.18
SARAYKOY JEOTERMAL (Denizli)	Prod. Comp.	Geothermal	6.85	42.00
AKKOY ENERJI (AKKOY I HEPP)	Prod. Comp.	HEPP	101.94	263.00
ALP ELEKTRIK (TINAZTEPE) ANTALYA	Prod. Comp.	HEPP	7.69	17.00
CALDERE ELK.(CALDERE HEPP)Dalaman-MUGLA	Prod. Comp.	HEPP	8.74	25.00
CANSU ELEKTRIK (Murgul/ARTVIN)	Prod. Comp.	HEPP	9.18	31.00
DAREN HEPP ELKT. (SEYRANTEPE BARAJI VE HEPP)	Prod. Comp.	HEPP	49.70	161.00
DEGIRMENUSTU EN. (KAHRAMANMARAS)	Prod. Comp.	HEPP	25.70	40.00
H.G.M. ENERJI (KEKLICEK HEPP) (YeSIlyurt)	Prod. Comp.	HEPP	8.67	11.00
HAMZALI HEPP (TURKON MNG ELEKTRIK)	Prod. Comp.	HEPP	16.70	66.00
HIDRO KNT.(YUKARI MANAHOZ REG.VE HEPP)	Prod. Comp.	HEPP	22.40	45.00
IC-EN ELK.(CALKISLA REGULATORU VE HEPP)	Prod. Comp.	HEPP	7.66	11.00
KALEN ENERJI (KALEN II REGULAT. VE HEPP)	Prod. Comp.	HEPP	15.65	28.00
MARAS ENERJI (FIRNIS REGULATORU VE HEPP)	Prod. Comp.	HEPP	7.22	23.00
SARMASIK I HEPP (FETAS FETHIYE ENERJI)	Prod. Comp.	HEPP	21.04	54.00
SARMASIK II HEPP (FETAS FETHIYE ENERJI)	Prod. Comp.	HEPP	21.58	61.00
TORUL	EUAS	HEPP	105.60	130.00
YESIL ENERJI ELEKTRIK (TAYFUN HEPP)	Prod. Comp.	HEPP	0.82	4.00
AKSA ENERJI (Antalya)	Prod. Comp.	Natural Gas	183.80	1,290.00
AKSA ENERJI (Manisa)	Prod. Comp.	Natural Gas	52.38	370.00
ANTALYA ENERJI (Addition)	Prod. Comp.	Natural Gas	17.46	122.29
ATAC INSAAT SAN. A.S.B.(ANTALYA)	Autoproducer	Natural Gas	5.40	37.00
BAHCIVAN GIDA (LULEBURGAZ)	Autoproducer	Natural Gas	1.17	8.00
CAN ENERJI (Corlu-TEKIRDAG) (Addition)	Prod. Comp.	Natural Gas	52.38	304.23
FOUR SEASONS OTEL (ATIK PASHA TUR.A.S)	Autoproducer	Natural Gas	1.17	7.00
FRITOLAY GIDA SAN.VE TIC.AS.(Addition)	Autoproducer	Natural Gas	0.01	0.07
MB SEKER NISASTA SAN. A.S. (Sultanhani)	Autoproducer	Natural Gas	8.80	60.00
MELIKE TEKSTIL (GAZIANTEP)	Autoproducer	Natural Gas	1.58	11.00
MISIS APRE TEKSTIL BOYA EN. SAN.	Autoproducer	Natural Gas	2.00	14.00
MODERN ENERJI (LULEBURGAZ)	Autoproducer	Natural Gas	13.40	680.00
POLAT TURZ. (POLAT RENAISSANCE IST.OT.)	Autoproducer	Natural Gas	1.60	11.00
SONMEZ Elektrik (Addition)	Prod. Comp.	Natural Gas	8.73	67.31
ITC-KA EnerjI UretIm A.S.(Mamak)(Addition)	Prod. Comp.	Waste	14.13	99.91
BAKI ELEKTRIK SAMLI RUZGAR	Prod. Comp.	WPP	21.00	92.00
DATCA RES (Datca)	Prod. Comp.	WPP	8.10	19.00
ERTURK ELEKTRIK Catalca RES	Prod. Comp.	WPP	60.00	180.00
GOZEDE HEPP (TEMSA ELEKTRIK) BURSA	Prod. Comp.	WPP	2.40	6.00
INNORES ELK YUNTDAG RUZG. (AliaGa)	Prod. Comp.	WPP	42.50	145.00
LODOS RES (Tasoluk)(G.O.P./ISTANBUL)	Prod. Comp.	WPP	24.00	69.00
SAYALAR RUZGAR (Dogal Enerji)	Prod. Comp.	WPP	30.60	88.00
SEBENOBA (DENIZ ELK.) (Samandag-HATAY)	Prod. Comp.	WPP	31.20	86.00
TOTAL 2008			**1,035.73**	**4,881.98**

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			2009 CAPACITY ADDITIONS	
SİLOPİ ELEKTRİK ÜRETİM A.Ş.	Prod.Comp.	Bitumen	135	945.00
HABAŞ (BİLECİK)(Paşalar)	Prod.Comp.	Fuel Oil	18	144.00
HABAŞ (İZMİR)(Habaş)	Prod.Comp.	Fuel Oil	36	288.00
HAYAT KAĞIT	Prod.Comp.	Fuel Oil	7.5	56.00
SİLOPİ ELEKTRİK ÜRETİM A.Ş.(ESENBOĞA)	Prod.Comp.	Fuel Oil	44.8	315.00
TÜPRAŞ RAFİNERİ(Aliağa/İzmir)	AutoProducer	Fuel Oil	24.7	171.78
TÜPRAŞ O.A.RAFİNERİ(Kırıkkale)(Düzeltme)	AutoProducer	Fuel Oil	10	70.00
İÇDAŞ ÇELİK (İlave)	Prod.Comp.	İmported Coal	270	1,923.33
ALKİM ALKALİ KİMYA (Cihanbeyli/KONYA)	Autoproducer	Lignite	0.4	3.00
AK GIDA SAN. VE TİC. A.Ş. (Pamukova)	Autoproducer	Natural Gas	7.5	61.00
AKSA AKRİLİK KİMYA SN. A.Ş. (YALOVA)	Prod.Comp.	Natural Gas	70	539.00
AKSA ENERJİ (Antalya) (Güç Değişikliği)	Prod.Comp.	Natural Gas	16.2	127.72
AKSA ENERJİ (MANİSA) (İlave)	Prod.Comp.	Natural Gas	52.4	414.93
ANADOLU ELEKTRİK (ÇAKIRLAR HES)	Prod.Comp.	Natural Gas	16.2	28.00
ANTALYA ENERJİ (İlave)	Prod.Comp.	Natural Gas	41.8	302.10
ARENKO ELEKTRİK ÜRETİM A.Ş. (Denizli)	Prod.Comp.	Natural Gas	12	84.00
CAM İş ELEKTRİK (Mersin) (İlave)	Prod.Comp.	Natural Gas	126.1	1008.00
ÇELİKLER TAAH. İNş. (RİXOX GRAND)	Autoproducer	Natural Gas	2	16.00
DALSAN ALÇI SAN. VE TİC. A.Ş.	Autoproducer	Natural Gas	1.2	9.00
DELTA ENERJİ ÜRETİM VE TİC.A.Ş.	Prod.Comp.	Natural Gas	60	467.00
DESA ENERJİ ELEKTRİK ÜRETİM A.ģ.	Prod.Comp.	Natural Gas	9.8	70.00
E.ŞEHİR END. ENERJİ (DG+M)(Eskişehir-2)	Prod.Comp.	Natural Gas	59	452.00
EGE BİRLEŞİK ENERJİ (LPG+DG+M)(Aliağa)	Prod.Comp.	Natural Gas	12.8	107.00
ENTEK KÖSEKÖY(İztek) (Düzeltme)	Prod.Comp.	Natural Gas	36.3	288.88
FALEZ ELEKTRİK ÜRETİMİ A. Ş.	Prod.Comp.	Natural Gas	11.7	88.00
GLOBAL ENERJİ (PELİTLİK)	Prod.Comp.	Natural Gas	8.6	155.00
GÜL ENERJİ ELKT. ÜRET. SN. VE TİC. A.ģ.	Prod.Comp.	Natural Gas	24.3	170.00
HABAŞ ALİAĞA	Prod.Comp.	Natural Gas	224.5	1796.00
KASAR DUAL TEKSTİL SAN. A.Ş. (Çorlu)	Autoproducer	Natural Gas	5.7	38.00
KEN KİPAŞ ELEKTRİK ÜRETİM (KAREN)	Prod.Comp.	Natural Gas	41.8	180.00
MARMARA PAMUKLU MENS. SN.TİC.A.Ş.	Prod.Comp.	Natural Gas	34.9	275.15
MAURİ MAYA SAN. A.Ş.	Autoproducer	Natural Gas	2	19.00
MODERN ENERJİ (B.Karıştıran)	Prod.Comp.	Natural Gas	96.8	680.00
NUH ÇİMENTO SAN. TİC. A.ģ.(Nuh Çim.) (İlave)	Prod.Comp.	Natural Gas	47	329.00
RASA ENERJİ (VAN)	Prod.Comp.	Natural Gas	78.6	500.00
SELKASAN KAĞIT PAKETLEME MALZ. İM.	Autoproducer	Natural Gas	9.9	73.00
ŞAHİNLER ENERJİ (Çorlu/TEKİRDAĞ)	Prod.Comp.	Natural Gas	26	185.00
TAV İSTANBUL TERMİNAL İŞLETME. A.Ş.	Autoproducer	Natural Gas	3.3	27.61
TESKO KİPA KİTLE PAZ. TİC. VE GIDA A.ģ.	Autoproducer	Natural Gas	2.3	18.00
YURTBAY ELEKTRİK ÜRETİM A.Ş. (D.G.+M)	Prod.Comp.	Natural Gas	6.9	50.00
ZORLU ENERJİ (B.Karıştıran) (İlave)	Prod.Comp.	Natural Gas	49.5	396.00
ERDEMİR(Ereğli-Zonguldak)	Prod.Comp.	Natural Gas	36.1	219.07
SÖNMEZ ELEKTRİK(Uşak) (İlave)	Prod.Comp.	Natural Gas	8.7	67.06
CARGILL TARIM VE GIDA SAN. TİC. A.Ş.	AutoProducer	R-Biogas	0.1	0.70
GÜRMAT ELEKT. (GÜRMAT JEOTERMAL)	Prod.Comp.	R-Geothermal	47.4	313.00
AKÇAY HES ELEKTRİK ÜR. (AKÇAY HES)	Prod.Comp.	R-HPP	28.8	45.00
AKUA ENERJİ (KAYALIK REG. VE HES)	Prod.Comp.	R-HPP	5.8	20.00
BAĞIŞLI REG. VE HES (CEYKAR ELEKT.)	Prod.Comp.	R-HPP	29.6	47.00
BEREKET ENERJİ (KOYULHİSAR HES)	Prod.Comp.	R-HPP	42	155.00
BEYOBASI EN. ÜR. A.Ş. (SIRMA HES)	Prod.Comp.	R-HPP	5.9	11.00
CİNDERE HES (Denizli)	Prod.Comp.	R-HPP	19	30.00
DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	Prod.Comp.	R-HPP	12.9	17.38
DENİZLİ ELEKTRİK (EGE I HES)	Prod.Comp.	R-HPP	0.9	2.00
ELESTAŞ ELEKTRİK (YAYLABEL HES)	Prod.Comp.	R-HPP	5.1	10.00
ELESTAŞ ELEKTRİK (YAZI HES)	Prod.Comp.	R-HPP	1.1	3.00
ERVA ENERJİ (KABACA REG. VE HES)	Prod.Comp.	R-HPP	8.5	15.00
FİLYOS ENERJİ (YALNIZCA REG. VE HES)	Prod.Comp.	R-HPP	14.4	33.00
KALEN ENERJİ (KALEN I - II HES)	Prod.Comp.	R-HPP	15.7	23.58
KAREL ENERJİ (Pamukova)	Prod.Comp.	R-HPP	9.3	40.00
KAYEN ALFA ENERJİ (KALETEPE HES)	Prod.Comp.	R-HPP	10	17.00
KISIK	EÜAŞ	R-HPP	9.6	20.00
LAMAS III - IV HES (TGT ENERJİ ÜRETİM)	Prod.Comp.	R-HPP	35.7	71.00
OBRUK HES	EÜAŞ	R-HPP	212.4	337.00
ÖZGÜR ELEKTRİK (AZMAK II REG.VE HES)	Prod.Comp.	R-HPP	24.4	43.00
ÖZTAY ENERJİ (GÜNAYģE REG.VE HES)	Prod.Comp.	R-HPP	8.3	14.00
ÖZYAKUT ELEK. ÜR.A.ş. (GÜNEŞLİ HES)	Prod.Comp.	R-HPP	1.8	4.00
REŞADİYE 3 HES (TURKON MNG ELEKT.)	Prod.Comp.	R-HPP	22.3	88.00
SARITEPE HES (GENEL DİNAMİK SİS.EL.)	Prod.Comp.	R-HPP	4.9	9.00
ŞİRİKÇİOĞLU EL.(KOZAK BENDİ VE HES)	Prod.Comp.	R-HPP	4.4	7.00
TAŞOVA YENİDEREKÖY HES (HAMEKA A.Ş.)	Prod.Comp.	R-HPP	2	6.00
TEKTUĞ (Erkenek)	Prod.Comp.	R-HPP	12.5	30.00
TOCAK I HES (YURT ENERJİ ÜRETİM SN.)	Prod.Comp.	R-HPP	4.8	6.00
TÜM ENERJİ (PINAR REG. VE HES)	Prod.Comp.	R-HPP	30	65.00
UZUNÇAYIR HES (Tunceli)	Prod.Comp.	R-HPP	27.3	49.00
YAPISAN (KARICA REG. ve DARICA I HES)	Prod.Comp.	R-HPP	97	154.00
YEŞİLBAŞ ENERJİ (YEŞİLBAŞ HES)	Prod.Comp.	R-HPP	14	26.00
YPM GÖLOVA HES (Suşehri/SİVAS)	Prod.Comp.	R-HPP	1.1	2.00
YPM SEVİNDİK HES (Suşehri/SİVAS)	Prod.Comp.	R-HPP	5.7	18.00
ITC-KA ENERJİ (SİNCAN)	Prod.Comp.	R-Waste	2.8	22.00
ITC-KA ENERJİ MAMAK KATI ATIK TOP.MERK.	Prod.Comp.	R-Waste	2.8	21.06
ORTADOĞU ENERJİ (KÖMÜRCÜODA)	Prod.Comp.	R-Waste	5.8	45.00
ORTADOĞU ENERJİ (ODA YERİ) (İlave)	Prod.Comp.	R-Waste	5.7	44.88
AK ENERJİ (AYYILDIZ RES)	Prod.Comp.	R-WPP	15	44
ALİZE ENERJİ (ÇAMSEKİ RES)	Prod.Comp.	R-WPP	20.8	70.00
ALİZE ENERJİ (KELTEPE RES)	Prod.Comp.	R-WPP	18.9	55.00
ALİZE ENERJİ (SARIKAYA RES) (Şarköy)	Prod.Comp.	R-WPP	28.8	82.00
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR	Prod.Comp.	R-WPP	31.5	104.00
BAKİ ELEKTRİK ŞAMLI RÜZGAR	Prod.Comp.	R-WPP	69	287.50
BELEN ELEKTRİK BELEN RÜZGAR-HATAY	Prod.Comp.	R-WPP	15	40.50
BORASKO ENERJİ (BANDIRMA RES)	Prod.Comp.	R-WPP	45	152.00
DATÇA RES (Datça)	Prod.Comp.	R-WPP	0.8	1.92
KORES KOCADAĞ RES (Urla/İZMİR)	Prod.Comp.	R-WPP	15	48.00
MAZI-3 RES ELEKT.ÜR. A.ģ. (MAZI-3 RES)	Prod.Comp.	R-WPP	10	29.78
ROTOR ELEKTRİK (OSMANİYE RES)	Prod.Comp.	R-WPP	57.5	185.00
SAYALAR RÜZGAR (Doğal Enerji)	Prod.Comp.	R-WPP	3.6	10.53
SOMA ENERJİ ÜRETİM (SOMA RES)	Prod.Comp.	R-WPP	18	50.80
ÜTOPYA ELEKTRİK (DÜZOVA RES)	Prod.Comp.	R-WPP	15	39.00
TOTAL 2009			**2,944.00**	**16,221.24**

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

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

			2010 CAPACITY ADDITIONS	
SİLOPİ ELEKTRİK ÜR. A.Ş. (ESENBOĞA)	Prod. Comp.	Fuel Oil	(44.76)	0.00
EREN ENERJİ ELEKTRİK ÜRETİM A.Ş.	Prod. Comp.	Imported Coal	160.00	1068.24
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	Prod. Comp.	Imported Coal	600.00	4005.88
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	Prod. Comp.	Imported Coal	600.00	4005.88
ATAER ENERJİ ELEKTRİK ÜRETİM A.Ş.	Prod. Comp.	LNG+N.Gas	49.00	277.89
AK-ENERJİ (UŞAK OSB)(Uşak-Ak.en.)	Prod. Comp.	LNG+N.Gas	(15.00)	0.00
AK-ENERJİ(DO+N) (Deba-Denizli)	Prod. Comp.	LNG+N.Gas	(15.60)	0.00
GLOBAL ENERJİ (PELİTLİK)	Prod. Comp.	Natural Gas	3.54	27.06
BASA ENERJİ (VAN)	Prod. Comp.	Natural Gas	26.19	166.62
AKSA ENERJİ (ANTALYA)	Prod. Comp.	Natural Gas	25.00	192.50
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	Prod. Comp.	Natural Gas	101.96	802.00
UĞUR ENERJİ ÜRETİM TİC. VE SAN. A.Ş.	Prod. Comp.	Natural Gas	48.20	405.14
AKSA ENERJİ (ANTALYA)	Prod. Comp.	Natural Gas	25.00	192.50
ALTEK ALARKO ELEKTRİK SANTRALLARI	Prod. Comp.	Natural Gas	60.10	415.57
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	Prod. Comp.	Natural Gas	151.95	802.00
BİNATOM ELEKTRİK ÜRETİM A.Ş.	Prod. Comp.	Natural Gas	2.00	13.00
CAN ENERJİ ELEKTRİK ÜR. A.Ş. (Tekirdağ)	Prod. Comp.	Natural Gas	29.10	203.00
SÖNMEZ ENERJİ ÜRETİM (UŞAK)	Prod. Comp.	Natural Gas	33.24	256.30
ENERJİ-SA (BANDIRMA)	Prod. Comp.	Natural Gas	1000.00	7540.00
UĞUR ENERJİ ÜR. TİC VE SAN. A.Ş. (İlave)	Prod. Comp.	Natural Gas	12.90	100.86
ENERJİ-SA (BANDIRMA) (Düzeltme)	Prod. Comp.	Natural Gas	[illegible]	0.00
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	Prod. Comp.	Natural Gas	69.84	557.92
SÖNMEZ ENERJİ ÜRETİM (UŞAK) (ilave)	Prod. Comp.	Natural Gas	2.50	19.77
ALTEK ALARKO ELEKTRİK SANTRALLARI	Prod. Comp.	Natural Gas	21.60	151.36
RASA ENERJİ (VAN) (İlave)	Prod. Comp.	Natural Gas	10.12	84.41
CEV ENERJİ ÜRETİM (GAZİANTEP ÇÖP Biogaz)	Prod. Comp.	R-Biogas	[illegible]	8.6
TUZLA JEOTERMAL	Prod. Comp.	R-Geothermal	7.50	55
MENDERES GEOTERMAL DORA-2	Prod. Comp.	R-Geothermal	9.50	73
AKIM ENERJİ (CEVİZLİK REG. VE HES)	Prod. Comp.	R-HEPP	91.40	167.00
ALAKIR HES (YURT ENERJİ ÜRETİM)	Prod. Comp.	R-HEPP	2.06	4.00
ASA ENERJİ (KALE REG ve HES)	Prod. Comp.	R-HEPP	9.57	18.00
AZMAK II REG. VE HES (Düzeltme)	Prod. Comp.	R-HEPP	(13.07)	0.00
BAYBURT HES (BAYBURT ENERJİ ÜRET.)	Prod. Comp.	R-HEPP	14.69	34.00
BEYTEK EL. ÜR. A.Ş. (ÇATALOLUK HES)	Prod. Comp.	R-HEPP	8.04	17.00
BİRİM HİDR. ÜRETİM A.Ş. (ERFELEK HES)	Prod. Comp.	R-HEPP	3.23	5.50
BİRİM HİDR. ÜRETİM A.Ş. (ERFELEK HES)	Prod. Comp.	R-HEPP	3.23	5.50
BULAM REG. VE HES (MEM ENERJİ ELK.)	Prod. Comp.	R-HEPP	7.05	19.00
BURÇ BENDİ VE HES (AKKUR ENERJİ)	Prod. Comp.	R-HEPP	27.39	64.00
ÇAKIT HES (ÇAKIT ENERJİ A.Ş.)	Prod. Comp.	R-HEPP	20.18	54.00
ÇAMLIKAYA REG. VE HES	Prod. Comp.	R-HEPP	5.65	11.00
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	Prod. Comp.	R-HEPP	12.61	29.00
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	Prod. Comp.	R-HEPP	12.61	29.00
CEYHAN HES (OŞKAN HES) (ENOVA EN.)	Prod. Comp.	R-HEPP	23.09	55.00
CİNDERE HES (İlave)	Prod. Comp.	R-HEPP	9.07	16.07
DAMLAPINAR HES (CENAY ELEKTRİK ÜR.)	Prod. Comp.	R-HEPP	16.42	52.00
DİM HES (DİLER ELEKTRİK ÜRETİM)	Prod. Comp.	R-HEPP	38.26	70.00
DİNAR HES (ELDA ELEKTRİK ÜRETİM)	Prod. Comp.	R-HEPP	4.44	9.00
DOĞUBAY ELEKTRİK (SARIMEHMET HES)	Prod. Comp.	R-HEPP	3.10	6.00
EGEMEN 1 HES (ENERSİS ELEKTRİK)	Prod. Comp.	R-HEPP	8.62	18.17
EGEMEN 1B HES (ENERSİS ELEKTRİK)	Prod. Comp.	R-HEPP	11.10	22.57
ERENKÖY REG. VE HES (TORAMANLAR)	Prod. Comp.	R-HEPP	21.46	49.00
ERENLER REG. ve HES (BME BİRLEŞİK EN.)	Prod. Comp.	R-HEPP	45.00	48.00
ERİKLİ-AKOCAK REG. ve AKOCAK HES	Prod. Comp.	R-HEPP	41.25	73
ERİKLİ-AKOCAK REG. ve AKOCAK HES	Prod. Comp.	R-HEPP	41.25	73
FEKE 2 BARAJI VE HES (AKKUR ENERJİ)	Prod. Comp.	R-HEPP	69.34	123.00
HINTNA ELEKTRİK ÜR. A.Ş. (SÜMER HES)	Prod. Comp.	R-HEPP	21.00	39.00
GÖK REG. ve HES (GÖK ENERJİ EL. SAN.)	Prod. Comp.	R-HEPP	10.01	24.00
GÜDÜL I REG. VE HES (YAŞAM ENERJİ)	Prod. Comp.	R-HEPP	2.36	8.00
GÜZELÇAY-I HES (İLK ELEKTRİK ENERJİ)	Prod. Comp.	R-HEPP	3.14	9.30
GÜZELÇAY-II HES (İLK ELEKTRİK ENERJİ)	Prod. Comp.	R-HEPP	4.90	14.70
HETAŞ HACISALİHOĞLU (YILDIZLI 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 (ERDEMYILDIZ ELEK. ÜRT.)	Prod. Comp.	R-HEPP	7.12	20.00
KALE REG. VE HES (KALE ENERJİ ÜR.)	Prod. Comp.	R-HEPP	34.18	66.00
KALKANDERE REG. VE YOKUŞLU HES	Prod. Comp.	R-HEPP	14.54	36.00
KAR-EN KARADENİZ EL.A.Ş. ARALIK HES	Prod. Comp.	R-HEPP	12.41	32.00
KARADENİZ EL. (UZUNDERE-I HES)(İlave)	Prod. Comp.	R-HEPP	31.08	46.50
KARADENİZ EL.ÜRET. (UZUNDERE-1 HES)	Prod. Comp.	R-HEPP	31.08	46.50
KARŞIYAKA HES (AKUA ENERJİ ÜRET.)	Prod. Comp.	R-HEPP	1.89	5.00
KAYABÜKÜ REG. VE HES (ELİTE ELEKT.)	Prod. Comp.	R-HEPP	14.58	28.00
KİRPİLİK REG. VE HES (ÖZGÜR ELEKTRİK)	Prod. Comp.	R-HEPP	6.24	13.00
KOZAN HES (SER-ER ENERJİ)	Prod. Comp.	R-HEPP	4.00	5.00
KULP IV HES (YILDIZLAR EN. ELK. ÜR. AŞ.)	Prod. Comp.	R-HEPP	12.30	23.00
MURGUL BAKIR (Ç.Kaya) (İlave)	Prod. Comp.	R-HEPP	10.60	31.59
NARİNKALE REG. VE HES (EBD ENERJİ)	Prod. Comp.	R-HEPP	3.10	6.00
NİSAN E. MEKANİK EN. (BAŞAK REG. HES)	Prod. Comp.	R-HEPP	6.85	17.00
NURYOL ENERJİ (DEFNE REG. VE HES)	Prod. Comp.	R-HEPP	7.23	13.00
ÖZGÜR ELEKTRİK (AZMAK I REG VE HES)	Prod. Comp.	R-HEPP	5.91	12.00
ÖZGÜR ELEKTRİK (AZMAK I REG VE HES)	Prod. Comp.	R-HEPP	5.91	12.00
PAŞA REG. VE HES (ÖZGÜR ELEKTRİK)	Prod. Comp.	R-HEPP	9.06	19.00
PETA MÜHENDİSLİK EN. (MURSAL II HES)	Prod. Comp.	R-HEPP	4.00	11.00
REŞADİYE 1 HES (TÜRKON MNG ELEKT.)	Prod. Comp.	R-HEPP	15.68	119.00
REŞADİYE 2 HES (TÜRKON MNG ELEKT.)	Prod. Comp.	R-HEPP	26.14	71.00
SABUNSUYU II HES (ANG ENERJİ ELK.)	Prod. Comp.	R-HEPP	7.09	17.00
SELEN ELEKTRİK (KEPEZKAYA HES)	Prod. Comp.	R-HEPP	28.00	70.00
SELİMOĞLU REG. VE HES	Prod. Comp.	R-HEPP	8.80	20.00
TEKTUĞ ELEKTRİK (ANDIRIN HES)	Prod. Comp.	R-HEPP	40.50	60.00
ULUABAT KUVVET TÜNELİ VE HES	Prod. Comp.	R-HEPP	48.51	105
ULUABAT KUVVET TÜNELİ VE HES (İlave)	Prod. Comp.	R-HEPP	48.51	105,00
UMUT III REG. VE HES (NİSAN ELEKTR.)	Prod. Comp.	R-HEPP	12.00	15.00
UZUNÇAYIR HES (Tunceli) (İlave)	Prod. Comp.	R-HEPP	27.33	60.66
UZUNÇAYIR HES (Tunceli) (İlave)	Prod. Comp.	R-HEPP	27.33	60.66
YAVUZ REG. VE HES (MASAT ENERJİ)	Prod. Comp.	R-HEPP	22.50	47.00
YEDİGÖZE HES (YEDİGÖZE ELEKTRİK)	Prod. Comp.	R-HEPP	155.33	[illegible]
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	Prod. Comp.	R-Waste	4.25	33.35
ITC-KA ENERJİ (SİNCAN)	Prod. Comp.	R-Waste	1.42	11.13
ITC ADANA BİOKÜTLE SANT.	Prod. Comp.	R-Waste	8.01	60.00
ITC ADANA BİOKÜTLE SANT. (Düzeltme)	Prod. Comp.	R-Waste	[illegible]	0.00
AKSA ENERJİ (Gemlik/BURSA)	Prod. Comp.	R-Waste	(1.40)	0.00
AKDENİZ ELEKTRİK (MERSİN RES)	Prod. Comp.	R-WPP	33.00	90.00
ALİZE ENERJİ (KELTEPE RES)	Prod. Comp.	R-WPP	1.80	5.39
ASMAKİNSAN (BANDIRMA 3 RES)	Prod. Comp.	R-WPP	20.00	10.67
ASMAKİNSAN (BANDIRMA 3 RES)	Prod. Comp.	R-WPP	4.00	2.13
BAKRAS EN. ELKT.ÜR. A.Ş. ŞENBÜK RES	Prod. Comp.	R-WPP	15.00	40
BELEN ELEKTRİK (BELEN RES) (İlave)	Prod. Comp.	R-WPP	6.00	11.67
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	Prod. Comp.	R-WPP	52.50	176.17
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	Prod. Comp.	R-WPP	37.50	125.83
BORASKO ENERJİ (BANDIRMA RES)	Prod. Comp.	R-WPP	12.00	30.11
BOREAS ENERJİ (BOREAS I ENEZ RES)	Prod. Comp.	R-WPP	15.00	42
DENİZ ELEKTRİK (SEBENOBA RES)	Prod. Comp.	R-WPP	10.00	24
KUYUCAK RES (ALİZE ENERJİ ÜR.) (İlave)	Prod. Comp.	R-WPP	17.60	64.63
KUYUCAK RES (ALİZE ENERJİ ÜRET.)	Prod. Comp.	R-WPP	8.00	29.38
MAZI-3 RES ELEKTRİK (MAZI-3 RES)	Prod. Comp.	R-WPP	7.50	20.00
ROTOR ELEKTRİK (GÖKÇEDAĞ RES)	Prod. Comp.	R-WPP	20.00	64.44
ROTOR ELEKTRİK (GÖKÇEDAĞ RES) (İlave)	Prod. Comp.	R-WPP	2.50	8.06
ROTOR ELEKTRİK (OSMANİYE RES)	Prod. Comp.	R-WPP	20.00	64.44
ROTOR ELEKTRİK (OSMANİYE RES)	Prod. Comp.	R-WPP	17.50	56.39
ROTOR ELEKTRİK (OSMANİYE RES)	Prod. Comp.	R-WPP	17.50	56.39
SARES RES (GARET ENERJİ ÜRETİM)	Prod. Comp.	R-WPP	15.00	61.00
SOMA ENERJİ ÜRETİM (SOMA RES)	Prod. Comp.	R-WPP	4.50	11.36
SOMA ENERJİ ÜRETİM (SOMA RES)	Prod. Comp.	R-WPP	7.20	18.18
SOMA ENERJİ ÜRETİM (SOMA RES)	Prod. Comp.	R-WPP	7.20	18.18
SOMA ENERJİ ÜRETİM (SOMA RES)	Prod. Comp.	R-WPP	6.30	15.91
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	Prod. Comp.	R-WPP	9.00	22.73
SOMA RES (BİLGİN WPP SAN. EN.ÜR.)	Prod. Comp.	R-WPP	32.00	94.25
SOMA RES (BİLGİN WPP SAN.)(İlave)	Prod. Comp.	R-WPP	30.00	87.00
SOMA RES (BİLGİN WPP SAN) (İlave)	Prod. Comp.	R-WPP	27.50	79.75
TURGUTTEPE RES (SABAŞ ELEKTRİK ÜR.)	Prod. Comp.	R-WPP	22.00	55.00
ÜTOPYA ELEKTRİK (DÜZOVA RES) (İlave)	Prod. Comp.	R-WPP	15.00	30
ZİYARET RES (ZİYARET RES ELEK.)(İlave)	Prod. Comp.	R-WPP	22.50	76.50
ZİYARET RES (ZİYARET RES ELEKTRİK)	Prod. Comp.	R-WPP	12.50	42.50
TOTAL 2010			4770.208	25657.06

ANNEX-3: THE EIA AFFIRMATIVE CERTIFICATE OF THE PROJECT ACTIVITY

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

Karar Tarihi: 15/11/2006
Karar No : 1176

ÇED OLUMLU BELGESİ

16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 14. maddesi gereğince; *"Tatar Barajı, HES ve Malzeme Ocakları"* projesi hakkında "*Çevresel Etki Değerlendirmesi Olumlu Kararı*" verilmiştir.

Osman TÜZÜN
Bakan a.
Genel Müdür

Proje Sahibi : Darenhes Elektrik Üretimi A.Ş.
Projenin Yeri : Tunceli ve Elazığ İlleri

ANNEX.4: LIST OF HYDRO POWER CAPACITY BUILT BY PRIVATE SECTOR (OCTOBER 2009)[40]

Name Of The Power Plant	Location	Date Of Commissioning	Total Installed Capacity (Mw)	Average Annual Production (GWh)	Operator
Başaran Hes	Aydin	2006	0,60	4,27	Ekin Hidro Elk. Ürt Ltd. Şti.
Tayfun Hes	K.Maraş	2008	0,82		Yeşil En. Ür. San. Tic. A.Ş.
Ege I Hes	Denizli	08/28/2013	0,92		Denizli Elek. Ürt. A.Ş.
Gölova Hes	Sivas	06/11/2013	1,05		Ypm. Elektrik Üretim. A.Ş.
Güneşli Hes	K.Maraş	05/30/2013	1,2	4,28	Özyakut Elek: Ürt: A.Ş.
Taşova-Yenidereköy Hes	Amasya	01/31/2013	1,98	10,08	Hameka Elk. Enerji Ürt. A.Ş.
Dodurgalar-I	Denizli	04/27/2008	2,07	6,16	Elta Elektrik Üretim Ltd.Şti.
Dodurgalar -Ii	Denizli	04/27/2008	2,07	6,16	Elta Elektrik Üretim Ltd.Şti.
Gözede Hes	Bursa	2008	2,40	4,28	Temsa Elk. Ürt.Ltd.Şti
Karasu Hes	K.Maraş	2007	2,40	18,27	Kurteks Tic.San. A.Ş.
Bereket I Hes (Serbest Ürt)	Denizli		3,15	12,00	
Beypinari- Suşehri Hes	Sivas	2007	3,69	23,10	Ypm. Elektrik Üretim. A.Ş.
Konak Suşehri Hes	Sivas	2007	4,016	25,16	Ypm. Elektrik Üretim. A.Ş.
Altintepe Suşehri Hes	Sivas	2007	4,082	24,307	Ypm. Elektrik Üretim. A.Ş.
Zamanti Bahçelik Brj. Ve Hes	Kayseri	2006	4,22		Molu Enerji Ürt. A.Ş.
Kozak Bendi Ve Hes	K.Maraş	07/09/2013	4,40		Şirikçioğlu Elektrik Üretim A. Ş.
Süleymanli Hes (Otop)			4,60	18,00	
Çaygören Hes	Balikesir	2006	4,60		Su Ener. Maden San.A.Ş.
Murgul Hes	Artvin		4,70		Eti Bakir A.Ş.
Tocak Hes	Antalya	05/09/2013	4,760		Yurt Enrj. Ürt. San. Ve

[40]This list is a compilation of the list given in http://topraksuenerji.org/aralik_2009_itibariyle_isletmedeki_hidroelektirik_santraller.html, and Annex1 of the 2010-2019 projection report by TEIAS (http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf (last visited on 1/7/2011).

					Tic. Ltd.Şti
Saritepe Hes Dinamik		2009	4,9	20	Dinamık Enerji
Yaylabel		2009	5,1	20	Elestaş
Keban Deresi Hes	Elaziğ	2007	5,4	31,68	Tek-Tuğ Aş
Ataköy Zorlu		2009	5,5	8	Zorlu Enerji
Sevindik Hes	Sivas	06/10/2013	5,714		Ypm. Elektrik Üretim. A.Ş.
Kayalik Reg.Ve Hes	Erzincan	07/16/2013	5,76		Akua Enerji Üretim.A.Ş
Sirma Hes	Aydin	05/24/2013	5,88	23,20	Beyobasi Ener. Üret.A.Ş.
Erkenek Reg. Ve Hes	Adiyaman	02/27/2013	6,00		Tektuğ Elk. Enerji Ürt. A.Ş.
Tahta Reg. Ve Hes	K. Maraş	2007	6,25	48,00	Özgür Elek Ür. A.Ş.
Firnis Hes	K.Maraş	2008	7,22	36,00	Maraş Enerji Yat. San. A.Ş.
Çalkişla Reg. Ve Hes	Erzincan	2008	7,66	17,26	Iç-En Elk. Ürt. Ve Tic. A.Ş.
Tinaztepe Hes	Antalya	2008	7,69		Alp Elk. Ürt. A.Ş.
Günayşe Reg. Ve Hes	Trabzon	08/14/2013	8,30		Öztay Enrj. Elek. Ürt. A.Ş.
Keklicek Hes	Malatya	2008	8,674	25,02	Hgm Tic.
Çaldere Hes	Muğla	2008	8,74	35	Çaldere Elk. Ürt. A.Ş.
Cansu Hes	Artvin	2008	9,18	47,33	Cansu Elk.Ürt.A.Ş.
Pamukova Hes (Serbest Ürt)	Sakarya	2000	9,30	55,00	Karel
Kaletepe Hes	Erzurum	07/24/2013	10,200		Kayen Alfa Enrj. Ürt. Ltd. Şti.
Gökyar Hes	Muğla	2006	11,62		Bereket Enr. Ür. A.Ş.
Hacilar (Gökpinar) (Otop)	Malatya	2004	13,34	88,00	Yapisan San. A.Ş.
Aksu Reg. Ve Şahmallar Hes	Antalya	2006	14,00	55,61	Enerjisa Ener. Ürt. A.Ş.
Yeşilbaş		2009	14	56	
Yukari Mercan Hes		2006	14,19	44,18	Içtaş
Filyos Yalnizca Hes		2009	14,4	67	
Kalealti Hes	Osmaniye	2006	15,00	51,64	Tektuğ Elk. Enerji Ürt. A.Ş.
Tercan		2009	15	51	Zorlu Enerji
Çildir		2009	15,4	30	Zorlu Enerji

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Sugözü Reg. Ve Kizildüz Hes	Antalya	2006	15,43	53,06	Enerjisa Ener. Ürt. A.Ş.
Kalen I Hes	Giresun	2008	15,65		Kalen Enr. Elk Ürt.A.Ş.
Çakirlar Hes	Artvin	08/14/2013	16,16		Anadolu Elek. Ürt.Tic. San. A.Ş.
Hamzali Hes	Kirikkale	2008	16,70		Mng Elk. Ürt.A.Ş.
Beyköy Zorlu		2009	16,8	87	Zorlu Enerji
Lamas Iii Hes	Mersin	06/06/2013	17,837		Tgt Enerji Ürt. Ve Tic. A.Ş.
Lamas Iv Hes	Mersin	06/06/2013	17,837		Tgt Enerji Ürt. Ve Tic. A.Ş.
Ikizdere Zorlu		2009	18,6	110	Zorlu Enerji
Cindere Denizli		2009	19,1	58	
Bağişli Reg. Ve Hes	Hakkari	21.03.2009-07.05.2009	19,714		Ceykar Elk. Ürt. A.Ş.
Mercan		2009	20,4	78	Zorlu Enerji
Kuzgun		2009	20,9	36	Zorlu Enerji
Sarmaşik I Hes	Trabzon	2008	21,04	108,06	Fetaş
Sarmaşik Ii Hes	Trabzon	2008	21,58	95,30	Fetaş
Reşadiye Iii		2009	22,3	175	Turkon Mng
Yukari Manahoz Hes	Trabzon	2008	22,40		Hidro Kontrol Elek. Ürt. A.Ş.
Pamuk Reg. Ve Hes (Serbest Ürt)	Mersin		23,72	81,00	Pamuk Hes Elk.Ürt.A.Ş.
Kargilik Hes (Serbest Ürt)	K.Maraş	2005	24	72	Tek-Tuğ Aş
Azmak Ii		2009	24,4	91	Özgür Elektrik
Kargaçayiri Reg. Ve Değirmenüstü Hes	K.Maraş	2008	25,70		Değirmenüstü Eneri. Tic. San.A.Ş.
Uzunçayir		2009	27,3	105	
Akçay Hes	Aydin	08/15/2013	28,78	94,88	Akçay Hes Ürt. A. Ş.
Pinar		2009	30,1	138	Tüm En.
Kalen Ii Hes	Giresun	2009	31,30	1,04	Kalen Enr. Elk Ürt.A.Ş.
Mentaş Reg. Ve Hes	Adana	2006	41,70	163,00	Bereket Enerji Ürt.San Vetic.A.Ş.
Koyulhisar	Sivas	06/13/2013	42		Bereket Enr. Ür. A.Ş.
Andirin Hes	K.Maraş	2009	42	124	Tek-Tuğ Aş
Eşen Ii (Göltaş) Hes (Serbest Ürt)	Muğla	2002	43,40	187,50	Göltaş
Birkapili Hes (Serbest Ürt)	Mersin	2004	48,50	74,80	Enerjisa Enerji Ürt. A.Ş.
Seyrantepe Brj Ve Hes	Elaziğ	2008	49,70	161,00	Limak-Bilgin Jv (Darenhes)

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Uzunçayir Hes	Tunceli	2009	74,00	317,00	Limak Inş A.Ş.
Darica -1	Ordu	2009	99,1	328	Yapısan Elektrik
Akköy I Hes		20,09	101,9	408	Akköy Enerji

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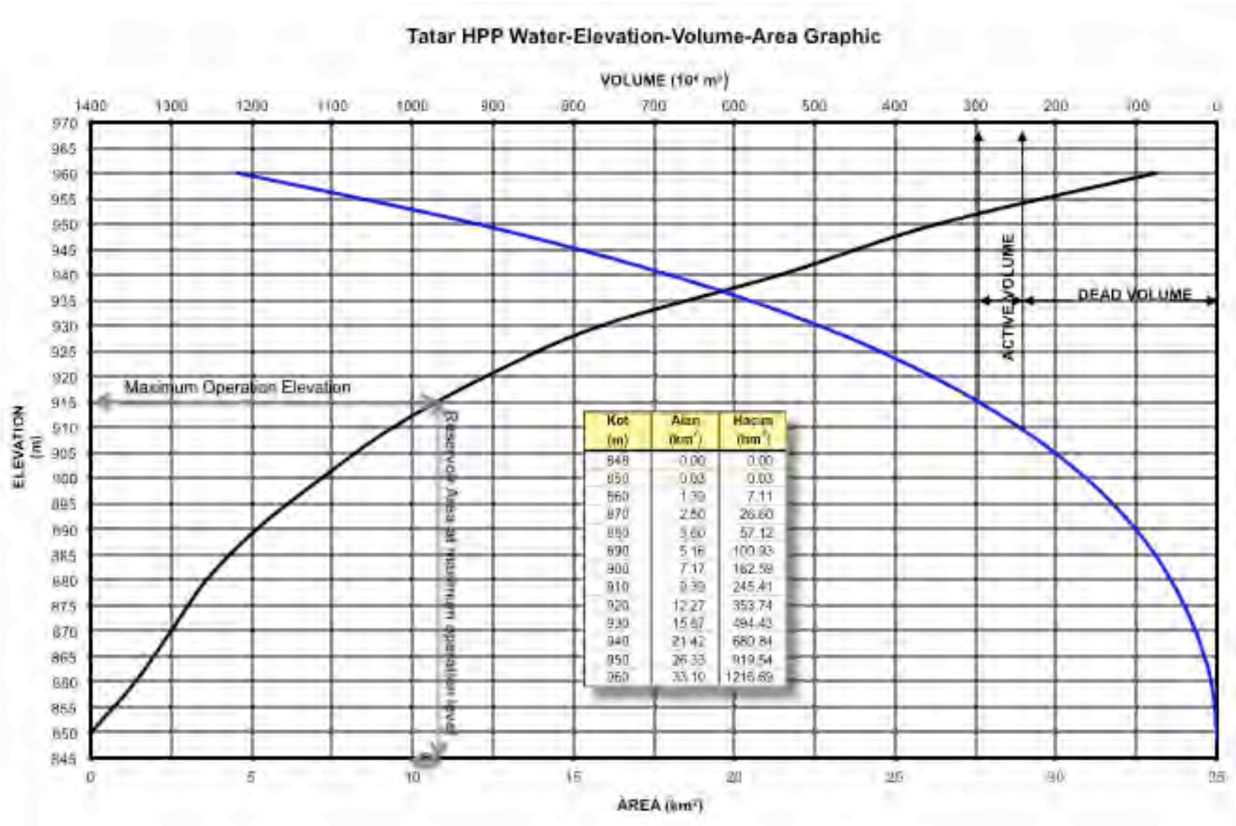
ANNEX.5 TATAR HEPP WATER ELEVATION-VOLUME-AREA GRAPHIC THAT INDICATES RESERVOIR AREA AT MAXIMUM OPERATION ELEVATION.



Kot (m)	Alan (km²)	Hacim (hm³)
848	0.00	0.00
850	0.03	0.03
860	1.39	7.11
870	2.80	26.60
880	3.60	57.12
890	5.16	100.93
900	7.17	162.59
910	9.39	245.41
920	12.27	353.74
930	15.67	494.43
940	21.42	680.84
950	26.33	919.54
960	33.10	1216.69