DÜZCE-AKSU HYDRO ELECTRICITY POWER PLANT

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Project Title	Düzce-Aksu Hydro Electricity Power Plant
Version	2.03
Date of Issue	19-April-2016
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Düzce-Aksu Elektrik Üretim A.Ş. is planning to construct Düzce-Aksu Regulator and Hydro Electricity Power Plant (HEPP) on the Aksu River, that is a branch of the Büyük Melen River, within the jurisdiction of Gölyaka Town of Düzce Province. The purpose of the project is electricity production using the potential energy of Aksu River 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 Düzce-Aksu Hydro Electric Power Plant (HEPP) will be delaying the addition of conventional thermal power plants to the Turkish National Electricity Grid.

As shown on the EMRA approved elecyticity production license[1] the established capacity of Düzce-Aksu HEPP is 46.2 MW. The project is expected to produce a total of 141,370[1] MWh of electricity per year therefore the plant load factor of the project calculates to be, 34.93 %, as shown in the below calculation:

$$\frac{141{,}370.00\ MWh}{46.2\ MW X 365 X 24h} = \frac{141{,}370.00}{404{,}712} = 0.3493 = 34.93\%$$

Based on Turkey's Combined Margin Emission Factor of 0.53323 CO_{2e} tonnes /MWh, the project is expected to produce 75,382 tonnes of CO_{2e} GHG reductions each year.

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

Table 1: The Major milestones at the project development history

Date	Milestone
23/03/06	Water usage agreement signed between DSI and Düzce-Aksu A.Ş.
21/09/06	Project Licence Granted by EMRA
13/02/07	Connection agreement signed between Düzce-Aksu and TEIAS
16/07/07	Project was granted EIA not needed certification
17/03/08	Turbine Contract Signed
16/05/09	Duzce-Aksu A.Ş. Board expressed a decision indicating the need for carbon revenue
16/11/09	Construction start Date
03/12/09	Turn Key contract signed between Düzce-Aksu and Bereket Enerji
07/06/10	Loan Agreement Signed

The Düzce-Aksu HEPP is going to be made up of one regulating body, a sedimentation pond, a water conveyance tunnel, a head pond, a valve chamber, penstock, power plant, tail water canal and the switchgear area. The produced electricity will be fed to the Turkish National grid via an 8 km transmission line.

The water will be entering to the weir body and the water collecting area over the Aksu River at the 790.50 m elevation level. Then the water will be settled at the sedimentation pond and will be transferred to the conveyance tunnel. The water that will pass this tunnel will then be transferred to the head pond where it will be fed to the penstock, and will be passed to the hydro power plant

[1] Düzce-Aksu HPP Electricity Production Licence Dated 21/09/2006 numbered: EÜ/921-3/724

building where the electricity will be produced via turbines. The water will than be left back to the Aksu River at the 138.2 m elevation level. How the project activity will be operating is shown below in Figure 1:

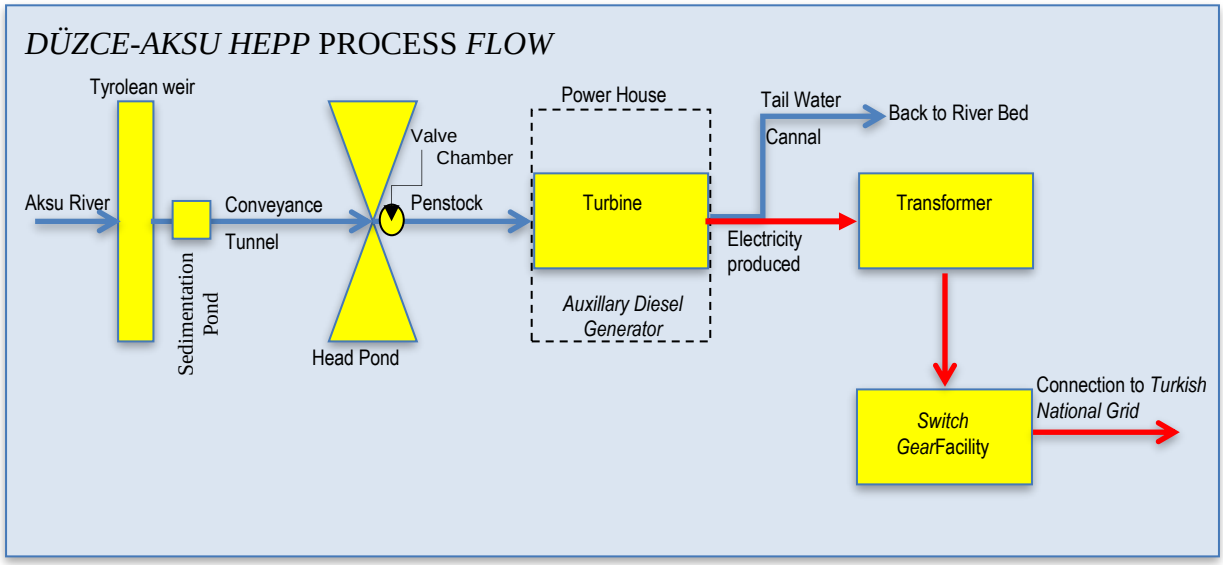

Figure 1: Flow chart showing the basic operational principles of the project activity. The project activity will be connected to the grid via the 154 KV Osmanca Transformation Center, as indicated in the connection agreement provided to the validating DOE.

1.2 Sectoral Scope and Project Type

The project category is Sectoral Scope 1: Energy industries (renewable-/non -renewable sources). The project is a non-grouped, stand alone project.

1.3 Project Proponent

Organization name	Düzce Aksu Elektrik Üretim A.Ş.
Contact person	Özgün Gül Koparan
Title	Environmental Affairs Manager
Address	Gazi Mustafa Kemal Bulvarı 15 Mayıs Mah. 832 Sok. No:2 75.Yıl Esnaf Sarayı K:2 Denizli-Turkey
Telephone	+90 258 242 27 76
Email	ogul@bereketenerji.com.tr

1.4 Other Entities Involved in the Project

Organization name	Turkuaz Karbon Varlık Yönetimi Enerji Proje ve Dan. San. İth. İhr. Ltd. Şti.
Role in the project	Preparation of the Project Description Document
Contact person	Dr. Aslı Sezer Özçelik
Title	Carbon Consultant
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1.5 Project Start Date

25.04.2014, is the date when the project started to supply electricity to the Turkish grid as substantiated by the partial acceptance letter sent to the Governance of Düzce Province, Düzce-Turkey.

1.6 Project Crediting Period

The project crediting period is 10 years: 25.04.2014 to 23.04.2024 (both days inclusive). Renewable twice.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	☑
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 0: 25.04.2014 to 31.12.2014	51,838.0
Year 1: 2015	75,382.0
Year 2: 2016	75,382.0
Year 3: 2017	75,382.0
Year 4: 2018	75,382.0
Year 5: 2019	75,382.0
Year 6: 2020	75,382.0
Year 7: 2021	75,382.0
Year 8: 2022	75,382.0
Year 9: 2023	75,382.0
Year.10: 2024 (01.01.2024 to 24 04.2024)	23,544.0
Total estimated ERs	753,820.0
Total number of crediting years	10
Average annual ERs	75,382

1.8 Description of the Project Activity[2]

[2] The information provided at this chapter is taken from the revised feasibility study (March 2007) that was prepared according to host country's relevant authorities (DSI-State Hydraulic Works) set rules, and was presented to and acknowledged by the host country government authorities.

Düzce-Aksu HEPP, that will be built on Aksu River. The tyrolean type weir will be approximately at the elevation of 790.50 m. Düzce-Aksu HEPP will be utilizing approximately (net) 645 m of potential energy difference to produce electricity.

Düzce-Aksu HEPP with 46.20 MW installed capacity, will be connecting to the Turkish National Power Grid via one of Transformer Substations by 22 km long 154 kV Hendek-Osmanca transmission line. 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 645.50 m level, by the help of a weir and a water intake body. After that the water will be kept at the sedimentation pond and will pass to the a conveyance tunnel of approximately 5 km long, than will be transferred to the penstock via a head pond, The water that will enter to the penstock will then be transferred to two turbine units, each with 23.1 MW capacity. The two turbines will be housed within the Hydro Electricity 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 approximately 138 m.

The following are the facilities to be constructed:

- Düzce-Aksu weir to be constructed at approximately 485 m elevation level
- Sedimentation tank
- Conveyance tunnel
- Valve Chamber
- Penstock
- Hydro Electricity Power Plant building
- Tail water canal and spillway
- The switch gear area and the transformer

General technical characteristics of Düzce-Aksu HEPP are given in Table 2.

Table 2 : General technical characteristics of Düzce-Aksu HEPP

The Weir	
Place	The Weir will be located on the Aksu River, at the close proximity of the Gölyaka Town of Düzce Province.
Purpose	Temporarily storing and diverting the Aksu River's water to the water intake structure.
Elevation of the river bed	788.50 m
Elevation of the foundation	790.50 m
Weir Crest Level	793.75 m
Upstream water level	793.55 m
Type	Reinforced Concrete Body without gates
Height from the foundation of the weir	3.25 m (Approximately)
Height of the weir from the River Bed	3.00 m
Full Body Crest Length	16 m (including the middle feet)
Sedimentation Ponds	
First Level	
Length	41.00 m

Width	4.50 m
Number of Sections	2
Second Level	
Length	80.00 m
Width	5.50 m
Number of Sections	3

Conveying Tunnel	
Type	Horse shoe type
Number of units	2
Length	2X130 = 260.00 m
Height	6.00 m
Width	20.00 m
Sedimentation Pool Access tunnels	
Type	Prent Profile
Slope	0.001
Length	4,895 m
Digging Radius	3.5 m
Inner Radius	3 m
Head Pond	
Maximum Water Level	786.55 m
Volume	2000 m^3
Penstock	
Radius	1420-1730 mm
Pipe wall thickness	40 to 12 mm
Length	2,200 m
Number of Branching	2
Radius of Branching	866 mm
Pipe wall thickness of Branching	10 mm
Power Plant Building	
Power Plant Type	Over the surface
Dimentions	2X15X17 m
Height	1X6X10.5 m
Gross fall	652.30 m
Net Fall	645.51 m
Total Installed Capacity (Bar)	46.2 MW
Project Flow Rate	8 m^3/s
Annual Energy Production:	
Primer Energy	34.85 GWh/year
Secondary Energy	106.52 GWh/year
Total Energy	141.37 GWh/year
Number of Turbines	2
Unit Capacity	23.1 MW
Type	Horizontal Axis Pelton Type
Unit Flow Rate	4 m^3/s

The project will be using Horizontal Axis Pelton type turbines. The principle of the old water-wheel is embodied in the modern Pelton turbine. This turbine has a similar look and physical principle like a classic water wheel. A Pelton turbine is used in cases where large heads of water are available. The following figure exhibits the working principle of a Pelton Turbine (Figure 3):

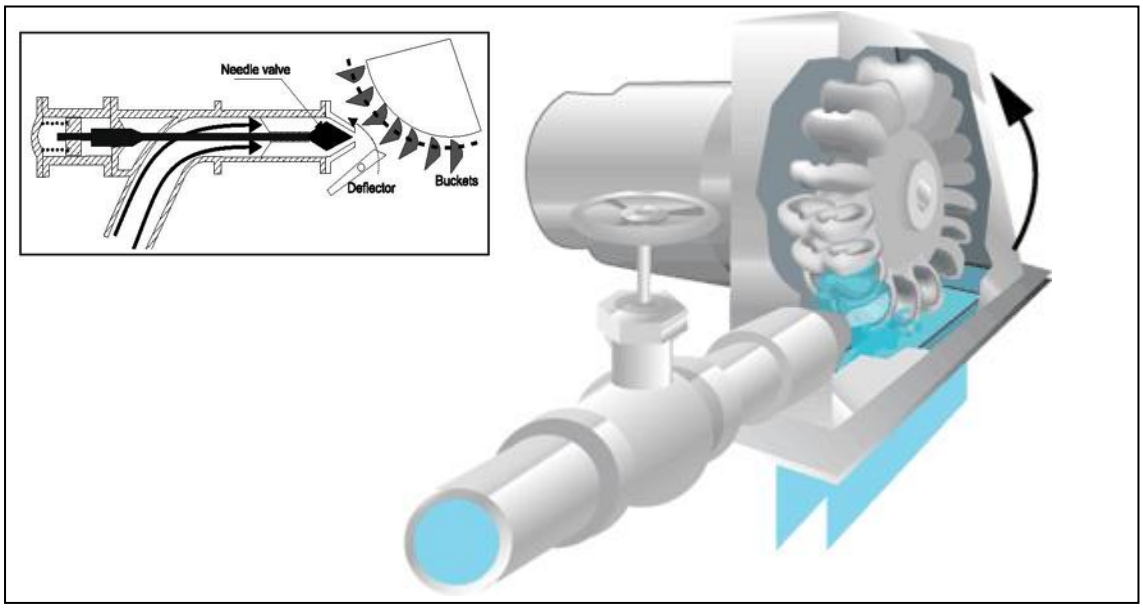

Figure 2: The working principle of a Pelton type turbine.

The project owner is granted a production license for 49 years. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report[3] 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[4]. As a result the project life time is estimated to be about 20 years.

The project will be producing 141,370 MWh of electricity per year. This is 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 Western Part of the Northern Black Sea geographical district of Turkey at the Düzce Province as shown in the location Map below (Figure 3). The nearest settlemet to the project site is Gölyaka that can be reached using the major İstanbul Ankara Motorway, along the route towards Ankara Gölyaka is situated 11 km's after the Düzce province.

The coordinates of the weir and the the power house are indicated in the below table (Table3):

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

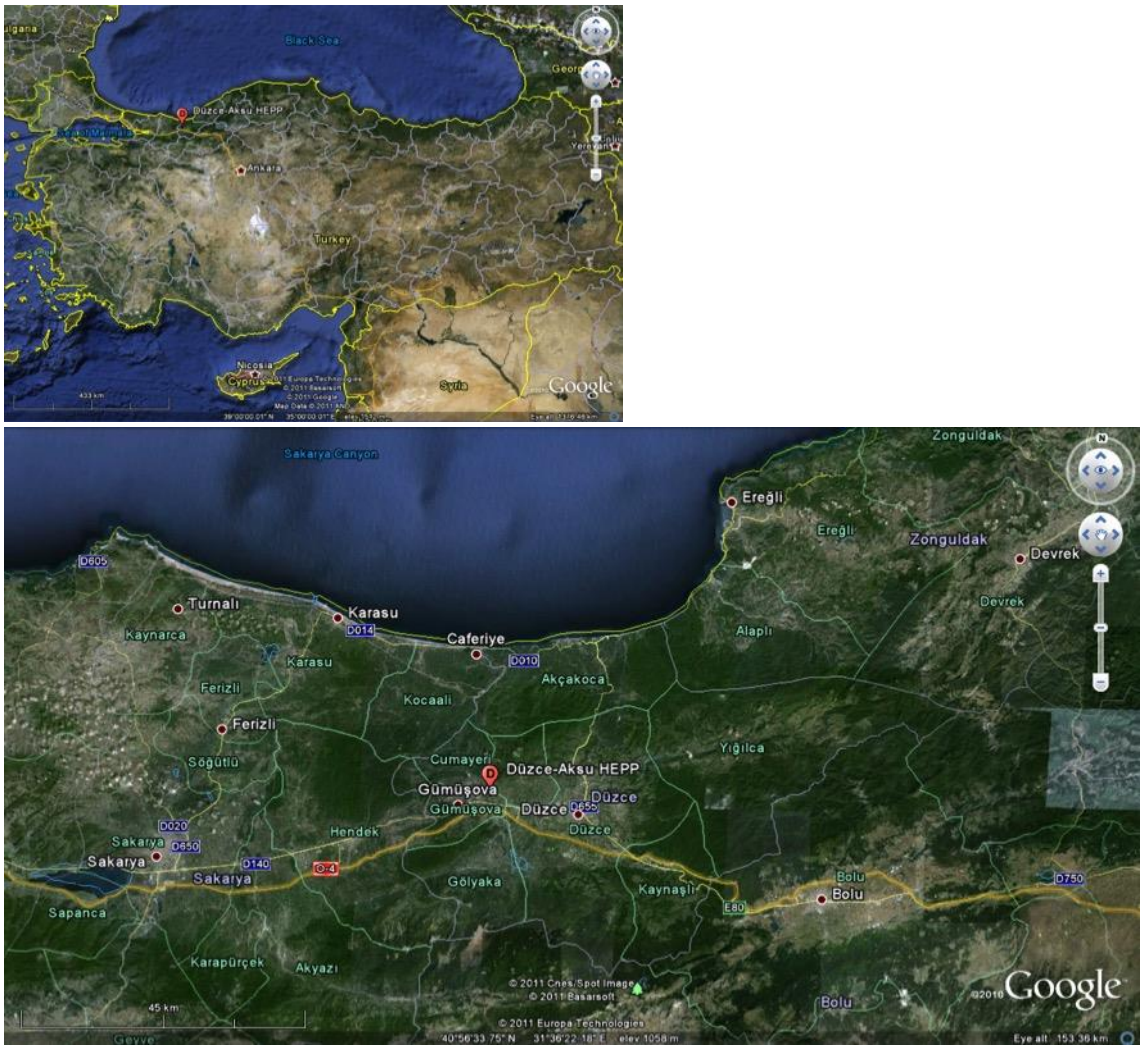

Figure 3: Google Earth Satellite imagery showing the location of the project area

Table 3: The geographical coordinates[5] indicating the location of the major components of the project activity:

Component's name	Latitude	Longitude
Weir	40°42'8.07"N	30°57'49.93"E
Powerhouse	40°45'39.31"N	30°59'20.59"E

1.10 Conditions Prior to Project Initiation

The project is a renewable energy project, prior the project initiation, there was no other hydro electric power plant installation at the project site.

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 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 is given in Appendix 1.

[5] These coordinates are taken from .kmz file provided by the project owner, the file is also provided to the validating DOE.

1.12 Ownership and Other Programs

1.12.1 Right of Use

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

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable

1.12.3 Other Forms of Environmental Credit

Not applicable

1.12.4 Participation under Other GHG Programs

Not applicable

1.12.5 Projects Rejected by Other GHG Programs

Not applicable

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is not a grouped project activity.

Leakage Management

Not applicable, as per ACM0002 Version 16.0 page 11, paragraph 52.

“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.

Further Information

No further information to be added

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilised:

Approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 16.0.0.

The Approved Methodology refers to the following tools:

“Tool for the demonstration and assessment of additionality” (Version 07.0)
“Tool to calculate the emission factor for an electricity system”. (Version 05.0)
"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 6.0.0).

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 05.0.0)

Also these tools are refeered to in this PDD

“Tool to determine the remaining lifetime of equipment” (Version 01)
Tool to determine Common practice (Version 03.1)
Methodological tool: Investment analysis (Version 06.0)

2.2 Applicability of Methodology

The ACM0002 (version 16.0) 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 16.0, is justified as the project activity meets the following applicability criteria:

Reference page in ACM0002 (Version 16.0)	Applicability Criteria	Justification
4 paragraph 4	(a) 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; (b) 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 16 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	The Düzce-Aksu 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 plant)

	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.	
5 paragraph 6	In case of hydro power plants: One of the following conditions must apply: (a) The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or (b) 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 (c) 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/m2.	The project activity satisfies condition (c), as it results in a new reservoir and the power density of the project activity is 17,367.5 W/m2 which is greater than 4 W/m2 as shown in the following calculation: nstalled Capacity/ Reservoir Area[6]=Power Density 46,200,000 W/708,282 m^2=65.23 W/m^2
5 paragraph 7	In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m2 all the following conditions must apply: (a) The power density calculated for the entire project activity using equation (5) is greater than 4 W/m2; (b) Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; (c) Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; (d) Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m2, is lower than 15 MW; (e) Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m2, is less than 10 per cent of the total installed capacity of the project activity from multiple reservoirs.	Not Applicable as the project activity is the addition of a new hydro power plant with only a single reservoir.
5-6 paragraph 8	The methodology is not applicable to the following: (a) 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; (b) Biomass fired power plants; (c) A hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m2.	The Project activity is elligible as : It does not involve switching from fossil fuels It is not a biomass fired power plant Although it is the creation of a hydro power plant with a new reservoir it's power density is greater than 4 W/m2 (the power density of the project activity is 65.23 W/m^2).
6 paragraph 9	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is 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 addition of a new hydro power plant thus a new reservoir, and it is not a retrofit, replacemeny or capacity addition project.
6 paragraph 10	In addition, the applicability conditions included in the tools referred to below apply.	Not applicable as the tool is not used in the casae of the project activity.

2.3 Project Boundary

Table 4 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 4.

[6] The reservoir Area is shown by a topographic map as shown in Appendix V

The project boundary includes net electricity generated and supplied to the Turkish national grid. The GHG emmissions due to the temporary use and burning of the diesel fuel by the auxiliary power generator, is not included to be inline with the nethodology.

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/m2)
		N_2O	No	Minor emission source
		Other	N.A.	N.A.
	Auxillary Diesel Generator	CO_2	Yes	Neglected[7]
		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 16.0), Section 5.2. page 9 paragraph 23:

> *"23. 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".*

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

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

2.5 Additionality

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

[7] ACM0002 Version 14.0.0 indicates that "...The use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected." 9Page 11 paragraph 32).

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 39.

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

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

The 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 Appendix I.

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..

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 and the Guidelines issued at EB 62[19] 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"

Investment Analysis tool version 06.0[8], 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 at the time[9] of investment decision,[10] (Ba3) is comparable to country's with the same Moody's index such as Tunisia and Suriname, from this point of view a reasonable and appropriate benchmark to compare the Equity IRR can be taken as 13.30 %.

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

The following parameters are taken into account for the assessment of the investment (Table 5) and supplementary parameters are provided in the "DüzceFinancialAnalysis" workbook and submitted to the validating DOE.

Table 5: Major parameters[11] taken into account for the financial analysis and determination of the Equity IRR of the Düzce-Aksu HEPP Project:

Parameter	Value	Unit	References
Installed Capacity	46.20	MW	Electricity Production License
Expected Annual Electricity Generation	141,370	MWh	Electricity Production License
Expected Annual Emission Reduction(ER)	75,382	tCO2e	Calculated (see Chapter 3 for details)
Expected VCS-SCS-VCU sales price	4.00	USD/t CO2e	Estimation
Total Investment	75,994,712	USD	Based on revised calculation submitted to the financers around May 2009
Annual Operation Costs	611,254.55	USD	Based on revised calculation submitted to the financers around May 2009
Loan	60,000,000.00	USD	Loan Agreement
Loan Period	14	years	Loan Agreement
Electricity Sales Price	0.073	USD/KWh	Price guaranteed by the renewable energy law dated 10/5/2005 and numbered 5346
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 29,158,943.80 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

[8] TOOL27 Methodological tool: Investment analysis Version 06.0
[9] The investment decision date is marked as the construction start date, e.i. when the project owner decided to start up with the construction. Because the project owner have communicated with the finance institutions and were sure to receive a loan for the project. So they deceided to move forward with the project. To be conservative we have utilised the parameters and values of the realized loan agreement, because this was the best offer for the project owner.
[10] http://countryeconomy.com/ratings/turkey
[11] The IRR calculation is made with values considered valid and calculated based on the unit values announced in 2009 by the State Hydraulica Works (DSI) of the host country.

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[12]. 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[13]. The technical lifetime of the project activity is longer than the crediting period (10 years, renewable twice), therefore as the investment analysis tool (version 6.0, EB 85 Report, Annex 12) 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 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, after the commissioning of the project activity.

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 10.02 % which is below the bench mark of 13.20%.

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 Price
- Electricity Ammount

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 " TOOL27 Methodological tool: Investment analysis Version 06.0 " of EB 85 Annex 12 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: 13.20%)

Change	-10%	-5%	5%	10%	Exceed Benchmark?
Investment Cost	12.99%	11.31%	8.98%	8.12%	No
Operating Cost	10.10%	10.06%	9.98%	9.95%	No
Electricity Price	8.57%	9.30%	10.73%	11.43%	No
Electricity Ammount	8.57%	9.30%	10.73%	11.43%	No

[12] http://ekutup.dpt.gov.tr/enerji/oik585.pdf (See page 4-25 (or p72 of pdf) Last visited on 06/2/2013)
[13] http://ekutup.dpt.gov.tr/enerji/oik585.pdf (See page 4-26 (or p73 of pdf) Last visited on 6/2/2013)

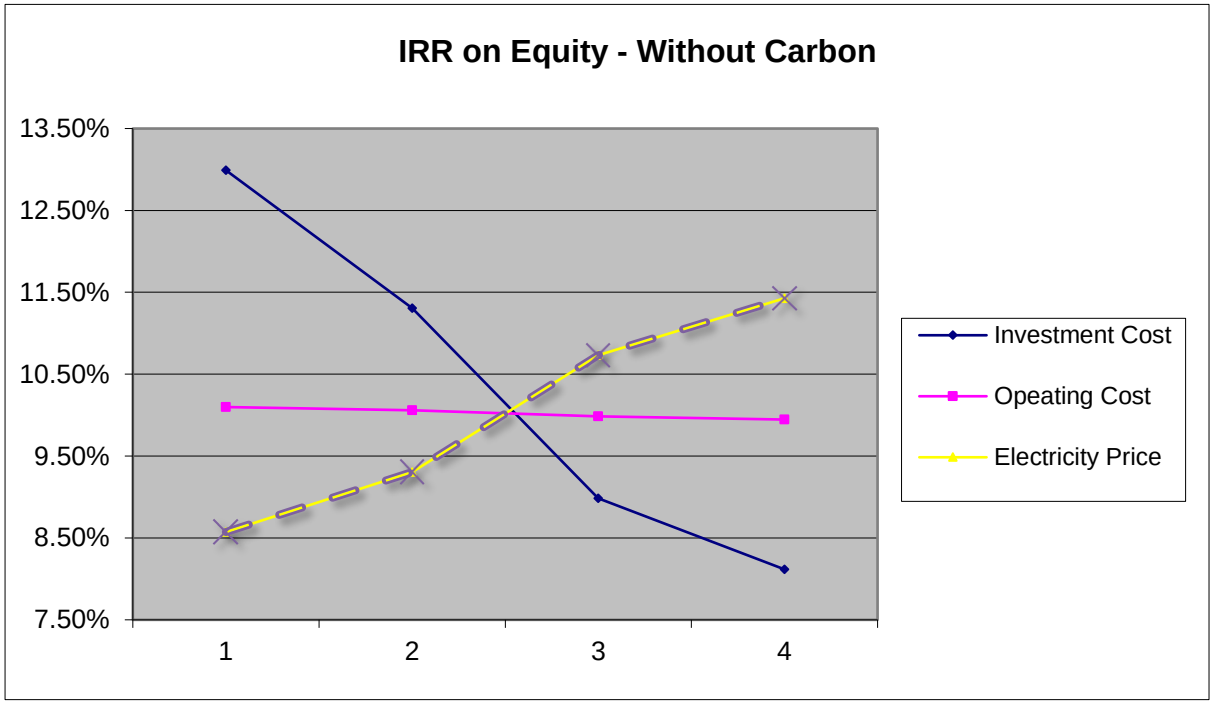

Figure 4**:** Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by ±10%

To exceed the benchmark, the either the electricity price or the electricity amount produced must increase by about 23.85% over the life of the project, or the investment cost must be reduced by about 10.76%. Considering the fact that the global financial crisis can also effect the host country there is a great possibility that the demand for electricity may decrease. As the feasibility report considers the firm and secondary energy to be produced based on the water availabiliity thus the available water may not increase in time. So a price increase around 23.85% is not expected. In addition to this 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 23.85%. 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 estimated production values. The investment costs we have considered in our financial analysis is reasonable and considering the harsh geograpical conditions due to the close proximity of the project activity to the North Anatolian Fault Zone, one can expect an increase in the investment cost but a decrese is 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 13.30 %, with an equity internal rate of return of 10.02%. 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

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

As per "Tool for the Demonstration and Assessment of Additionality", projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory frame-work, investment climate, access to technology, access to financing, etc. According to the Guidelines on Common Practice (EB69 Report;Annex8-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 46.20 MW of the proposed project is selected as the design capacity. Therefore, the range from 23.10 to 69.30 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 13th water catchment that is designated as the Western Black Sea 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 23.10 to 69.30 MW, the hydroelectric power plant projects that are within this range, operational within the borders of the Western Black Sea Catchment are given below in table 7:

Table 7: The list of all the hydroelectric power plants that are within the capacity range. (Source: A list of units providing electricity to the year 2011 Turkish Electricity Grid is provided as an Annex 1 to the most recent Capacity Projection report published by TEIAS (**http://212.175.131.171/proj**eksiyon/KAPASITEPROJEKSIYONU2012**.pdf)15**.

Name of Facility	***Fuel***	***Ownership***	***Capacity***	***Project Production Potential (GWh)***	***Firm Production GWh***	***Location***	***WaterShed Number and Name***
Tefen HPP	*Hydro*	*Private*	*33*	*141*	*80*	*Zonguldak*	*13 Western BlackSea*

Figure 5: The map showing the catchment boundaries within Turkey. The project is located within the borders of the ***Western Black Sea*** **Catchment**.

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}.

Looking at the above table (Table 7) there is only one project comparable to the project activity.

As explained above, considering the Western Black Sea Catchment 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, it is revealed that there is only 1 power plant operational in the Turkish grid with a capacity ranging between 23.10 MW and 69.30 MW (See Table:7). Therefore the number of N_{all} is 1.

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 Ndiff.

Common Practice tool Sub-step 4a:
When we consider the project listed in Table 7, this projects is different from Düzce-Aksu HEPP in the following aspects:

[14] 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.
[15] 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.

- Tefen Project was developed in an other province namely Zonguldak, and not on the same river system as the project activity, but on the Filyos Stream and thus the flow regime can be considered different .

  However, with a conservetive approach we consider this project to be similar to the project activity and we take $N_{diff}=0$

Conclusion of Common Practice tool Sub- Step 4b is $N_{diff}=0$

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.

$F=1-N_{diff}/N_{all}$
$F=1-(0/1)$
$F=1-0$
$F=1$

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 1 > 0.2, however
$N_{all}-N_{diff}=1-0=1<3$ in that case the Düzce-Aksu HEPP is not common practice.

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

Outcome: The Düzce-Aksu Hydro Electric Power Plant project is additional for two main reasons:

1. The Düzce-Aksu 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 Duzce-Aksu 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 difficulties that the project will face at investment and operation phases. 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 and its related tools are applied as they are without any deviation from methodology.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

According to the latest version (Version 16.0) of ACM0002 and the tool to calculate the emission factor for electricity system, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system". (Version 5.0)

The Project therefore applies the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 5.0 – EB87, Annex 9) 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:

> "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.
>
> "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):

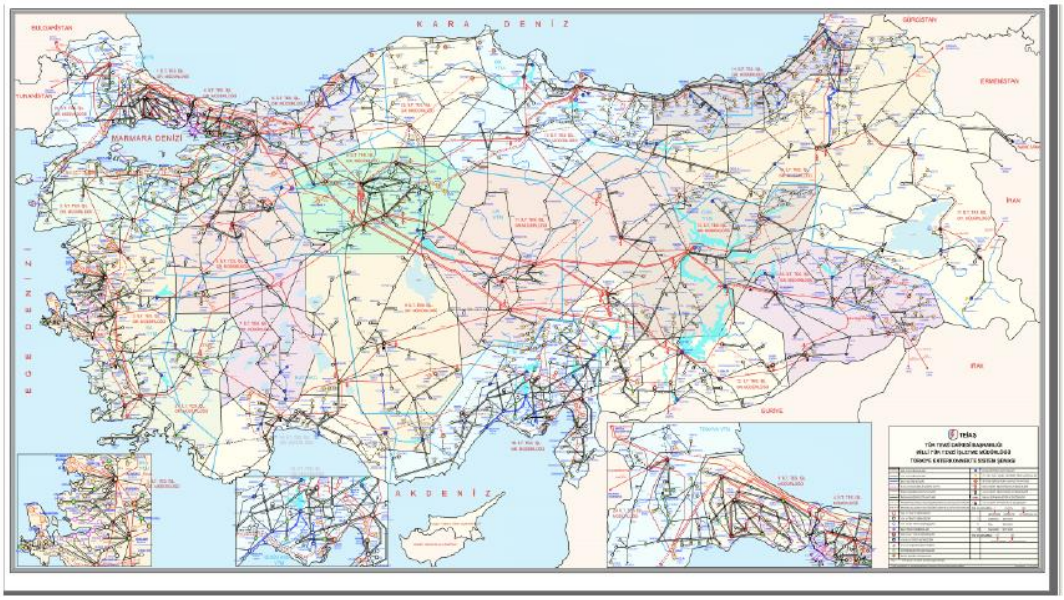

Figure 6: The Map showing the boundaries of Turkish Electricity Grid (Source Electricity Market Report 2010, by Electricity Market Regulatory Authority **http://www.epdk.gov.tr/documents/10157/48dd12d4-74da-4dcf-9f48-86983146c0d8**)

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 (optional)

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 8: Share of primary sources in electricity generation, 2007 – 2011[16]

	2007	2008	2009	2010	2011
Thermal	81.02 %	82.72 %	80.5 %	73.78 %	74.82%
Hydro	18.72 %	16.77 %	18.46 %	24.52 %	22.81%
Wind & Geothermal	0.26 %	0.51 %	0.99 %	1.70 %	2.36%
Total	100 %	100 %	100 %	100 %	100 %

Since the Simple OM calculation (option (A)) is selected, the emission factor is calculated by the generation-weighted average emissions per electricity unit (tCO2/GWh), and averaged over the past three years of all generating sources serving the system, not including low-cost / must run power plants. The tool gives two options for the calculation of 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 2009, 2010 and 2011. All the data used in calculation of the Simple OM are taken from the TEIAS website, details of which are given below.

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

The Simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit of net electricity generation (tCO_2/MWh) for all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

[16] Annual Development of Installed Capacity Generation in Turkey (1970-2011)
http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/kgucunkullanım(13-21)/13.xls
(http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kgucunkullanım(13-21)/13.xls)

- 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[17],
- Annual heating values for fuels consumed for electricity generation[18],
- Annual electricity generation by fuel type, import and export[19]

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:

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

Where:

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

$FCi_{,y}$ = 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)

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:

[17] Fuel Consumed in thermal P.P.in Turkey by the Electric Utilities (2007-2011) (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/47.xls

[18] Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electric Utilities (2007-2011), (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/49.xls).

[19] Turkey's Gross Electricity Generation by Primary Energy Resources and The Electric Utilities (2007-2011) / (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/40(06-11).xls)/ Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2011), (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls).

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);

c) 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_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

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

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

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which 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 an 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 ($EF_{grid,BM,y}$):

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

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:

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

EGPJ,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)
EFgrid,CM,y = Combined margin CO2 emissions factor in year y (tCO2/MWh)

And

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

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

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

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER_y = Emission reductions in year y (tCO2)
BE_y = Baseline emissions in year y (tCO2)
PE_y = Project Emissions in year y (tCO2)
L_y = Leakage emissions in year y (tCO2)

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

3.2 Project Emissions

As 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 has a power density of 65.23 W/m^2, this is greater than 10 W/m^2,

Project Activity	Installed Capacity	/	Reservoir Area[20]	=	Power Density
Düzce-AksuHEPP	46,200,000 W	/	708,282 m^2	=	65.23 W/m^2

therefore

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

Where:

PEHP,y = Project emissions from water reservoirs (tCO2e/yr)

There may be one diesel generator installed within the project boundary. This is only going to be utilized as a back-up or emergency generator, therefore, the emissions from this back up generator have been deemed negligible as per the ACM0002 (version 16.0) methodology.

3.3 Leakage

There are no leakage emissions related to project activity

[20] The reservoir Area map that indicates the aerial extent of the reservoir at maximum operation level is provided in Appendix V.

3.4 Net 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 2009, 2010 and 2011. 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/kton as follows:

Table 9: Net Calorific Values for each fuel type for Turkey

Fuel Type	NCV (TJ/KT)		
	2009	2010	2011
Hard Coal+ Imported Coal	22.21	22.32	22.79
Lignite	6.43	7.13	7.30
Fuel Oil	39.81	40.23	41.58
Diesel Oil	42.37	33.09	43.15
LPG	46.47	0.00[13]	0
Naphtha	43.65	33.50	0
Natural Gas	43.65	33.50	37.10

The emission factors of fuels required are taken from IPCC 2006 guidelines for GHG inventories[21]. All data used for the calculations can be found in Appendix-2. (See Table 1 and Table 2 to in Appendix-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 10: Calculation of emission by electricity generation (2009-2011)

	Default CO_2 Emissions (tCO_2		
	2009	2010	2011
Hard Coal+Imported Coal	13,649,138.82	15,365,199.79	22,366,901.55
Lignite	37,164,240.90	36,745,389.26	40,801,815.79
Fuel Oil	4,792,096.57	2,708,730.18	52,086,506.72
Diesel Oil	556,318.57	63,674.50	1,604,878.16
Lpg	317.74	0.00	39,996.20
Naphta	24,429.94	30,502.68	0.00
Natural Gas	42,346,272.06	44,215,362.69	0.00
TOTAL	98,532,496.86	99,128,859.11	110,822,747.76

[21] 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)

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.

Table 11: Net Electricity Generation from thermal power plants (units in GWh)

	2009	2010	2011
Unit:		**GWh**	
Net Generation	186,619.30	203,046.10	217,557.70
Gross Generation	194,812.90	211,207.70	229,395.10
Net/Gross Ratio	0.9579412	0.9613575	0.9483973
Net Thermal Generation	150,323.43	149,806.03	162,781.31
Electricity Imports	812.00	734.26	4,555.80
EGy (GWh)	151,135.43	150,949.83	167,337.11
EGy (MWh)	151,135,428.72	150,949,827.21	167,337,105.18

The OM Emission Factor for the years 2009, 2010 and 2011 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 12: Annual OM Emission Factors

Year	OM Emission Factor
2009	0.65195
2010	0.65670
2011	0.66227

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

$$EF_{grid,OMsimple} = 0.65716$$

Build margin

As mentioned above we have preferred 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);

c) 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_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

Since TEIAŞ didn't announce the commissioning dates of the power plants added to the grid in 2011, it is not possible to identify the amount of electricity produced by the newly added 5 units or the $SET_{5\text{-units}}$.

The net electricity generation in year 2011 is taken as reference for determination of plants that comprise 20% of the system generation. Based on Turkey's Annual Electricity statistics published on the TEIAŞ web site (www.teias.gov.tr) , the net generation in year 2011 was 217,557.7GWh (See Table 12, in 2011, out of this amount 9,646.71 GWh was identified[22] to be produced by projects that claimed VERs, excluding this number from the net generation we end up with 207,910.99 GWh of electricity which is our AEG_{TOTAL} and 20% of that amount is calculated as 41,582.198 GWh.

As we are unable to determine the $AEG_{SET\text{-}5\text{-}units}$ and the entire added capacity in year 2011 was 15,454.53 GWh, a number which is less than 20% of AEG_{TOTAL}, it is therefore obvious that 20% of AEG_{TOTAL}, is higher than $AEG_{SET\text{-}5\text{-}units}$.

Therefore the 20% of AEG_{TOTAL} with a value of 41,582.198 GWh is to be compared to the capacity additions in the recent years, and used as AEG_{SAMPLE} to calculate Build Margin Emission Factor.

Summing up the electricity generations of all the plants added to the Turkish National Grid in 2010 and 2011, but excluding the projects that claimed VERs, the total generation in this two years sums up to 41,710.56 GWh.

The total generation by the power plants added in year 2011 is 15,454.53 GWh. This number is still smaller than the $AEG_{SET\ 20\%}$ value of 41,582198 GWh. Therefore, to reach the AEG_{SE} 20% all the units added in year 2010 are also added. As a result, the $AEG_{SET\ Sample}$ value we are using in our BM calculation is 47,710.56 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 2011, and 2010 are available as Annex-2 to the capacity projection reports published in the TEIAS web page. Although the annual generation capacity data for each plant is not available on the statistics page of TEİAŞ. The data for the years 2011[23] and 2010[24] 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

[22] A list of units providing electricty to the year 2011 Turkish Electricity Grid is provided as an Annex 1 to the most recent Capacity Projection report published by TEIAS (http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf). We have checked and identified the units 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.

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

[24] http://www.teias.gov.tr/projeksiyon/KapasiteProjeksiyonu2011.doc

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 can 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, as mentioned above, 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 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 13: Default Electric efficiency rates taken from Annex 1 of the Methodological Tool to calculate the emission factor for an electricity system (Version 4.0.0) (EB 75, Annex 15).

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 14: 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 04.0.0) (EB 75 Report Annex 15)

Fuel Type	EF (tCO_2/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
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 15 Annual CO_2 Emissions for Capacity Additions and Annual BM Emission Factors

Capacity Additions in 2010 (GWh)		CO_2 Emissions	$EF_{grid,BM,2010}$
Coal	12017.6	8,029.71	
Lignite	180.0	117.81	
Natural Gas	13108.5	4,270.76	
Renewables and Wastes	949.9	0.00	
TOTAL	**26,256.04**	**12,418.28**	**0.47297**
Capacity Additions in 2011 (GWh)		CO_2 Emissions	$EF_{grid,BM,2011}$
Fuel Oil	922.67	545.18	
Coal	4.32	2.89	
Lignite	180.78	98.05	
Naphtha	-	0.00	
Natural Gas	12,301.75	4,007.91	
Renewables and Wastes	2,045.00	0.00	
TOTAL	**15,454.53**	**4,654.02**	**0.30114**

The Build Margin Emission Factor of the grid is then calculated as a generation weighted average for the years 2010 and 2011. The resulting BM Grid is:

$$EF_{grid,BM} = 0.40930\ tCO_{2e}/MWh$$

Combined margin emission 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.

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

$EF_y = 0.50 * 0.65716 + 0.50 * 0.40930 = 0.53323\ tCO_{2e}/MWh$

$ER_y = BE_y = EG_{facility,y} * EF_y$
$= 141,370 \text{ MWh} * 0.53323 tCO_{2e}/MWh = 75,382 tCO_{2e}$

A summary of the GHG removals by the project activity is given below in Table 17, as follows:

Table 16: Summary of GHG reductions by the project activity

Years	Estimated baseline emissions or removals(tCO_2)	Estimated project emissions or removals (tCO_{2e})	Estimated leakage emissions (tCO_{2e})	Estimated net GHG emission reductions or removals (tCO_{2e})
2013 (25 April to 31 Dec.)	51,838	0	0	51,838
2014	75,382	0	0	75,382
2015	75,382	0	0	75,382
2016	75,382	0	0	75,382
2017	75,382	0	0	75,382
2018	75,382	0	0	75,382
2019	75,382	0	0	75,382
2020	75,382	0	0	75,382
2021	75,382	0	0	75,382
2022	75,382	0	0	75,382
2023 (1 Jan - 24 April)	23,544	0	0	23,544
Total	753,820	0	0	753,820

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	Mass or Volume Unit (Tonnes or cubic meter)
Description	Amount of fuel *i* consumed by relevant power plants in Turkey in years, 2009, 2010, 2011
Source of data	Turkish Electricity Transmission Company (TEIAŞ) Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/47.xls)
Value applied	Please see Appendix 2 (Table 1)
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.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	

Data Unit / Parameter	NCV
Data unit	GJ/Mass or Volume Unit
Description	Net Calorific Values for fossil fuels in years 2009, 2010 and 2011
Source of data	Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/49.xls http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/47.xls)
Value applied	Please see Appendix-2 –Table 5
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.
Purpose of Data	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.
Comments	

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 Appendix 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 2, 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.
Purpose of Data	Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$
Comments	

Data Unit / Parameter	EG_y
Data unit	MWh
Description	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/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls
Value applied	Please see Appendix 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.
Purpose of Data	Data used for the calculation of $EF_{grid,OM,Simple,y}$
Comments	

Data Unit / Parameter	$EG_{m,y}$
Data unit	MWh
Description	Net quantity of 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 2011[25] and 2012[26].
Value applied	Please see Appendix 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.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	

[25] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf
[26] http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf

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 4.0.0)" are used
Value applied	Please see Appendix 2
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.
Purpose of Data	Data used for the calculation of $EF_{grid,BM,y}$
Comments	

4.2 Data and Parameters Monitored

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

Data Unit / Parameter	EG_y
Data unit	MWh
Description	Electricity
Source of data	Net Amount of Electricity supplied to the "Turkish National Grid" by the proposed project
Description of measurement methods and procedures to be applied	Data will be measured directly from meters and records on TEIAS readings protocol papers.
Frequency of monitoring/recording	Annually
Value applied	Will be determined at he monitoring stage but expected annual production is 141,370 MWh
Monitoring equipment	Data will be monitored continuously by redundant metering devices, which will provide the data for the monthly invoicing to TEİAŞ. All meters will be in compliance with the communiqué for Metering Devices to be used in the Electricity Market[27].
QA/QC procedures to be applied	There will be two meters that will backup each other. Generated electricity will also be monitored by the operator using software for internal monitoring.
Purpose of data	Data to be used for the calculation of Baseline Emissions.
Calculation method:	Direct Continuous Measurement
Comments	The collected data will be kept by Düzce Aksu Elektrik Üretim A.Ş. During the crediting period and until two years after the last issuance of VERs for the "Düzce-aksu Hydro Electricity

[27] 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

	Power Plant" project activity for that crediting period.

Data / Parameter:	CapPJ
Data unit:	W
Description:	Installed capacity of the hydropower plants after the implementation of the Project Activity.
Measured /Calculated /Default:	Measured
Source of data:	Project site computers with SCADA system and the turbine name plates.
Description of measurement methods and procedures to be applied:	Observed via the SCADA system of the Project Activity
Frequency of monitoring/recording:	Once for each monitoring period
Value applied:	46,200,000
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:	-

Data / Parameter:	$\mathbf{A_{PJ}}$
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 at its maximum fullness.
Measured /Calculated /Default:	Indirectly measured based on the reservoir area map provided in Appendix V.
Source of data:	Surface area determined using the lake surface area map provided in Appendix-V of this PD.
Description of measurement methods and procedures to be applied:	The reservoir area corresponding to maximum operational level has been determined via the topographic map showing the lake area, presented in Appendix-V.
Frequency of monitoring/recording:	Once during each monitoring period
Value applied:	708,282
Monitoring equipment:	-
QA/QC procedures to be applied:	Can be checked and compared to satellite imagery available by Google Earth.
Calculation method:	N/A
Any comment:	-

4.3 Monitoring Plan

Objectives of the monitoring program

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

Data to be monitored

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

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

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. In order to make verification of the reservoir area, the reservoir lake can be visited during the verification site visit and be compared to the reservoir area map, presented in Appendix V.

The electricity produced will be sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by two meters 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 for invoicing. TEİAŞ also conducts the calibration and maintenance of these meters and thus, ensures the accuracy and quality of the measurements. The quality standards that the meters need to comply is “The ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S)” The calibration of the meters is done and the meters will be checked continuously if there is a difference of 0.2 % in the readings of the main and the auxiliary meters, the calibration is repeated.

The net electricity produced is calculated by subtracting the total electricity consumed by the hydroelectric power plant, from the gross electricity generation and a certain percentage is lost during the transmission. 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 17: Positions and responsibilities of the VER monitoring team members.

Position	Responsibility
Düzce-Aksu HEPP Manager	Day to day operation of the Düzce-Aksu 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 Data entry to PMUM system
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 auxiliary 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 invoicing. In addition to the readings of the two metering devices, generation data of the Düzce-Aksu 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.

5 ENVIRONMENTAL IMPACT

According to the rules and regulations at the time of licence application for electricity production the project was given a certificate of indicating that the Project does not need to undergo a full EIA process, by the Düzce Provincial Directorate of Environment and Forestry. Because, at the time of licence application the Hydro Power Plants that had installed capacity lower than 50 MW was considered to be out of scope according to EIA regulation that was active during the period of application. This letter is attached in Appendix III.

Although there was no significant environmental impacts determined, the following is the summary of the impacts and the mitigation actions outlined in the Project Presentation Reort submitted to the authorities:

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 Dereli Municipality.

Biodiversity: A fish passage will be constructed to ease up and down stream movements of the fish living in Aksu river.

6 STAKEHOLDER COMMENTS

The major stake holders to the project are the central and local governmental institutions. These are namely: The Energy Market Regulatory Authority (EMRA), Düzce Provincial Directorate of Environment and Forestry, General Directorate of Forestry, Düzce Governorship, Düzce-Aksu Municipality, General Directorate of Mining Affairs. The closest settlement is the Gölyaka town,and its bound villages.

The project owner identified these stakeholders and got into communication with them at the start of the project. Among the government authorities, EMRA is a significant stakeholder as they issue the electricity production licence and monitor the realization stages of the project.

The project owner informed these stakeholders and communicated officially along the designing stage of the project.

Amongst these stake holders, the Ministry of Environment and Forestry (MoEF) and its Düzce Provincial Directorate are the two other significant stakeholders as they provide the relevant

environmental permits. The General Directorate of Forestry is also very important as they give the land use permission for the forested areas.

APPENDIX I: 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 Labor 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;

APPENDIX II: BASELINE INFORMATION

Table 1: http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/47.xls

TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKIT MİKTARLARININ ÜRETİCİ KURULUŞLARA DAĞILIMININ YILLAR İTİBARİYLE GELİŞİMİ
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
ANNUAL DEVELOPMENT OF 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

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**Taşkömürü**	*Hard Coal*	1,664,859	1,563,792	1,700,458
	Linyit	*Lignite*	57,850,129	50,123,941	54,558,282
	TOPLAM	*TOTAL*	**59,514,988**	**51,687,733**	56,258,740
	Fuel-Oil *Fuel Oil*	**Asıl Yakıt** *Main Fuel*	239,410	16,864	27,098
		Yrd. Yakıt *Auxiliary Fuel*	134,007	105,073	118,439
		TOPLAM *TOTAL*	**373,417**	**121,937**	145,537
	Motorin *Diesel Oil*	**Asıl Yakıt** *Main Fuel*	45,364	4	0
		Yrd. Yakıt *Auxiliary Fuel*	72,956	18,901	13,984
		TOPLAM *TOTAL*	**118,320**	**18,905**	13,984
	TOPLAM	*TOTAL*	**491,737**	**140,842**	159,521
	Doğal Gaz	*Natural Gas*	5,091,011	4,493,275	4,173,420
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	**Fuel-Oil**	*Fuel Oil*	0	0	0
	Motorin	*Diesel Oil*	0	0	0
	TOPLAM	*TOTAL*	**0**	**0**	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	4,956,318	5,855,911	8,873,976
	Linyit	*Lignite*	5,770,389	6,565,451	6,949,028
	TOPLAM	*TOTAL*	**10,726,707**	**12,421,362**	15,823,004
	Fuel-Oil	*Fuel Oil*	1,220,904	769,845	386,071
	Motorin	*Diesel Oil*	62,537	1,449	1,063
	LPG	*LPG*	111	0	0
	Nafta	*Naphta*	8,077	13,140	0
	TOPLAM	*TOTAL*	**1,291,629**	**784,434**	387,134
	Doğal Gaz	*Natural Gas*	15,887,029	17,290,139	18,631,167
TÜRKİYE *TURKEY*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	6,621,177	7,419,703	10,574,434
	Linyit	*Lignite*	63,620,518	56,689,392	61,507,310
	TOPLAM	*TOTAL*	**70,241,695**	**64,109,095**	**72,081,744**
	Fuel-Oil	*Fuel Oil*	1,594,321	891,782	531,608
	Motorin	*Diesel Oil*	180,857	20,354	15,047
	LPG	*LPG*	111	0	0
	Nafta	*Naphta*	8,077	13,140	0
	TOPLAM	*TOTAL*	**1,783,366**	**925,276**	**546,655**
	Doğal Gaz	*Natural Gas*	**20,978,040**	**21,783,414**	**22,804,587**

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.

* ADÜAŞ'ın lisansı Eylül 2008 tarihinde serbest üretim lisansına dönüştürülmüştür.
ADÜAŞ's license has been turned into the IPP license in September 2008

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:
Source: http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/49.xls

http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/yakıt46-49/49.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

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**Taşkömürü**	*Hard Coal*	5,452	4,990	5,511
	Linyit	*Lignite*	83,356	80,967	91,352
	TOPLAM	*Total*	**88,809**	**85,957**	**96,863**
	Fuel-Oil *Fuel Oil*	**Asıl Yakıt** *Main Fuel*	2,301	162	261
		Yrd. Yakıt *Auxiliary Fuel*	1,286	1,009	1,137
		TOPLAM *TOTAL*	**3,587**	**1,171**	**1,398**
	Motorin *Diesel Oil*	**Asıl Yakıt** *Main Fuel*	467	0	0
		Yrd. Yakıt *Auxiliary Fuel*	751	195	144
		TOPLAM *TOTAL*	**1,219**	**195**	**144**
	TOPLAM	*TOTAL*	**4,806**	**1,366**	**1,542**
	Doğal Gaz	*Natural Gas*	**42,335**	**37,354**	**34,621**
	TOPLAM	*TOTAL*	**135,949**	**124,676**	**133,026**
MOBİL SANTRALLAR *MOBIL POWER PLANTS*	**Fuel-Oil**	***Fuel Oil***	0	0	0
	Motorin	***Diesel Oil***			
	TOPLAM	***TOTAL***	**0**	**0**	**0**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	29,677	34,556	52,056
	Linyit	*Lignite*	14,295	15,584	15,857
	TOPLAM	*Total*	**43,973**	**50,141**	**67,914**
	Fuel-Oil	*Fuel Oil*	11,573	7,398	3,882
	Motorin	*Diesel Oil*	612	15	11
	Lpg	*Lpg*	1	0	0
	Nafta	*Naphta*	84	105	0
	TOPLAM	*TOTAL*	**12,270**	**7,518**	**3,893**
	Doğal Gaz	*Natural Gas*	**143,931**	**157,134**	**167,443**
	TOPLAM	*TOTAL*	**187,904**	**207,275**	**235,357**
TÜRKİYE *TURKEY*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	35,130	39,546	57,567
	Linyit	*Lignite*	97,652	96,551	107,210
	TOPLAM	*Total*	**132,781**	**136,097**	**164,777**
	Fuel-Oil	*Fuel Oil*	15,160	8,569	5,280
	Motorin	*Diesel Oil*	1,830	209	155
	Lpg	*Lpg*	1	0	0
	Nafta	*Naphta*	84	105	0
	TOPLAM	*TOTAL*	**17,076**	**8,884**	**5,435**
	Doğal Gaz	*Natural Gas*	**186,266**	**194,487**	**202,064**
	TOPLAM	*TOTAL*	**336,123**	**339,468**	**372,276**

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.

Table 4:
Source: Computation based on Table 3 (in Annex-2) provided above.

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

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**Taşkömürü**	*Hard Coal*	22,828,163	20,892,383	23,074,208
	Linyit	*Lignite*	348,995,433	338,990,622	382,472,805
	TOPLAM	*Total*	**371,823,595**	**359,883,005**	405,547,013
	Fuel-Oil *Fuel Oil*	**Asıl Yakıt** *Main Fuel*	9,632,696	679,656	1,091,289
		Yrd. Yakıt *Auxiliary Fuel*	5,386,180	4,223,229	4,760,433
		TOPLAM *TOTAL*	**15,018,876**	**4,902,885**	5,851,723
	Motorin *Diesel Oil*	**Asıl Yakıt** *Main Fuel*	1,956,278	159	0
		Yrd. Yakıt *Auxiliary Fuel*	3,146,162	815,082	603,737
		TOPLAM *TOTAL*	**5,102,441**	**815,241**	603,737
	TOPLAM	*TOTAL*	**20,121,317**	**5,718,126**	6,455,459
	Doğal Gaz	*Natural Gas*	**177,247,713**	**156,392,061**	144,950,365
	TOPLAM	*TOTAL*	**569,192,626**	**521,993,192**	556,952,838
MOBİL SANTRALLAR *MOBIL POWER PLANTS*	**Fuel-Oil**	***Fuel Oil***	0	0	0
	Motorin	***Diesel Oil***	0	0	0
	TOPLAM	***TOTAL***	**0**	**0**	0
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	124,253,075	144,680,890	217,948,438
	Linyit	*Lignite*	59,852,102	65,249,084	66,392,055
	TOPLAM	*Total*	**184,105,177**	**209,929,975**	284,340,493
	Fuel-Oil	*Fuel Oil*	48,452,601	30,974,336	16,254,037
	Motorin	*Diesel Oil*	2,560,350	61,818	45,552
	Lpg	*Lpg*	5,158	0	0
	Nafta	*Naphta*	352,524	440,154	0
	TOPLAM	*TOTAL*	**51,370,633**	**31,476,308**	16,299,589
	Doğal Gaz	*Natural Gas*	**602,609,967**	**657,887,178**	701,051,608
	TOPLAM	*TOTAL*	**786,715,144**	**867,817,153**	985,392,101
TÜRKİYE *TURKEY*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	147,081,237	165,573,274	241,022,646
	Linyit	*Lignite*	408,847,535	404,239,706	448,864,860
	TOPLAM	*Total*	**555,928,772**	**569,812,980**	**689,887,506**
	Fuel-Oil	*Fuel Oil*	63,471,478	35,877,221	22,105,760
	Motorin	*Diesel Oil*	7,662,790	877,059	649,289
	Lpg	*Lpg*	5,158	0	0
	Nafta	*Naphta*	352,524	440,154	0
	TOPLAM	*TOTAL*	**71,491,950**	**37,194,434**	**22,755,049**
	Doğal Gaz	*Natural Gas*	**779,857,681**	**814,279,239**	**846,001,974**
	TOPLAM	*TOTAL*	**1,407,278,403**	**1,421,286,653**	**1,558,644,529**

Table 5:
Source: Computation based on Table 3 (in Annex-2) provided above.

NET CALORIFIC VALUES OF FUELS CONSUMED IN THE THERMAL POWER PLANTS

Unit: TJ/KT

			2009	2010	2011
EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ*	**Taşkömürü**	*Hard Coal*	13.71	13.36	13.57
	Linyit	*Lignite*	6.03	6.76	7.01
	TOPLAM	*TOTAL*	**6.25**	**6.96**	7.21
	Fuel-Oil *Fuel Oil*	**Asıl Yakıt** *Main Fuel*	40.24	40.30	40.27
		Yrd. Yakıt *Auxiliary Fuel*	40.19	40.19	40.19
		TOPLAM *TOTAL*	**40.22**	**40.21**	40.21
	Motorin *Diesel Oil*	**Asıl Yakıt** *Main Fuel*	0.00	1.00	0.00
		Yrd. Yakıt *Auxiliary Fuel*	43.12	43.12	43.17
		TOPLAM *TOTAL*	**43.12**	**43.12**	43.17
	TOPLAM	*TOTAL*	**40.92**	**40.60**	40.47
	Doğal Gaz	*Natural Gas*	34.82	34.81	34.73
MOBİL SANTRALLAR *MOBILE POWER PLANTS*	**Fuel-Oil**	*Fuel Oil*	0.00	0.00	0.00
	Motorin	*Diesel Oil*	0.00	0.00	0.00
	TOPLAM	*TOTAL*	**0.00**	**0.00**	**0.00**
OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	25.07	24.71	24.56
	Linyit	*Lignite*	10.37	9.94	9.55
	TOPLAM	*TOTAL*	**17.16**	**16.90**	**17.97**
	Fuel-Oil	*Fuel Oil*	39.69	40.23	42.10
	Motorin	*Diesel Oil*	40.94	42.66	42.85
	LPG	*LPG*	0.00	1.00	0.00
	Nafta	*Naphta*	43.65	33.50	0.00
	TOPLAM	*TOTAL*	**39.77**	**40.13**	42.10
	Doğal Gaz	*Natural Gas*	37.93	38.05	37.63
TÜRKİYE *TURKEY*	**Taşkömür+İthal kömür**	*Hard Coal+Imported Coal*	22.21	22.32	22.79
	Linyit	*Lignite*	6.43	7.13	7.30
	TOPLAM	*TOTAL*	**7.91**	**8.89**	**9.57**
	Fuel-Oil	*Fuel Oil*	39.81	40.23	41.58
	Motorin	*Diesel Oil*	42.37	43.09	43.15
	LPG	*LPG*	46.47	0.00	0.00
	Nafta	*Naphta*	43.65	33.50	0.00
	TOPLAM	*TOTAL*	**40.09**	**40.20**	**41.63**
	Doğal Gaz	*Natural Gas*	37.17	37.38	37.10

Table 6:

Source: http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/40(06-11).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*			2009	2010	2011
E	TAŞKÖMÜRÜ	*Hard Coal*	1,851.1	1,882.7	2,004.2
	LİNYİT	*Lignite*	22,395.3	20,646.7	20,588.7
	KÖMÜR TOPLAMI	*Coal Total*	**24,246.4**	**22,529.4**	**22,592.9**
Ü	FUEL-OİL	*Fuel Oil*	974.4	62.2	103.0
	MOTORİN	*Diesel oil*	0.2	0.0	0.0
A	SIVI TOPLAMI	*Liquid Total*	**974.6**	**62.2**	**103.0**
	DOĞAL GAZ	*Natural Gas*	**17,225.5**	**15,289.4**	**13,939.9**
Ş	TERMİK TOPLAM	*Thermal Total*	**42,446.5**	**37,881.0**	**36,635.9**
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	*Hydro+Jeothermal+Wind Total*	**28,338.2**	**41,377.4**	**36,888.2**
	TOPLAM	*Total*	**70,784.8**	**79,258.3**	**73,524.1**
BAĞLI ORTAKLIKLAR *Affiliated partnerships Of EÜAŞ*	LİNYİT	*Lignite*	11,974.5	10,524.2	13,407.6
	DOĞAL GAZ	*Natural Gas*	6,694.4	5,749.9	5,419.0
	TERMİK TOPLAM	*Thermal Total*	**18,668.9**	**16,274.1**	**18,826.5**
MOBİL SANTRALLAR *MOBILE P.P.*	FUEL-OİL	*Fuel Oil*	**0.0**	**0.0**	**0.0**
	MOTORİN	*Diesel oil*		**0.0**	
	TERMİK TOPLAM	*Thermal Total*	**0.0**	**0.0**	**0.0**
OTOPRODÜKTÖRLER ÜRETİM ŞRK. İŞLETME HAKKI DEV. *Autoproducers Production Comp. TOOR*	TAŞKÖMÜRÜ+İTHAL KÖMÜR	*Hard Coal+Imported Coal*	14,744.5	17,221.6	25,343.3
	LİNYİT	*Lignite*	4,719.6	4,771.2	4,874.1
	KÖMÜR TOPLAMI	*Coal Total*	**19,464.1**	**21,992.8**	**30,217.4**
	FUEL-OİL	*Fuel Oil*	3,465.4	2,081.6	797.5
	MOTORİN	*Diesel oil*	345.6	4.3	3.1
	LPG	*LPG*	0.4	0.0	0.0
	NAFTA	*Naphtha*	17.6	31.9	0.0
	SIVI TOPLAMI	*Liquid Total*	**3,829.0**	**2,117.8**	**800.6**
	DOĞAL GAZ	*Natural Gas*	**72,174.8**	**77,104.5**	**84,688.7**
	YENİLENEBİLİR+ATIK	*Renewables and wastes*	**340.1**	**457.0**	**340.1**
	TERMİK TOPLAM	*Thermal Total*	**95,808.0**	**101,672.5**	**116,046.8**
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	*Hydro+Jeothermal+Wind Total*	**9,551.2**	**14,002.8**	**20,868.6**
	TOPLAM	*Total*	**105,359.2**	**115,675.3**	**136,915.4**
TÜRKİYE *TURKEY*	TAŞKÖMÜRÜ+İTHAL KÖMÜR	*Hard Coal+Imported Coal*	16,595.6	19,104.3	27,347.5
	LİNYİT	*Lignite*	39,089.5	35,942.1	38,870.4
	KÖMÜR TOPLAMI	*Coal Total*	**55,685.1**	**55,046.4**	**66,217.9**
	FUEL-OİL	*Fuel Oil*	4,439.8	2,143.8	900.5
	MOTORİN	*Diesel oil*	345.8	4.3	3.1
	LPG	*LPG*	0.4	0.0	0.0
	NAFTA	*Naphtha*	17.6	31.9	0.0
	SIVI TOPLAMI	*Liquid Total*	**4,803.5**	**2,180.0**	**903.6**
	DOĞAL GAZ	*Natural Gas*	**96,094.7**	**98,143.7**	**104,047.6**
	YENİLENEBİLİR+ATIK	*Renewables and wastes*	**340.1**	**457.5**	**469.2**
	TERMİK TOPLAM	*Thermal Total*	**156,923.4**	**155,827.6**	**171,638.3**
	HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM	*Hydro+Jeothermal+Wind Total*	**37,889.5**	**55,380.1**	**57,756.8**
	TÜRKİYE TOPLAMI	*TURKEY'S TOTAL*	**194,812.9**	**211,207.7**	**229,395.1**

Table 7: (Source: http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls)

TÜRKİYE ELEKTRİK ENERJİSİ ÜRETİM - TÜKETİM VE KAYIPLARININ YILLAR İTİBARİYLE GELİŞİMİ

ANNUAL DEVELOPMENT OF ELECTRICITY GENERATION- CONSUMPTION AND LOSSES IN TURKEY

(1984-2011)

Source: http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/33(84-11).xls

YILLAR *YEARS*	BRÜT ÜRETİM *GROSS GEN.*	ARTIŞ % *INCREASE*	İÇ İHTİYAÇ *INTER. CONSUMPTION*	%	NET ÜRETİM *NET GEN.*	İTHALAT *IMPORTS*	ŞEBEKEYE VERİLEN[1] *SUPPLIED TO THE NETWORK* [1]	ŞEBEKE KAYBI — NETWORK LOSSES İLETİM *TRANSMISSION*	%	DAĞITIM *DISTRIBUTION*		TOPLAM *TOTAL*	%	IRACAT[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		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		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		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		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		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		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		6680.3	12.3	907		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		7561.2	13.2	506		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		8994.8	14.2	314		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		10251.6	14.6	589		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	*	11843.0	16.0	570		61400.9	*	3.7
1995	86247.4	10.1	4388.8	5.1	81858.6	0	81858.6	* 2034.9	2.5	11733.9	*	13768.8	16.8	696		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	*	15854.8	17.5	343		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	*	18581.9	18.4	###		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	*	20794.9	19.1	###		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	*	21545.0	19.1	###		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	*	23755.9	19.4	###		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	*	23328.7 **	19.3	###		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	*	23931.9	18.8	###		102948.0	*	6.1
2003	140580.5	8.6	5332.2	3.8	135248.3	1158.0	136406.3	3330.7	2.4	20722.0	*	24052.7	17.6	###		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	*	23243.0	16.0	###		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	*	24044.0	15.4	###		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	*	23789.2	14.0	###		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	*	26646.6	14.5	###		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	*	27481.5	14.4	###		161947.6	*	4.4
2009	194812.9	-1.8	8193.6	4.2	186619.3	812.0	187431.3	3973.4	2.1	25018.0	*	28991.4	15.5	###		156894.1	*	-3.1
2010	211207.7	8.4	8161.6	3.9	203046.1	1143.8	204189.9	5690.5	2.8	24531.2	*	30221.7	14.8	###		172050.6	*	9.7
2011	229395.1	8.6	11837.4	5.2	217557.7	4555.8	222113.5	4189.3	1.9	28180.0	*	32369.3	14.6	###		186099.6		8.2

1)Şebekeye Verilen = Net Üretim+İthalat

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

*** Kaynak : Türkiye Elektrik Dağıtım ve Tüketim İstatistikleri ,1994-2010 (2011 Geçici)**

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 ,1994-2010*

Table 8a:
Source: http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2011.pdf

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
SELİMOĞLU REG. VE HES	0.00	0.00	0.00	Private	Hydro	7-Jan-10
KULP IV HES (YILDIZLAR EN.ELK.ÜR.AŞ.)	12.30	41.00	23.00	Private	Hydro	13-Jan-10
TUZLA JEOTERMAL	0.00	0.00	0.00	Private	Geothermal	13-Jan-10
ROTOR ELEKTRİK (OSMANİYE RES)	0.00	0.00	0.00	Private	Wind	14-Jan-10
CİNDERE HES (İlave)	9.07	28.29	16.07	Private	Hydro	21-Jan-10
ETİ SODA ÜRE.PAZ.NAK.VE ELK.ÜRE.SAN.	24.00	144.00	144.00	Auto producer	Lignite	22-Jan-10
BAYBURT HES (BAYBURT ENERJİ ÜRET.)	14,6	51.00	24.00	Private	Hydro	28-Jan-10
UZUNÇAYIR HES (Tunceli) (İlave)	0.00	0.00	0.00	Private	Hydro	28-Jan-10
ALTINMARKA	4.60	37.02	37.02	Auto producer	Natural Gas	28-Jan-10
CAN TEKSTİL (Çorlu/TEKİRDAĞ)	7.83	60.25	60.25	Auto producer	Natural Gas	28-Jan-10
ALAKIR HES (YURT ENERJİ ÜRETİM)	2.06	6.00	4.00	Private	Hydro	29-Jan-10
CEV ENERJİ ÜRETİM (GAZİANTEP ÇÖP Biogas)	0.00	0.00	0.00	Private	Biogas	1-Feb-10
AKBAŞLAR (İlave)	1.54	1.54	12.08	Auto producer	Natural Gas	18-Feb-10
ASA ENERJİ (KALE REG.ve HES)	9,6	0.00	0.00	Private	Hydro	19-Feb-10
PETA MÜHENDİSLİK EN. (MURSAL II HES)	4.50	19.00	11.00	Private	Hydro	19-Feb-10
HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1.20	5.00	3.00	Private	Hydro	23-Feb-10
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	0.00	0.00	0.00	Private	LFG	24-Feb-10
KONYA ŞEKER SAN. VE TİC. A.Ş.1	6.00	36.00	36.00	Auto producer	Lignite	26-Feb-10
GLOBAL ENERJİ (PELİTLİK)	3.54	27.06	27.06	Private	Natural Gas	26-Feb-10
ASMAKİNSAN (BANDIRMA 3 RES)	20.00	0.00	0.00	Private	Wind	26-Feb-10
FLOKSER Tekstil (Çatalça-İstanbul)(Süetser tesisi)	-2.13	0.00	0.00	Auto producer	Natural Gas	28-Feb-10
RASA ENERJİ (VAN)	26.19	166.62	166.62	Private	Natural Gas	3-Mar-10
ROTOR ELEKTRİK (OSMANİYE RES)	17.50	0.00	0.00	Private	Wind	10-Mar-10
SOMA ENERJİ ÜRETİM (SOMA RES)	4.50	0.00	0.00	Private	Wind	10-Mar-10
DOĞUBAY ELEKTRİK (SARIMEHMET HES)	3.10	10.00	6.00	Private	Hydro	11-Mar-10
DENİZ ELEKTRİK (SEBENOBA RES)	10.00	0.00	0.00	Private	Wind	12-Mar-10
AKDENİZ ELEKTRİK (MERSİN RES)	33,0	0.00	0.00	Private	Wind	19-Mar-10
AKSA ENERJİ (ANTALYA)	25.00	192.50	192.50	Private	Natural Gas	20-Mar-10
NURYOL ENERJİ (DEFNE REG. VE HES)	7.23	22.00	13.00	Private	Hydro	26-Mar-10
MENDERES GEOTERMAL DORA-2	0.00	0.00	0.00	Private	Jeothermal	26-Mar-10
ASMAKİNSAN (BANDIRMA 3 RES)	4.00	0.00	0.00	Private	Wind	26-Mar-10
ÖZGÜR ELEKTRİK (AZMAK I REG.VE HES)	5.91	0.00	0.00	Private	Hydro	1-Apr-10
BİRİM HİDR. ÜRETİM AŞ. (ERFELEK HES)	3.23	9.50	5.50	Private	Hydro	3-Apr-10
BEYTEK EL. ÜR. A.Ş. (ÇATALOLUK HES)	9,5	0.00	0.00	Private	Hydro	7-Apr-10

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
NİSAN E.MEKANİK EN. (BAŞAK REG. HES)	6.85	22.00	12.00	Private	Hydro	9-Apr-10
BOREAS ENERJİ (BOREAS I ENEZ RES)	15,0	0.00	0.00	Private	Wind	9-Apr-10
UZUNÇAYIR HES (Tunceli) (İlave)	27.33	0.00	0.00	Private	Hydro	11-Apr-10
FIRTINA ELEKTRİK ÜR. A.Ş. (SÜMER HES)	21.60	59.41	33.27	Private	Hydro	16-Apr-10
FRİTOLAY GIDA SAN.VE TİC A.Ş.	0.07	4.00	4.00	Auto producer	Biogas	21-Apr-10
YILDIZ ENTEGRE AĞAÇ (Kocaeli)	12.37	79.79	79.79	Auto producer	Natural Gas	22-Apr-10
BAKRAS EN. ELKT.ÜR. A.Ş. ŞENBÜK RES	15,0	0.00	0.00	Private	Wind	22-Apr-10
ALİZE ENERJİ (KELTEPE RES)	1.80	0.00	0.00	Private	Wind	28-Apr-10
KAR-EN KARADENİZ EL.A.Ş. ARALIK HES	12.41	56.00	32.00	Private	Hydro	30-Apr-10
ITC-KA ENERJİ (SİNCAN)	0.00	0.00	0.00	Private	LFG	30-Apr-10
ATAER ENERJİ ELEKTRİK ÜRETİM A.Ş.	49.00	277.89	277.89	Private	Natural Gas	5-May-10
BİRİM HİDR. ÜRETİM AŞ. (ERFELEK HES)	3.23	9.50	5.50	Private	Hydro	14-May-10
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101.95	802.00	802.00	Private	Natural Gas	22-May-10
KARADENİZ EL.ÜRET. (UZUNDERE-1 HES)	31.08	82.44	46.46	Private	Hydro	27-May-10
SİMKO(Kartal)	-2.05	0.00	0.00	Auto producer	Natural Gas	27-May-10
AKIM ENERJİ (CEVİZLİK REG. VE HES)	91,4	0.00	0.00	Private	Hydro	28-May-10
CEYHAN HES (OŞKAN HES) (ENOVA EN.)	23.89	0.00	0.00	Private	Hydro	3-Jun-10
ERENLER REG. ve HES (BME BİR.MÜT.EN.)	45.00	85.00	48.00	Private	Hydro	4-Jun-10
ROTOR ELEKTRİK (GÖKÇEDAĞ RES)	20.00	0.00	0.00	Private	Wind	5-Jun-10
ÇAKIT HES (ÇAKIT ENERJİ A.Ş.)	20.18	0.00	0.00	Private	Hydro	10-Jun-10
SOMA ENERJİ ÜRETİM (SOMA RES)	7.20	0.00	0.00	Private	Wind	10-Jun-10
PAŞA REG. VE HES (ÖZGÜR ELEKTRİK)	8.68	0.00	0.00	Private	Hydro	11-Jun-10
GÜZELÇAY-I HES (İLK ELEKTRİK ENERJİ)	3.14	16.67	9.30	Private	Hydro	15-Jun-10
KALE REG. VE HES (KALE ENERJİ ÜR.)	34.14	0.00	0.00	Private	Hydro	16-Jun-10
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	37.50	0.00	0.00	Private	Wind	16-Jun-10
MAZI-3 RES ELEKTRİK (MAZI-3 RES)	7.50	0.00	0.00	Private	Wind	18-Jun-10
UĞUR ENERJİ ÜRETİM TİC. VE SAN. A.Ş.	48.20	405.14	405.14	Private	Natural Gas	21-Jun-10
SÖKTAŞ (N+LPG)(Aydın)	-4.50			Auto producer	NAFTA	23-Jun-10
ÇAMLIKAYA REG. VE HES	5.65	19.00	11.00	Private	Hydro	30-Jun-10
ERİKLİ-AKOCAK REG. ve AKOCAK HES	41.25	0.00	0.00	Private	Hydro	30-Jun-10
BORASKO ENERJİ (BANDIRMA RES)	12.00	0.00	0.00	Private	Wind	30-Jun-10
AKSA ENERJİ (ANTALYA)	25.00	192.50	192.50	Private	Natural Gas	1-Jul-10
DİNAR HES (ELDA ELEKTRİK ÜRETİM)	4.44	15.00	9.00	Private	Hydro	3-Jul-10
DAMLAPINAR HES (CENAY ELEKTRİK ÜR.)	16.42	92.00	0.00	Private	Hydro	8-Jul-10
DİM HES (DİLER ELEKTRİK ÜRETİM)	38.25	123.00	70.00	Private	Hydro	8-Jul-10

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
ÖZGÜR ELEKTRİK (AZMAK I REG.VE HES)	5.91	0.00	0.00	Private	Hydro	10-Jul-10
ALTEK ALARKO ELEKTRİK SANTRALLARI	60.10	415.57	415.57	Private	Natural Gas	10-Jul-10
KİRPİLİK REG. VE HES (ÖZGÜR ELEKTRİK)	6.24	22.00	13.00	Private	Hydro	11-Jul-10
YAVUZ REG. VE HES (MASAT ENERJİ)	22.50	0.00	0.00	Private	Hydro	14-Jul-10
EREN ENERJİ ELEKTRİK ÜRETİM A.Ş.	160.00	4,005.88	4,005.88	Private	Coal	15-Jul-10
ZİYARET RES (ZİYARET RES ELEKTRİK)	12.50	0.00	0.00	Private	Wind	15-Jul-10
FLOKSER TEKSTİL (Çerkezköy/TEKİRDAĞ)	5.17	42.00	42.00	Autoproducer	Natural Gas	17-Jul-10
KAYABÜKÜ REG. VE HES (ELİTE ELEKT.)	14.58	0.00	0.00	Private	Hydro	21-Jul-10
RB KARESİ İTHALAT İHRACAT TEKSTİL	8.60	65.00	65.00	Autoproducer	Natural Gas	23-Jul-10
SOMA ENERJİ ÜRETİM (SOMA RES)	7.20	0.00	0.00	Private	Wind	28-Jul-10
ERİKLİ-AKOCAK REG. ve AKOCAK HES	41.25	0.00	0.00	Private	Hydro	29-Jul-10
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101.95	802.00	802.00	Private	Natural Gas	31-Jul-10
GÖK REG. ve HES (GÖK ENERJİ EL. SAN.)	10.01	43.00	24.00	Private	Hydro	6-Aug-10
BULAM REG. VE HES (MEM ENERJİ ELK.)	7.03	0.00	0.00	Private	Hydro	10-Aug-10
KESKİNOĞLU TAVUKÇULUK VE DAM. İŞL.	3.50	25.00	25.00	Autoproducer	Natural Gas	11-Aug-10
SOMA RES (BİLGİN Wind SAN. EN.ÜR.)	32.50	0.00	0.00	Private	Wind	13-Aug-10
BİNATOM ELEKTRİK ÜRETİM A.Ş.	2.00	13.00	13.00	Private	Natural Gas	17-Aug-10
KURTOĞLU BAKIR KURŞUN SAN. A.Ş.	1.59	12.00	12.00	Autoproducer	Natural Gas	19-Aug-10
CAN ENERJİ ELEKTRİK ÜR. A.Ş.(Tekirdağ)	29.10	203.00	203.00	Private	Natural Gas	19-Aug-10
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	12.61	0.00	0.00	Private	Hydro	20-Aug-10
SOMA ENERJİ ÜRETİM (SOMA RES)	6.30	0.00	0.00	Private	Wind	20-Aug-10
GÜDÜL I REG. VE HES (YAŞAM ENERJİ)	2.36	14.00	8.00	Private	Hydro	25-Aug-10
SÖNMEZ ENERJİ ÜRETİM (UŞAK)	33.24	248.59	248.59	Private	Natural Gas	26-Aug-10
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	12.61	0.00	0.00	Private	Hydro	28-Aug-10
KARŞIYAKA HES (AKUA ENERJİ ÜRET.)	1.59	0.00	5.00	Private	Hydro	28-Aug-10
ITC ADANA BİOKÜTLE SANT.	0.00	0.00	0.00	Private	LFG	2-Sep-10
BELEN ELEKTRİK (BELEN RES) (İlave)	6.00	0.00	0.00	Private	Wind	2-Sep-10
TEKTUĞ ELEKTRİK (ANDIRIN HES)	40.50	106.00	60.00	Private	Hydro	3-Sep-10
ÜTOPYA ELEKTRİK (DÜZOVA RES) (İlave)	15.00	0.00	0.00	Private	Wind	3-Sep-10
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	52.50	0.00	0.00	Private	Wind	4-Sep-10
ROTOR ELEKTRİK (OSMANİYE RES)	17.50	0.00	0.00	Private	Wind	4-Sep-10
SELEN ELEKTRİK (KEPEZKAYA HES)	28.00	0.00	0.00	Private	Hydro	6-Sep-10
REŞADİYE 2 HES (TURKON MNG ELEKT.)	26.14	0.00	0.00	Private	Hydro	17-Sep-10
KOZAN HES (SER-ER ENERJİ)	4.00	9.00	5.00	Private	Hydro	21-Sep-10
SOMA RES (BİLGİN Wind SAN) (İlave)	27.50	0.00	0.00	Private	Wind	23-Sep-10

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
KIRKA BORAKS(Kırka) (Eti Maden İşl.) (İlave)	10.00	65.93	65.93	Autoproducer	Natural Gas	29-Sep-10
KAHRAMAN REG. VE HES (KATIRCIOĞLU)	1.42	6.00	3.00	Private	Hydro	30-Sep-10
NARİNKALE REG. VE HES (EBD ENERJİ)	3.10	10.00	6.00	Private	Hydro	30-Sep-10
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	9.00	0.00	0.00	Private	Wind	1-Oct-10
ERENKÖY REG. VE HES (TÜRKERLER)	21.46	87.00	49.00	Private	Hydro	7-Oct-10
ENERJİ-SA (BANDIRMA)	1,000.00	7,540.00	7,540.00	Private	Natural Gas	7-Oct-10
UĞUR ENERJİ ÜR. TİC.VE SAN. A.Ş. (İlave)	12.00	100.86	100.86	Private	Natural Gas	7-Oct-10
ZİYARET RES (ZİYARET RES ELEK.)(İlave)	22.50	0.00	0.00	Private	Wind	13-Oct-10
KAHTA I HES (ERDEMYILDIZ ELEK. ÜRT.)	7.12	0.00	0.00	Private	Hydro	14-Oct-10
ROTOR ELEKTRİK (GÖKÇEDAĞ RES) (İlave)	2.50	0.00	0.00	Private	Wind	15-Oct-10
AZMAK-II REG. VE HES (Düzeltme)	-18.07	0.00	0.00	Private	Hydro	25-Oct-10
ITC ADANA BİOKÜTLE SANT. (Düzeltme)	0.00	0.00	0.00	Private	LFG	25-Oct-10
ENERJİ-SA (BANDIRMA) (Düzeltme)	-69.20	0.00	0.00	Private	Natural Gas	25-Oct-10
ULUABAT KUVVET TÜNELİ VE HES	48.51	0.00	0.00	Private	Hydro	27-Oct-10
SABUNSUYU II HES (ANG ENERJİ ELK.)	7.35	21.00	12.00	Private	Hydro	28-Oct-10
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600.00	4,005.88	4,005.88	Private	Coal	1-Nov-10
BURÇ BENDİ VE HES (AKKUR ENERJİ)	27.33	0.00	0.00	Private	Hydro	4-Nov-10
KARADENİZ EL. (UZUNDERE-1 HES)(İlave)	31.08	82.44	46.46	Private	Hydro	7-Nov-10
GÜZELÇAY-II HES (İLK ELEKTRİK ENERJİ)	4.96	26.33	14.70	Private	Hydro	11-Nov-10
MURGUL BAKIR (Ç.Kaya) (İlave)	19.60	40.50	31.59	Private	Hydro	11-Nov-10
KUYUCAK RES (ALİZE ENERJİ ÜRET.)	8.00	0.00	0.00	Private	Wind	11-Nov-10
SOMA RES (BİLGİN Wind SAN.)(İlave)	30.00	0.00	0.00	Private	Wind	11-Nov-10
ULUABAT KUVVET TÜNELİ VE HES (İlave)	48.51	0.00	0.00	Private	Hydro	25-Nov-10
MARMARA PAMUKLU MENSUCAT (İlave)	26.19	203.45	203.45	Autoproducer	Natural Gas	25-Nov-10
FRİTOLAY GIDA SAN.VE TİC A.Ş. (İlave)	0.33	3.00	3.00	Autoproducer	Biogas	26-Nov-10
EGEMEN 1 HES (ENERSİS ELEKTRİK)	8.82	0.00	0.00	Private	Hydro	26-Nov-10
REŞADİYE 1 HES (TURKON MNG ELEKT.)	15.68	0.00	0.00	Private	Hydro	26-Nov-10
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	69.84	557.92	557.92	Private	Natural Gas	26-Nov-10
YEDİGÖZE HES (YEDİGÖZE ELEKTRİK)	155.33	474.00	268.00	Private	Hydro	2-Dec-10
SÖNMEZ ENERJİ ÜRETİM (UŞAK) (İlave)	2.56	19.77	19.77	Private	Natural Gas	7-Dec-10
AK-ENERJİ (UŞAK OSB)(Uşak-Ak.en.)	-15.24	0.00	0.00	Private	Natural Gas	9-Dec-10
AK-ENERJİ(DG+N) (Deba-Denizli)	-15.60	0.00	0.00	Private	Natural Gas	9-Dec-10
KUYUCAK RES (ALİZE ENERJİ ÜR.) (İlave)	17.60	0.00	0.00	Private	Wind	9-Dec-10
UMUT III REG. VE HES (NİSAN ELEKTR.)	12.00	26.00	15.00	Private	Hydro	13-Dec-10
TÜPRAŞ RAFİNERİ (İZMİT) (İlave)	40.00	258.82	258.82	Autoproducer	Natural Gas	15-Dec-10

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
POLYPLEX EUROPA POLYESTER FİLM	7.81	61.00	61.00	Autoproducer	Natural Gas	16-Dec-10
ALTEK ALARKO ELEKTRİK SANTRALLARI	21.89	151.36	151.36	Private	Natural Gas	18-Dec-10
AKSA ENERJİ (Demirtaş/BURSA)	-1.40	0.00	0.00	Private	Waste	21-Dec-10
SARES RES (GARET ENERJİ ÜRETİM)	15.00	0.00	0.00	Private	Wind	22-Dec-10
FEKE 2 BARAJI VE HES (AKKUR ENERJİ)	69.34	0.00	0.00	Private	Hydro	24-Dec-10
EGEMEN 1B HES (ENERSİS ELEKTRİK)	11.10	0.00	0.00	Private	Hydro	28-Dec-10
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600.00	4,005.88	4,005.88	Private	Coal	29-Dec-10
RASA ENERJİ (VAN) (İlave)	10.12	64.41	64.41	Private	Natural Gas	29-Dec-10
KALKANDERE REG. VE YOKUŞLU HES	14.54	0.00	0.00	Private	Hydro	30-Dec-10
TURGUTTEPE RES (SABAŞ ELEKTRİK ÜR.)	22.00	0.00	0.00	Private	Wind	30-Dec-10
AK TEKSTİL-1 (G.antep)	-13.04	0.00	0.00	Autoproducer	FUEL-OİL	31-Dec-10
SİLOPİ ELEKTRİK ÜR. A.Ş. (ESENBOĞA)	-44.78	0.00	0.00	Private	FUEL-OİL	31-Dec-10
INTERNATIONAL HOSPITAL İSTANBUL AŞ.	0.77	6.00	6.00	Autoproducer	Natural Gas	31-Dec-10
TÜPRAŞ RAFİNERİ (İZMİT) (Düzeltme)	-39.14	0.00	0.00	Autoproducer	Natural Gas	31-Dec-10
YALOVA ELYAF	-12.30	0.00	0.00	Autoproducer	Natural Gas	31-Dec-10

Table 8b:
Source: http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2012.pdf

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
AKIM ENERJİ BAŞPINAR (SÜPER FİLM)	25.32	177.00	177.00	PRIVATE	NATURAL GAS	Unknown
AKSA AKRİLİK (İTHAL KÖM.+D.G)	25.00	175.00	175.00	PRIVATE	NATURAL GAS	Unknown
AKSA ENERJİ (Antalya)	300.00	1,800.00	1,800.00	PRIVATE	NATURAL GAS	Unknown
AKSA ENERJİ (Antalya) (İlave)	300.00	1,800.00	1,800.00	PRIVATE	NATURAL GAS	Unknown
ALDAŞ ALTYAPI YÖNETİM DANIŞMANLIK	1.95	15.00	15.00	AUTOPRODUCER	NATURAL GAS	Unknown
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	130.95	986.25	986.25	PRIVATE	NATURAL GAS	Unknown
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	8.73	67.76	67.76	PRIVATE	NATURAL GAS	Unknown
BEKİRLİ TES (İÇDAŞ ELEKTRİK EN.)	600.00	4.32	4.32	PRIVATE	IMPORTED COAL	Unknown
BOSEN ENERJİ ELEKTRİK ÜRETİM AŞ.	93.00	698.09	698.09	PRIVATE	NATURAL GAS	Unknown
BOYTEKS TEKSTİL SAN. VE TİC. A.Ş.	8.60	67.00	67.00	PRIVATE	NATURAL GAS	Unknown
CENGİZ ÇİFT YAKITLI K.Ç.E.S.	131.34	985.00	985.00	PRIVATE	NATURAL GAS	Unknown
CENGİZ ENERJİ SAN.VE TİC.A.Ş.	35.00	281.29	281.29	PRIVATE	NATURAL GAS	Unknown
ETİ BOR (Borik Asit)(Emet) (Düzeltme)	0.60	4.47	4.47	AUTOPRODUCER	NATURAL GAS	Unknown
FRAPORT IC İÇTAŞ ANTALYA HAVALİMANI	8.00	64.00	64.00	AUTOPRODUCER	NATURAL GAS	Unknown
GLOBAL ENERJİ (PELİTLİK)	4.00	29.91	29.91	PRIVATE	NATURAL GAS	Unknown
GORDİON AVM (REDEVCO ÜÇ EMLAK)	2.01	15.00	15.00	AUTOPRODUCER	NATURAL GAS	Unknown
GOREN-1 (GAZİANTEP ORGANİZE SAN.)	48.65	277.00	277.00	PRIVATE	NATURAL GAS	Unknown
GÜLLE ENERJİ(Çorlu) (İlave)	3.90	18.43	18.43	PRIVATE	NATURAL GAS	Unknown
HAMİTABAT (Lisans Tadili)	36.00	244.15	244.15	GOVERNMENT	NATURAL GAS	Unknown
HASIRCI TEKSTİL TİC. VE SAN. LTD. ŞTİ.	2.00	15.00	15.00	AUTOPRODUCER	NATURAL GAS	Unknown
HG ENERJİ ELEKTRİK ÜRET. SAN.TİC. A.Ş.	52.38	366.00	366.00	PRIVATE	NATURAL GAS	Unknown
ISPARTA MENSUCAT (Isparta)	4.30	33.00	33.00	AUTOPRODUCER	NATURAL GAS	Unknown
İSTANBUL SABİHA GÖKÇEN UL.AR. HAV.	4.00	32.00	32.00	AUTOPRODUCER	NATURAL GAS	Unknown
KARKEY (SİLOPİ 1)	100.44	697.67	697.67	PRIVATE	F.OIL	Unknown
KNAUF İNŞ. VE YAPI ELEMANLARI SN.	1.56	12.00	12.00	AUTOPRODUCER	NATURAL GAS	Unknown
LOKMAN HEKİM ENGÜRÜ SAĞ.(SİNCAN)	0.51	44.00	44.00	AUTOPRODUCER	NATURAL GAS	Unknown
MARDİN-KIZILTEPE (AKSA ENERJİ)	32.10	225.00	225.00	PRIVATE	F.OIL	Unknown
MOSB Enerji Elektrik Üretim Ltd. Şti.(İlave)	43.50	351.86	351.86	PRIVATE	NATURAL GAS	Unknown
NUH ENERJİ EL. ÜRT.A.Ş. (ENERJİ SANT.-2)	119.98	900.00	900.00	PRIVATE	NATURAL GAS	Unknown
ODAŞ DOĞALGAZ KÇS (ODAŞ ELEKTRİK)	54.96	415.00	415.00	PRIVATE	NATURAL GAS	Unknown

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
POLYPLEX EUROPA POLYESTER FİLM	3.90	31.45	31.45	AUTOPRODUCER	NATURAL GAS	Unknown
SAMSUN TEKKEKÖY EN. SAN. (AKSA EN.)	131.34	980.00	980.00	PRIVATE	NATURAL GAS	Unknown
SAMUR HALI A.Ş.	4.30	33.00	33.00	AUTOPRODUCER	NATURAL GAS	Unknown
SARAY HALI A.Ş.	4.29	33.00	33.00	AUTOPRODUCER	NATURAL GAS	Unknown
ŞANLIURFA OSB (RASA ENERJİ ÜR. A.Ş.)	116.76	800.00	800.00	PRIVATE	NATURAL GAS	Unknown
AKSU REG. VE HES (KALEN ENERJİ)	5.20	16.00	12.00	PRIVATE	HYDRO	Unknown
DEĞİRMENDERE (Kadirli) (KA-FNİH ELEK.)	0.50	1.20	0.80	OP.RIGHTS TRANSFER	HYDRO	Unknown
DERME (KAYSERİ VE CİVARI ENERJİ)	4.50	14.00	7.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
ERKENEK (KAYSERİ VE CİVARI ENERJİ)	0.32	1.23	0.74	OP.RIGHTS TRANSFER	HYDRO	Unknown
BALKONDU I HES (BTA ELEKTRİK ENERJİ)	9.19	33.00	20.00	PRIVATE	HYDRO	Unknown
BATMAN	0.48	1.16	1.08	PRIVATE	HYDRO	Unknown
GİRLEVİK (BOYDAK ENERJİ)	3.04	21.00	19.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
BERDAN	10.20	47.20	15.00	PRIVATE	HYDRO	Unknown
BOĞUNTU HES (BEYOBASI ENERJİ)	3.80	17.00	10.00	PRIVATE	HYDRO	Unknown
HAKKARİ (Otluca) (NAS ENERJİ A.Ş.)	1.28	6.00	5.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
HASANLAR	9.35	39.90	29.60	GOVERNMENT	HYDRO	Unknown
BÜNYAN (KAYSERİ VE CİVARI EL. T.A.Ş)	1.16	3.40	3.20	PRIVATE	HYDRO	Unknown
ÇAKIRMAN REG. VE HES (YUSAKA EN.)	6.98	22.00	15.00	PRIVATE	HYDRO	Unknown
İNEGÖL(Cerrah) (KENT SOLAR ELEKTRİK)	0.27	1.00	0.80	OP.RIGHTS TRANSFER	HYDRO	Unknown
İZNİK (Dereköy) (KENT SOLAR ELEKTRİK)	0.24	1.00	0.90	OP.RIGHTS TRANSFER	HYDRO	Unknown
ÇAMARDI (KAYSERİ VE CİVARI EL. T.A.Ş)	0.07	0.01	0.01	PRIVATE	HYDRO	Unknown
KARAÇAY (Osmaniye) (KA-FNİH ELEKTRİK)	0.40	2.30	2.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
ÇAMLICA III HES (ÇAMLICA ELEKTRİK)	27.62	43.00	25.00	PRIVATE	HYDRO	Unknown
ÇAMLIKAYA REG.VE HES (ÇAMLIKAYA EN)	2.82	6.71	3.88	PRIVATE	HYDRO	Unknown
ÇANAKÇI HES (CAN ENERJİ ENTEGRE)	4.63	19.43	10.96	PRIVATE	HYDRO	Unknown
ÇANAKÇI HES (CAN ENERJİ ENTEGRE)	4.63	19.43	10.96	PRIVATE	HYDRO	Unknown
ÇEŞMEBAŞI REG. VE HES (GİMAK EN.)	8.20	28.00	17.00	PRIVATE	HYDRO	Unknown
KAYADİBİ (BARTIN) (İVME ELEKTROMEK.)	0.46	2.30	2.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
KERNEK (KAYSERİ VE CİVARI ENERJİ)	0.83	0.80	0.60	OP.RIGHTS TRANSFER	HYDRO	Unknown
ÇUKURÇAYI HES (AYDEMİR ELEKTRİK ÜR.)	1.80	8.00	4.00	PRIVATE	HYDRO	Unknown
DAREN HES ELEKTRİK (SEYRANTEPE)	49.70	181.13	140.88	PRIVATE	HYDRO	Unknown
DURU 2 REG. VE HES (DURUCASU ELEK.)	4.49	22.00	13.00	PRIVATE	HYDRO	Unknown

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
KOVADA-I (BATIÇİM ENERJİ ELEKTRİK)	8.25	4.10	1.60	OP.RIGHTS TRANSFER	HYDRO	Unknown
KOVADA-II (BATIÇİM ENERJİ ELEKTRİK)	51.20	36.20	24.40	OP.RIGHTS TRANSFER	HYDRO	Unknown
ERENKÖY REG. VE HES (NEHİR ENERJİ)	21.46	87.00	49.00	PRIVATE	HYDRO	Unknown
EŞEN-1 HES (GÖLTAŞ ENERJİ ELEKTRİK)	30.00	120.00	65.00	PRIVATE	HYDRO	Unknown
EŞEN-1 HES (GÖLTAŞ ENERJİ ELEKTRİK)	30.00	120.00	65.00	PRIVATE	HYDRO	Unknown
GÖKMEN REG. VE HES (SU-GÜCÜ ELEKT.)	2.87	13.00	8.00	PRIVATE	HYDRO	Unknown
KUZUCULU (Dörtyol) (KA-FNİH ELEKTRİK)	0.27	1.30	1.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
M.KEMALPAŞA (Suuçtu) (KENT SOLAR)	0.47	1.50	1.30	OP.RIGHTS TRANSFER	HYDRO	Unknown
MALAZGİRT (MOSTAR ENERJİ ELEKTRİK)	1.22	4.00	3.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
TEKİRDAĞ-ÇORLU TEKS.TES.(NİL ÖRME)	2.68	21.00	21.00	AUTOPRODUCER	NATURAL GAS	Unknown
TİRENDA TİRE ENERJİ ÜRETİM A.Ş.	58.38	410.00	410.00	PRIVATE	NATURAL GAS	Unknown
TOROS TARIM (MERSİN) (NAFTA+D.GAZ)	12.14	96.00	96.00	AUTOPRODUCER	NAPHTA	Unknown
TÜPRAŞ O.A. RAFİNERİ (Kırıkkale) (İlave)	12.00	84.78	84.78	AUTOPRODUCER	NAPHTA	Unknown
YENİ UŞAK ENERJİ ELEKTRİK SANTRALI	8.73	65.00	65.00	PRIVATE	NATURAL GAS	Unknown
ZORLU ENERJİ (B.Karıştıran)	7.20	54.07	54.07	PRIVATE	NATURAL GAS	Unknown
ADİLCEVAZ (MOSTAR ENERJİ ELEKTRİK)	0.39	0.80	0.50	OP.RIGHTS TRANSFER	HYDRO	Unknown
AHLAT (MOSTAR ENERJİ ELEKTRİK)	0.20	0.60	0.50	OP.RIGHTS TRANSFER	HYDRO	Unknown
HACININOĞLU HES (ENERJİ-SA ENERJİ)	71.14	180.00	102.00	PRIVATE	HYDRO	Unknown
HACININOĞLU HES (ENERJİ-SA ENERJİ)	71.14	180.00	102.00	PRIVATE	HYDRO	Unknown
HASANLAR HES (DÜZCE ENERJİ BİRLİĞİ)	4.68	21.00	12.00	PRIVATE	HYDRO	Unknown
İNCİRLİ REG. VE HES (LASKAR ENERJİ)	25.20	126.00	71.00	PRIVATE	HYDRO	Unknown
KARASU 4-3 HES (İDEAL ENERJİ ÜRETİMİ)	4.60	22.00	12.00	PRIVATE	HYDRO	Unknown
KARASU 5 HES (İDEAL ENERJİ ÜRETİMİ)	4.10	24.00	14.00	PRIVATE	HYDRO	Unknown
BAYBURT (BOYDAK ENERJİ)	0.40	1.90	1.70	OP.RIGHTS TRANSFER	HYDRO	Unknown
KARASU I HES (İDEAL ENERJİ ÜRETİMİ)	3.84	19.00	11.00	PRIVATE	HYDRO	Unknown
BESNİ KAYSERİ VE CİVARI ENERJİ)	0.27	0.50	0.20	OP.RIGHTS TRANSFER	HYDRO	Unknown
KAZANKAYA REG. VE İNCESU HES (AKSA)	15.00	48.00	27.00	PRIVATE	HYDRO	Unknown
KESME REG. VE HES (KIVANÇ ENERJİ)	2.31	8.02	4.51	PRIVATE	HYDRO	Unknown
KESME REG. VE HES (KIVANÇ ENERJİ)	2.31	8.02	4.51	PRIVATE	HYDRO	Unknown
ÇAĞ-ÇAĞ (NAS ENERJİ A.Ş.)	14.40	25.00	22.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
KIRAN HES (ARSAN ENERJİ A.Ş.)	9.74	41.00	23.00	PRIVATE	HYDRO	Unknown

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
KORUKÖY HES (AKAR ENERJİ SAN. TİC.)	3.03	22.00	13.00	PRIVATE	HYDRO	Unknown
KÖYOBASI HES (ŞİRİKOĞLU ELEKTRİK)	1.07	5.00	3.00	PRIVATE	HYDRO	Unknown
KOZDERE HES (ADO MADENCİLİK ELKT.)	3.15	14.00	8.00	PRIVATE	HYDRO	Unknown
KULP I HES (YILDIZLAR ENERJİ ELK.ÜR.)	22.92	78.00	44.00	PRIVATE	HYDRO	Unknown
ÇEMİŞKEZEK (BOYDAK ENERJİ)	0.12	0.80	0.50	OP.RIGHTS TRANSFER	HYDRO	Unknown
MOLU ENERJİ (Zamantı-Bahçelik HES)	4.17	30.00	30.00	PRIVATE	HYDRO	Unknown
MURATLI REG. VE HES (ARMAHES EL.)	26.70	94.00	55.00	PRIVATE	HYDRO	Unknown
NARİNKALE REG. VE HES (EBD ENERJİ)	30.40	108.00	61.00	PRIVATE	HYDRO	Unknown
ÖREN REG. VE HES (ÇELİKLER ELEKTRİK)	6.64	29.00	16.00	PRIVATE	HYDRO	Unknown
OTLUCA II HES (BEYOBASI ENERJİ ÜR.)	6.36	27.00	15.00	PRIVATE	HYDRO	Unknown
PINARBAŞI (KAYSERİ VE CİVARI EL.T.A.Ş)	0.10	0.40	0.30	OP.RIGHTS TRANSFER	HYDRO	Unknown
POYRAZ HES (YEŞİL ENERJİ ELEKTRİK)	2.66	10.00	6.00	PRIVATE	HYDRO	Unknown
SARAÇBENDİ HES (ÇAMLICA ELEKTRİK)	25.48	101.00	57.00	PRIVATE	HYDRO	Unknown
SARIKAVAK HES (ESER ENERJİ YAT. AŞ.)	8.06	43.00	24.00	PRIVATE	HYDRO	Unknown
SAYAN HES (KAREL ELEKTRİK ÜRETİM)	14.90	47.00	27.00	PRIVATE	HYDRO	Unknown
SEFAKÖY HES (PURE ENERJİ ÜRETİM AŞ.)	33.11	121.00	68.00	PRIVATE	HYDRO	Unknown
SEYRANTEPE HES (Düzeltme))	7.14	26.02	20.24	PRIVATE	HYDRO	Unknown
SIZIR (KAYSERİ VE CİVARI EL. T.A.Ş)	5.76	46.00	35.00	OP.RIGHTS TRANSFER	HYDRO	Unknown
SÖĞÜTLÜKAYA (POSOF III) HES	6.13	31.00	18.00	PRIVATE	HYDRO	Unknown
TEFEN HES (AKSU MADENCİLİK SAN.)	11.00	47.00	26.67	PRIVATE	HYDRO	Unknown
TEFEN HES (AKSU MADENCİLİK SAN.)	22.00	94.00	53.33	PRIVATE	HYDRO	Unknown
TURUNÇOVA(Finike) (TURUNÇOVA EN.)	0.55	1.50	0.80	OP.RIGHTS TRANSFER	HYDRO	Unknown
TUZTAŞI HES (GÜRÜZ ELEKTRİK ÜR.)	1.61	10.00	6.00	PRIVATE	HYDRO	Unknown
ULUDERE (NAS ENERJİ A.Ş.)	0.64	3.20	2.60	OP.RIGHTS TRANSFER	HYDRO	Unknown
ÜZÜMLÜ HES (AKGÜN ENERJİ ÜRETİM)	11.36	41.00	23.00	PRIVATE	HYDRO	Unknown
VARTO (MOSTAR ENERJİ ELEKTRİK)	0.29	0.80	0.60	OP.RIGHTS TRANSFER	HYDRO	Unknown
YAMAÇ HES (YAMAÇ ENERJİ ÜRETİM A.Ş.)	5.46	17.00	10.00	PRIVATE	HYDRO	Unknown
YAPRAK II HES (NİSAN ELEKTROMEK.)	5.40	16.00	10.50	PRIVATE	HYDRO	Unknown
YAPRAK II HES (NİSAN ELEKTROMEK.)	5.40	16.00	10.50	PRIVATE	HYDRO	Unknown
YAŞIL HES (YAŞIL ENERJİ ELEKTRİK)	1.52	6.00	3.20	PRIVATE	HYDRO	Unknown
YAŞIL HES (YAŞIL ENERJİ ELEKTRİK)	2.28	9.00	4.80	PRIVATE	HYDRO	Unknown
YEDİGÖL REG. VE HES (YEDİGÖL HİDR.)	21.90	77.00	42.00	PRIVATE	HYDRO	Unknown

Unit Name	Capacity (MW)	Project Production Potential (GWh)	Firm Production (GWh)	Type	Fuel	Date of Commissioning
YEDİGÖZE HES (YEDİGÖZE ELEK.) (İlave)	155.33	474.83	133.95	PRIVATE	HYDRO	Unknown
AYRANCILAR HES (MURADİYE ELEKTRİK)	13.38	53.34	31.16	PRIVATE	HYDRO	Unknown
AYRANCILAR HES (MURADİYE ELEKTRİK)	18.72	74.64	43.73	PRIVATE	HYDRO	Unknown
BAYRAMHACILI BARAJI VE HES	47.00	175.00	95.00	PRIVATE	HYDRO	Unknown
CEVHER I-II REG. VE HES (ÖZCEVHER EN.)	16.36	65.00	32.00	PRIVATE	HYDRO	Unknown
KARASU II HES (İDEAL ENERJİ ÜRETİMİ)	3.08	13.00	8.00	PRIVATE	HYDRO	Unknown
BANDIRMA ENERJİ (BANDIRMA RES)	3.00	10.50	9.50	PRIVATE	WIND	Unknown

APPENDIX III :THE EIA NOT NECESSARY CERTIFICATE OF THE PROJECT ACTIVITY

T.C.
Çevre ve Orman Bakanlığı

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

Karar Tarihi: 16/07/2007
Karar No :

ÇED GEREKLİ DEĞİLDİR BELGESİ

16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 17. maddesi gereğince; "Düzce-Aksu HES *(46,20 MW)*" projesi hakkında "*Çevresel Etki Değerlendirmesi Gerekli Değildir*" kararı verilmiştir.

Osman TÜZÜN
Bakanın
Genel Müdürü

Proje Sahibi :Düzce-Aksu Hid. Elk.Enerjiden Elektrik Üretim Sant.Ltd. Şti.
Projenin Yeri :Düzce İli, Gölyaka İlçesi, Aksu Deresi.

APPENDIX IV: THE ELECTRICITY GENERATION LICENSE

EPDK

T.C. ENERJİ PİYASASI
DÜZENLEME KURUMU

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi
Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/921-3/724
Tarih : 21/09/2006

Bu Lisans, **Düzce Aksu Elektrik Üretim A.Ş.**'ye, Düzce ilinde kurulacak Düzce-Aksu Hidroelektrik üretim tesisinde 21/09/2006 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Düzenleme Kurulu'nun 21/09/2006 tarihli ve 921-3 sayılı Kararı ile verilmiştir.

Hasan KÖKTAŞ
Başkan

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

APPENDIX V: THE MAP SHOWING THE RESERVOIR AREA OF THE PROJECT ACTIVITY