BÜYÜKDÜZ HYDROELECTRIC POWER PLANT, TURKEY

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Büyükdüz Hydroelectric Power Plant (HEPP) is a run-of-river type hydrolic renewable energy facility project. It has an installed capacity of 70.844 MWm / 68.862 MWe, and an annual predicted average generation amount of 192,021,000 kWh. There are two turbines each having a capacity of 35.422 MWm / 34.431 MWe.[1]

The Project field is located in the Black Sea region, and in Eastern Black Sea regional basin, inside the borders of Gumushane province, and over Manastir (Dere kapi) creek that is a branch of Harsit River and confluences with that between Torul and Kurtun dams over Harsit River.

There are two weirs included in the project, namely Elmali and Tasoba Weirs. Elmali weir is located 11 km, and Taşoba weir is 10 km, and Büyükdüz HEPP is 5 km away, as air distance, from the centre of Kürtün District.

Elmali weir is constructed as a radial gate concrete structure on the Kurtun branch of Manastir creek. The location of Elmali weir is on the Kurtun branch of Manastir creek that is divided into two branches before it confluences with the Harsit River.

Tasoba weir is constructed on Cizere creek (Manastir branch) as a radial gate concrete structure. The location of Tasoba weir is on the main branch of Manastir creek that is divided into two branches before it confluences with the Harsit River.

Waters of Tasoba and Elmali weirs and natural flows diverted form Manastir creek will be fed into the turbines of Büyükdüz HEPP in order to generate electricity.

The project activity will reduce greenhouse gas emissions as reference to the baseline scenario taking into account that it is a zero emission project. No greenhouse gas or particulate matter emission will take place within project boundary and no leakage emissions will occur. Hence, a net emission reduction from the baseline emission level to zero level will result with the energy generated by the project that will displace the energy that would otherwise be generated by the fossil fuel fired power plants in the national grid. Although many harmful gases including the greenhouse gases and particulate matters will be avoided by the emission reduction process, only CO_2 will be considered in the emission reduction.

The scenario existing prior to the start of the implementation of the project activity was no electricity generation since the project is a greenfield project. Without the implementation of the project, the same amount of energy would be generated by other power plants of the national grid. Considering the general fossil fuel domination in the national grid, a natural gas or coal fired thermal power plant on average would generate this energy. This imaginary power plant would also emit greenhouse gases including CO_2 and particulate matters. Since the project will emit no greenhouse gases within its boundary and no leakage is in question, an emission caused by the

[1] Buyukduz HEPP Generation Licence, granted by Energy Market Regulatory Authority, dated 20/03/2008, Licence No: EU/1539-5/1123.

net electricity generation displaced by the project activity was produced prior to the implementation of the project.

The electrical energy generated by the project will replace the electrical energy of the national grid, based mainly on various fossil fuel sources like natural gas and coal. The Combined Margin Emission Factor is found to be $EF_{grid,CM,y}$ = 0.535 tCO_2/MWh in sub-section 3.4 of this document. Hence, the expected annual emission reduction to be caused by the project will be around 102,731 tonnes of CO_2e. For a 10-year crediting period the expected emission reductions will be about 1,027,309 tonnes of CO_2e.

The project was commissioned and the operation of the project and electricity generation started on 31 May 2012. The expected operational life of the project is assumed to be 35 years, as explained in the Section 1.8.

1.2 Sectoral Scope and Project Type

Scope number : 1

Sectoral scope: Energy industries (renewable - / non-renewable sources)

The project is not a grouped project.

1.3 Project Proponent

Organization name	Ayen Enerji A.S.
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1.4 Other Entities Involved in the Project

There are no other entities involved in the project.

1.5 Project Start Date

The Project was commissioned and started to feed energy to the grid on 31 May 2012. This is the date on which the project started to produce emission reductions. [2]

[2] Buyukduz HEPP Provisional Acceptance Protocol, dated 31/05/2012.

1.6 Project Crediting Period

The project crediting period is 10 years; 31/05/2012-30/05/2022 (both days included). The crediting period is renewable twice.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	☑
Large project	

Table 1. Estimated GHG Emisson Reductions of the Project

Year	Estimated GHG emission reductions or removals (tCO_2e)
2012	60,066
2013	102,731
2014	102,731
2015	102,731
2016	102,731
2017	102,731
2018	102,731
2019	102,731
2020	102,731
2021	102,731
2022	42,664
Total estimated ERs	1,027,309
Total number of crediting years	10
Average annual ERs	102,731

1.8 Description of the Project Activity

Büyükdüz HEPP is a river type hydraulic power plant and is located on the Demirkapi and Kurtun River in the Gumushane province.

• A water intake is located on the Demirkapi River at Tasoba on elevation 1189.50-1185.00 with a gated weir, an inlet structure with trashrack, gates and two sand traps for a maximum water discharge of ca. 8 m³/s.

• A water intake is located on the Kurtun River at Elmali on elevation 1189.50-1185.00 with a gated weir, an inlet structure with trashrack, gates and two sand traps for a maximum water discharge of ca. 8 m^3/s.

• A 6.8 km and 4.9 km long Y-Type headrace tunnel is present between the two water intakes on the reservoir.

• There is a reservoir with around 3,000 m^3 situated on elevation 1181.43 m a.s.l.

• The waterways are with a 902 m long first part of penstock, with a 680 m long headrace tunnel and a 89 m long second part of penstock.

• The open-air powerhouse has an installed turbine capacity of 68.9 MW.

General technical specifications of the project activity can be summarized as follows:

Table 2. General Technical Specifications of Büyükdüz Hydroelectric Power Plant

Item No	Descriptions			
1	Stream Name / Main Branch Name	:	Kurtun, Cizere Streams / Harsit Brook	
2	Used Flow Observation Station No.	:	DSI 22-009, DSI 22-84	
			Elmali Weir	Tasoba Weir
3	Precipitation Area (km^2)	:	155.8	139.6
4	Average Flow Rate (m^3/s)	:	3.928	2.594
5	Average Annual Total Flow (hm^3)	:	124.082	81.957
6	Q_{25} Bankfull Discharge (m^3/s)	:	94.04	67.78
7	Q_{100} Bankfull Discharge (m^3/s)	:	183.50	121.97
8	Weir Type	:	Radial gated solid webbed concrete with sluice outlet	
9	Crest Elevation (m)	:	1191.30	1191.30
10	Maximum Water Elevation (m)	:	1190.00	1190.00
11	Spillway Elevation (m)	:	1189.50	1189.50
12	Minimum Water Elevation (m)	:	1185.00	1185.00
13	Stream Bed Elevation (m)	:	1174.70	1177.80
14	Power Plant Tailrace Elevation (m)	:	672.00	
15	Diversion Tunnel Type	:	Basket handle section free surface	
16	Diversion Tunnel Length (m)	:	4 917.62 + 366.93	6 932.65
17	Diversion Tunnel Slope	:	0.0005	0.00032
18	Headrace Length (m)	:	211.30	
19	Headrace Slope	:	0.0005	
20	Penstock Diameter (m)	:	2.00	

21	Penstock Length (m)	:	1677
22	Penstock Wall Thickness (mm)	:	8 – 35
23	Turbine Type	:	Vertical Axis Pelton
24	Number of Units	:	2 identical
25	Busbar Voltage (kV)	:	11
26	Energy Transmission Line Section	:	(2x477) MCM
27	Energy Transmission Line Length (m)	:	300
28	Gross Head (m)	:	507.24
29	Net Head (m)(Two Units)	:	488.512
30	Project Flow Rate (m^3/s)	:	16.371
31	Installed Capacity (MW)	:	34.431 x 2
32	Firm Capacity (MW)	:	3.766
33	Firm Energy (GWh)	:	32.993
34	Secondary Energy (GWh)	:	159.027
35	Total Energy (GWh)	:	192.021

The plant load factor could be calculated as follows:

$$\frac{192{,}021 MWh}{68.862 MW * 365 days * 24 hours} = \frac{192{,}021 MWh}{603{,}231.12 MWh} = 0.318312 = 31.83\%$$

There are no descriptive information about the age and average lifetime of the equipment based on manufacturer's specifications. However, the generation licence was granted for 49 years. But general procedures applied by the General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs impose that at least 85% of the equipment has to be renewed after 35 years of operation and 35 years is a generally accepted and mentioned period in the industry standards and/or applications in Turkey.[3,4,5,6] Hence, 35 years is accepted as the expected lifetime of the project.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity. Since the project is a greenfield project, not a retrofit or a capacity addition project, the same amount of energy that will be supplied by the project would be generated by other power plants of the national grid without the implementation of the project.

[3] http://www.e-kutuphane.imo.org.tr/pdf/13085.pdf
[4] http://www.enerjisa.com.tr/tr-TR/ElektrikUretimi/ProjeDokumanlari/KavsakBendi_CED_Nihai_tr.pdf
[5] http://tedarikci.enerjisa.com/tr-TR/ElektrikUretimi/ProjeDokumanlari/Kopru_CED_Raporu_Tr.pdf
[6] http://mer.markit.com/br-reg/PublicReport.action?getDocumentById=true&document_id=103000000008498

There had been no facilities, systems or equipment in operation under the existing scenario prior to the implementation of the project in the area where the project is located.

1.9 Project Location

Table 3. Project Location Details of Büyükdüz Hydroelectric Power Plant

Item No	Descriptions	
1	Province	Gumushane
2	District	Kurtun
3	Basin Name	Harsit Basin
4	DSI (SHW) Region	22. Region
5	1/25 000 Map Names	G42 - d1, d3, d4
6	Elmali Weir 6^0 UTM Coordinates	4494210(N) / 503843(E)
7	Tasoba Weir 6^0 UTM Coordinates	4490395(N) / 510892(E)
8	Power Plant 6^0 UTM Coordinates	4498293(N) / 509514(E)

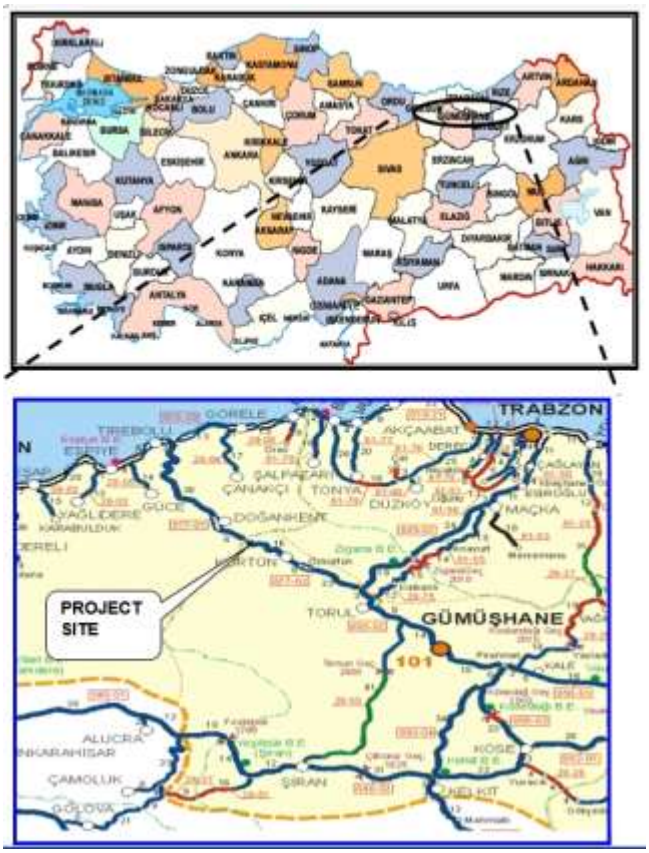

Figure 1. Project Site Location Map (Source : EIA Report)[7]

[7] Taşoba – Elmali Weirs, Büyükdüz HEPP and Construction Material Quarries Final EIA Report, prepared by Topcuoglu Mining, Industry and Trade Co. Ltd. Dated February 2008. English Version. Section II: Location of the Project Site, pages 17 – 18.

1.10 Conditions Prior to Project Initiation

There had been no other facilities on the project location when the project construction began. Since the project activity involves construction and implementation of a run of river type hydroelectric power plant on a location where there had been no other facilities, it is a greenfield project, and a retrofit or a capacity addition for an already existing facility is not in question. Also, the project activity does not generate any GHG emissions. Consequently, any possibility of the implementation of the project to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction is automatically excluded.

The baseline scenario for the project activity is the same as the conditions existing prior to the project initiation, as explained in the Section 2.4 of this document about Baseline Scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is in compliance with all the applicable and relevant laws, statutes and other regulatory frameworks. The most important of these are listed below table.

Table 4. Important mandatory laws and regulations that the project is consistent with

(a) Legislation about electricity generation and marketing:

Law / Regulation / Communiqué / Protocol	Number / Enforcement Date
Electricity Market Law	4628 / 03.03.2001
Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy	5346 / 18.05.2005
Energy Efficiency Law	5627 / 02.05.2007
Electricity Market Licence Regulation	- / 04.08.2002
Electricity Market Grid Regulation	- / 22.01.2003
Electricity Market Distribution Regulation	- / 19.02.2003
Regulation on Procedures and Principles as to Giving Renewable Energy Source Certificate	- / 04.10.2005
Regulation on Certification and Support of Renewable Energy Sources	- / 21.07.2011
Electricity Transmission System Supply Reliability and Quality Regulation	- / 10.11.2004
Electrical Installations Project Regulation	- / 16.12.2009
Regulation on Technical Evaluation of Licence Applications based on Wind Energy	- / 09.11.2008
Competition Regulation as to Licence Applications to Install Generation Facility Based On Wind Energy	- / 22.09.2010
Protocol as to Establishment of Permission Procedures about Effects of Wind Energy Power Plant Installation on Communication, Navigation and Radar Systems	- / 27.12.2010
Regulation on Domestic Manufacturing of the Equipment Used in Facilities Generating Electrical Energy from Renewable Energy Sources	- / 19.06.2011
Regulation on Electrical Energy Demand Forecasts	- / 04.04.2006
Electricity Market Balancing and Settlement Regulation	
Electricity Market Tariffs Regulation	
Electricity Market Import and Export Regulation	- / 25.09.2002

Electricity Market Customer Services Regulation	- / 25.09.2002
Electricity Market Eligible Consumer Regulation	- / 04.09.2002
Electricity Market Ancillary Services Regulation	- / 27.12.2008
Communiqué on Connection to Transmission and Distribution Systems and System Usage in the Electricity Market	- / 27.03.2003
Communiqué on Arrangement of Retail Contract in the Electricity Market	- / 31.08.2003
Communiqué on Meters to be used in the Electricity Market	- / 22.03.2003
Communiqué on Wind and Solar Measurements	- / 11.10.2002
Communiqué on Procedures and Principles of Making Financial Settlement in the Electricity Market	- / 30.03.2003

(b) Legislation about environment, forestry, labour and social security:

Law / Regulation / Communiqué / Protocol	Number / Enforcement Date
Environmental Law	2872 / 11.08.1983
Forestry Law	6831 / 08.09.1956
Labour Law	4857 / 22.05.2003
Construction Law	3194 / 09.05.1985
Law on Soil Conservation and Land Use	5403 / 19.07.2005
National Parks Law	2873 / 11.08.1983
Cultural and Natural Heritage Preservation Law	2863 / 23.07.1983
Animal Protection Law	5199 / 01.07.2004
Environmental Impact Assessment Regulation	- / 17.07.2008
Regulation on Environmental Planning	- / 11.11.2008
Regulation on Permissions and Licences that have to be taken according to Environmental Law	- / 29.04.2009
Air Quality Assessment and Management Regulation	- / 06.06.2008
Environmental Auditing Regulation	- / 22.09.2010
Regulation on Environmental Agents and Environmental Consulting Firms	- / 12.11.2010
Regulation on Assessment and Management of Environmental Noise	- / 04.06.2010
Regulation on Control of Waste Oils	- / 30.07.2008
Regulation on Amendment in the Regulation on Control of Waste Oils	- / 30.03.2010
Regulation on diggings that will be done where it is not possible to construct a sewage course	- / 19.03.1971
Regulation on Occupational Health and Safety	- / 09.12.2003
Noise Regulation	- / 23.12.2003
Vibration Regulation	- / 23.12.2003
Regulation on Machine Safety	- / 05.06.2002

1.12 Ownership and Other Programs

1.12.1 Right of Use

The generation licence granted by the Energy Market Regulatory Authority of Turkey,[1] in the name of the project proponent proves that the ownership of the power plant, all the equipment, and the generated electrical energy belongs to the project proponent as a legal entity. Consequently, all the emission reductions, removals or destructions originating from the project are owned by the project proponent.

1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable. The project activity is not included in any emission trading programs or other binding limits. Although Turkey is an Annex I Party to the UNFCCC, it is a party for which there is a specific COP and/or CMP decision, and it is not an Annex B country of the Kyoto Protocol having national binding targets or regulations.[8,9] Turkey can host neither CDM nor JI projects, and the project activity has been developed solely as a voluntary emission reduction project.

1.12.3 Other Forms of Environmental Credit

Not applicable. The project has not sought or received any other form of GHG-related environmental credits, including renewable energy certificates.

1.12.4 Participation under Other GHG Programs

Not applicable. The project has not been registered, or is seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

Not applicable. The project has not been rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project is eligible to be a VCS Project since all the related rules indicated in the latest VCS version can be applied to the project. The project activity is a newly developed, greenfield, renewable, and grid connected electricity generation project generating no GHG emissions.

In addition, the project is not a grouped or a bundled project.

Leakage Management

[8] http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php
[9] http://unfccc.int/essential_background/kyoto_protocol/items/1678.php

Not applicable. The leakage is not considered as per the applied methodology (ACM0002).[10]

Commercially Sensitive Information

This project description does not include any commercially sensitive information.

Further Information

No relevant further information is applicable.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The approved baseline and monitoring methodology applied to the project activity is "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0".

Tools referenced in this methodology:

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

2. Combined tool to identify the baseline scenario and demonstrate additionality (Version 05.0.0)

3. Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02.0.0)

4. Tool to calculate the emission factor for an electricity system (Version 04.0.0)

Only two of these tools, "Tool to calculate the emission factor for an electricity system (Version 04.0.0)" for baseline emission calculation and "Tool for the demonstration and assessment of additionality (Version 07.0.0)" for the assessment of additionality are used.

Since no project emission or leakage is in question regarding the project activity, "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02.0.0)" is not used. "Combined tool to identify the baseline scenario and demonstrate additionality (Version 05.0.0)" is also not used since it is not applicable to the project according to the scope and rules defined therein.

2.2 Applicability of Methodology

The choice of methodology ACM0002 and related tools are justified based on the fact that the proposed project activity meets the following relevant applicability conditions of the chosen methodology and tools:

[10] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0, Section 5.6 Leakage, page 17.
http://cdm.unfccc.int/filestorage/A/0/4/A04BWNRKLUEP6O1QX75YVTH28JDICZ/EB%2075_repan13_ACM0002_ver%2014.0.pdf?t=VEp8bjR1cHo2fDBdMtbCdJh79IFzZaqfneLX

- The project is a greenfield project. No power plant or a similar facility had been present in the project site when the project activity began.
- The project is a grid-connected renewable power generation project.
- The project activity does not involve any capacity addition or any retrofit or replacement of an existing power plant.
- The project activity is the installation of a run-of-river type hydroelectric power plant.
- There is no project emission or leakage related with the project activity.
- A clear grid boundary and grid characteristics can be identified for the relevant electricity system.
- Project Power Density is higher than 4 W/m2. (The power densities for the whole project, and for Elmali and Tasoba Weirs are all higher than, 10 W/m^2, resulting in zero project emission, as shown in the calculations in Section 2.4 about Baseline Scenario)

2.3 Project Boundary

The project utilises hydropower as the primary energy source to generate electricity. During normal operation when enough water flow is present to generate electricity, the project activity draws no energy from the grid to meet its auxiliary electricity consumption need. The project meets its auxiliary electricity consumption need from its own generated electricity. When there is not sufficient water to generate electricity, the project will draw some electricity from the grid to use for auxiliary electricity consumption. There is a backup power generator using diesel fuel to be used only when power cannot be supplied from the grid due to a connection loss, grid maintenance, or a power outage in the grid. Under only very such rare occasions will the backup power generator operate and produce emissions. These emissions are expected to be very low and can be neglected; so assumed to be zero.

Apart from the backup diesel power generator, there is no equipment or machinery related with the project activity that can produce any emissions.

Table 5. Relevant GHG Sources, Sinks and Reservoirs for the Project and Baseline Scenarios (Leakage not applicable)

Source		Gas	Included?	Justification/Explanation
Baseline	Electricity generation mix of national grid displaced by project activity	CO_2	Yes	Major GHG emission from the power plants in the fossil-fuel dominated national grid in the absence of the project activity is CO_2. The amount of other gases and pollutants are very low compared to CO_2. So, CO_2 is included in the baseline emission calculation.
		CH_4	No	Although there may be CH_4 or N_2O emissions from the power plants in the grid during
		N_2O	No	

Source		Gas	Included?	Justification/Explanation
		Other	No	electricity generation in the absence of the project activity, these emissions would be very low and trivial as compared to CO_2. As a result, CH_4 or N_2O emissions in the baseline emission calculations are neglected and assumed as zero.
Project	Activities during constructional and operational phases of the project	CO_2	No	Under normal conditions, no CO_2, CH_4 or N_2O emissions will occur apart from normal domestic activities of the personnel like heating and cooking. And those emissions resulting from these domestic activities will be very low to be taken into account in the calculations. So, these are neglected and not included.
		CH_4	No	
		N_2O	No	
		Other	No	

According to the used methodology "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0", "Project boundary" is defined as "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to."[11]

An electricity system is defined in the relevant tool, "Tool to calculate the emission factor for an electricity system (Version 04.0)" as "A grid/project electricity system - is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints;".[12]

Accordingly, the project boundary is defined as the Turkish national grid.

The flow diagram of the project boundary with its connections to the national grid is shown in the following figure in the next page. The monitoring variable used for emission reduction calculations is the net amount of generated electricity measured by two monitoring systems consisting of main and backup electricity meters for each unit.

[11] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5. Baseline Methodology – Sub-section 5.1. Project Boundary, Paragraph 20, page 8.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[12] Tool to calculate the emission factor for an electricity system (Version 04.0), Section 4 - Definitions, Paragraph 10 (e), page 6.
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

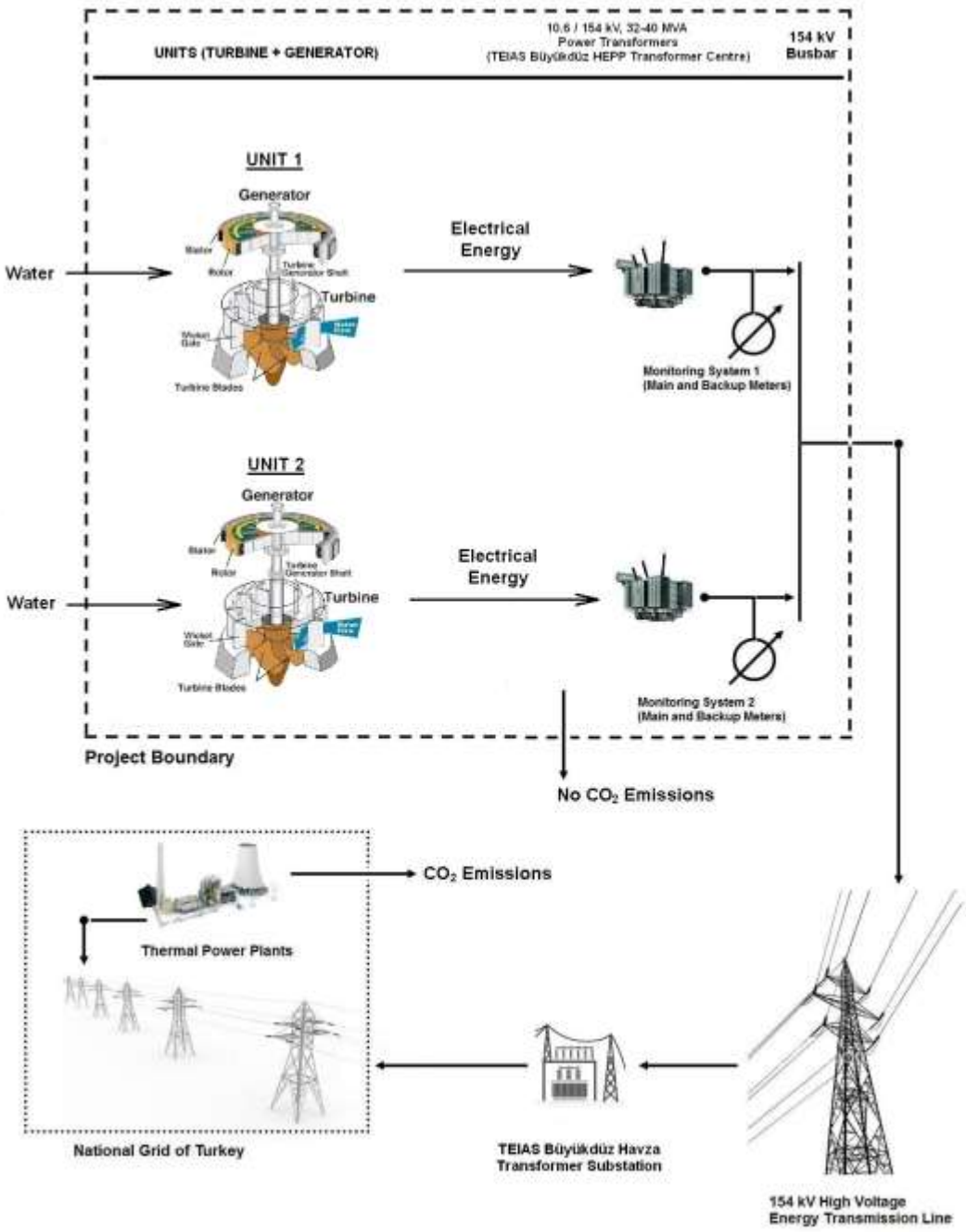

Figure 2. Schematic diagram showing the flow diagram of the project boundary, its connection to national grid, and emission sources and gases included in the project boundary and monitoring variables. The diagram was prepared by the project proponent by using the information given in the turbine specifications brochure[13], the extended official single line diagram[14], the simplified official single line

[13] Alstom Hydro Pelton Power Plant Brochure, provided to DOE.
[14] Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 27, Pages 292 – 293. Provided to DOE.

diagram of the project[15], and the connection and system usage agreements made between TEIAS and the project proponent[16,17].

2.4 Baseline Scenario

The selected baseline methodology for the development of Project Description is "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0"[18]. So, the most plausible baseline scenario is identified in accordance with this methodology.

Baseline methodology procedure explained on pages 4 – 6 of this methodology (Section 2.2 Applicability) proposes three alternatives for identification of the baseline scenario. Since the project activity is the installation of a new grid-connected hydroelectric power plant with 2 units (turbines and generators), and is not a capacity addition to or the retrofit or replacement for an existing grid-connected renewable power plant, the first alternative (Item (a) in paragraph 4) is the most suitable one for the project for identification of the baseline scenario; which is explained as follows[19]:

"2.2. Applicability
3. This 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).
4. The methodology is applicable under the following conditions:
(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;"

Since the project activity has nothing to do with a capacity addition or the retrofit or replacement of an existing grid-connected renewable power plant/unit(s) at the project site, the other alternative scenarios and respective step-wise procedures are not applicable.

Also, regarding the specific rules about the hydro power plants, the following explanations are given[20]:

"5. In case of hydro power plants:
6. 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

[15] Buyukduz HEPP Simplified Official Single-Line Diagram. Approved by TEIAS 14. Group Directorate of Transmission Installation and Operation, dated 30.05.2012. Provided to DOE.
[16] Connection Agreement made between the Project Proponent and TEIAS, dated 20/12/2010. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 5, Pages 33 – 88. Provided to DOE.
[17] System Usage Agreement made between the Project Proponent and TEIAS, dated 10/04/2012. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 6, Pages 89 – 104. Provided to DOE.
[18] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[19] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 2.2 Applicability, paragraphs 3 and 4, page 4. http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[20] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 2.2 Applicability, paragraphs 5 and 6, page 5. http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

(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/m^2; 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/m^2."

The power density for the Büyükdüz HEPP is calculated according to the directions given in the methodology[21]:

"37. The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Equation (5)

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A_{PJ}	=	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero"

For Büyükdüz HEPP, Cap_{PJ} = 68.862 MWe = 68,862,000 We, and Cap_{BL}=0[1]. For Elmali Weir, A_{PJ} = 38,433 m^2, and A_{BL} = 0. For Tasoba Weir, A_{PJ} = 42,333 m^2, and A_{BL} = 0[22,23]. The total value for both weirs, and for the whole project itself is A_{PJ} = 80,766 m^2, and A_{BL} = 0.

The water coming from the weirs combines into a single tunnel before entering into the turbines[24]. Hence, it is impossible to determine the contribution of each weir to the overall installed capacity. Consequently, in calculating the power densities of individual weirs, their ratio of maximum reservoir volume to the total maximum reservoir volume is assumed as the ratio of their contribution to the total installed capacity[22]:

[21] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.4.3 Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$), paragraph 37, pages 12-13. http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[22] Revised Feasibility Report for Elmali – Tasoba Weirs and Buyukduz HEPP, prepared by EN-SU Engineering Consultancy Ltd. Co, dated October 2010. Section 4. - Climate and Water Resources, Figures 4.6 and 4.7, Volume-Area Curves for Elmali and Tasoba Weirs, pages 157-158.
[23] Extended Detailed Volume-Area Curve Diagrams with Calculations provided by EN-SU Engineering Consultancy Ltd. Co as an Annex for Revised Feasibility Report for Elmali – Tasoba Weirs and Buyukduz HEPP, prepared by EN-SU Engineering Consultancy Ltd. Co, dated October 2010. Section 4. - Climate and Water Resources, Figures 4.6 and 4.7, Volume-Area Curves for Elmali and Tasoba Weirs, pages 157-158. Provided to DOE.
[24] Revised Feasibility Report for Elmali – Tasoba Weirs and Buyukduz HEPP, prepared by EN-SU Engineering Consultancy Ltd. Co, dated October 2010. Section 1.3., pages 8-9.

Maximum reservoir volumes for Elmali and Tasoba Weirs are 0.315338 hm^3, and 0.266923 hm^3, respectively.

Hence, the power density for each reservoir, and the project is calculated as below:

For Elmali Weir:

Power Ratio (PR) is:

$$PR_{Elmali} = \frac{0.315338\,hm^3}{0.315338\,hm^3 + 0.266923\,hm^3} = \frac{0.315338\,hm^3}{0.582261\,hm^3} = 54.16\%$$

Hence, the contribution of Elmali Weir to the installed capacity becomes:

68,862,000 W * 54.16% = 37,293,938 W. Accordingly, the power density of Elmali Weir becomes:

$$PD_{Elmali} = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{37{,}293{,}938W - 0W}{38{,}433m^2 - 0m^2} = \frac{37{,}293{,}938W}{38{,}433m^2} = 970.362/m^2 \cong 970W/m^2$$

For Tasoba Weir:

Power Ratio (PR) is:

$$PR_{Tasoba} = \frac{0.266923\,hm^3}{0.315338\,hm^3 + 0.266923\,hm^3} = \frac{0.266923\,hm^3}{0.582261\,hm^3} = 45.84\%$$

Hence, the contribution of Tasoba Weir to the installed capacity becomes:

68,862,000 W * 45.84% = 31,568,062 W. Accordingly, the power density of Tasoba Weir becomes:

$$PD_{Tasoba} = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{31{,}568{,}062W - 0W}{42{,}333m^2 - 0m^2} = \frac{31{,}568{,}062W}{42{,}333m^2} = 745.708W/m^2 \cong 746W/m^2$$

The power density for the whole project becomes:

$$PD_{Project} = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{68{,}862{,}000W - 0W}{80{,}766m^2 - 0m^2} = \frac{68{,}862{,}000}{80{,}766} = 852.611W/m^2 \cong 853W/m^2$$

The power density of the project is calculated to be 853 W/m^2. The power densities of Elmali and Tasoba Weirs are 970 W/m^2, and 746 W/m^2, respectively. Hence, according to the related explanation given in the methodology[25]:

[25] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.4.3 Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$), paragraph 36, page 12. http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

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

1. For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoirs, estimated as follows:

5.4.3.1. If the power density of the single or multiple reservoirs (*PD*) is greater than 4 W/m² and less than or equal to 10 W/m²

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000}$$

Where:

$PE_{HP,y}$	=	Project emissions from water reservoirs (t CO_2e/yr)
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants in year *y* (kg CO_2e/MWh)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

5.4.3.2. If the power density of the project activity (*PD*) is greater than 10 W/m²

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

Since the power densities of the project, Elmali Weir and Tasoba Weir, 853 W/m², 970 W/m², and 746 W/m² are all much above the given limit values of 4 W/m² for eligibility, and 10 W/m² zero emission, the project is eligible and has zero emission.

In consequence, the baseline scenario is identified and justified as follows, according to the methodology[26]:

"5.2. **Identification of the baseline scenario**

22. If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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 project activity has nothing to do with a capacity addition or the retrofit or replacement of an existing grid-connected renewable power plant/unit(s) at the project site, the other alternative scenarios and respective step-wise procedures are not applicable.

This assumption of baseline scenario can also be justified and supported by data, statistics and studies performed by TEIAS (Turkish Electricity Transmission Corporation).

[26] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0 Section 5.2, Identification of the baseline scenario, page 9. .
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

The following two tables summarize the situation of Turkish Electricity Generation sector as at the end of 2012:

Table 6. Distribution of Total Installed Capacity of Turkey by Fuel / Energy Source Types as at the end of 2012[27].

FUEL TYPES	THE END OF 2012		
	INSTALLED CAPACITY (MW)	CONTRIBUTION (%)	NUMBER OF POWER PLANTS
FUEL-OIL + ASPHALTITE + NAPHTA + DIESEL OIL	1,362.3	2.4	23
IMPORTED COAL + HARD COAL + LIGNITE	12,390.8	21.7	26
NATURAL GAS + LNG	17,169.6	30.1	189
RENEWABLE + WASTE	158.5	0.3	29
MULTI-FUEL SOLID + LIQUID	675.8	1.2	8
MULTI-FUEL LIQUID + N. GAS	3,269.2	5.7	45
GEOTHERMAL	162.2	0.3	9
HYDRAULIC DAMMED	14,744.6	25.8	64
HYDRAULIC RUN-OF-RIVER	4,864.8	8.5	317
WIND	2,260.5	4.0	61
TOTAL	**57,058.4**	**100.0**	**771**

Table 7. Distribution of Gross Electricity Generation of Turkey by Fuel / Energy Source Types in 2012[28]

TURKEY'S GROSS ELECTRICITY GENERATION BY PRIMARY ENERGY RESOURCES AND THE ELECTRIC UTILITIES		
Generation Characteristics of Year 2012		
Fuel / Energy Source Type	**Generation (Unit: GWh)**	**Percentage (%)**
Hard Coal+Imported Coal+Asphaltite	33,324.2	13.91
Lignite	34,688.9	14.48
Coal Total	**68,013.1**	**28.40**
Fuel Oil	981.3	0.41
Diesel oil	657.4	0.27
LPG	0.0	0.00
Naphtha	0.0	0.00
Liquid Total	**1,638.7**	**0.68**

[27] Installed Capacity of Turkey. Official TEIAS Values, Updated Regularly. Accessed on 20/02/2013, at 14:46 http://www.teias.gov.tr/yukdagitim/kuruluguc.xls

[28] The Distribution of Gross Electricity Generation by Primary Energy Resources and the Electric Utilities in Turkey – 2012, TEIAS Electricity Generation & Transmission Statistics of Turkey – 2012 http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/46.xls

Natural Gas	104,499.2	43.63
Renewables and wastes	720.7	0.30
Thermal Total	**174,871.7**	**73.02**
Hydro Total	**57,865.0**	**24.16**
Geothermal Total	**899.3**	**0.38**
Wind Total	**5,860.8**	**2.45**
TURKEY'S TOTAL	**239,496.8**	**100.00**

2.5 Additionality

2.5.1. Project Timeline

An overview of Implementation timeline of the project activity can be found in the table below:

Table 8. Implementation timeline of the project activity

Activity	Date
Local Stakeholder and Public Participation Meeting[29]	18/09/2007
Positive Environmental Impact Assessment for Büyükdüz HEPP.[30,31]	08/02/2008
Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Buyukduz HEPP.[32]	04/03/2008
Board Decision regarding Verified Emission Reductions.[33]	12/03/2008
Initial Issuance of the Generation Licence.[1,34]	20/03/2008
The First Amendment in the Generation Licence[1]. The subject of the amendment is the extension of construction and facility completion periods.	18/09/2009
Construction activities commenced in the project site (Project Site Delivery to the Contractor Construction Company (Aydiner Insaat A.S.). Although the actual constructional works started later, this is the earliest date that can be documented as the construction beginning date. Hence, the date the start of constructional works has been accepted as this date).[35]	01/11/2009
Turbine purchase and service agreement with turbine supplier (Alstom). This date is also the investment decision date, since	19/03/2010

[29] Büyükdüz Hydroelectric Power Plant Local Stakeholder and Public Participation Meeting Minutes and Participation List.
[30] Positive Environmental Impact Assessment Decision about Büyükdüz HEPP, granted by General Directorate of Environmental Impact Assessment and Planning of Ministry of Environment and Forestry, Dated 08/02/2008, Decision No: 1433. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 17, Pages 202 – 203.
[31] Public Disclosure Platform, http://kap.gov.tr/en/search/notice-results.aspx?id=49371
[32] Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Buyukduz HEPP, dated 04/03/2008. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 4, Pages 22 – 27.
[33] Ayen Enerji A.S. Board Decision that Verified Emission Reductions have been taken into account for the development of Buyukduz HEPP Project. Meeting No: 160, Meeting Date: 12/03/2008. Provided to DOE.
[34] Public Disclosure Platform, http://kap.gov.tr/en/search/notice-results.aspx?id=51652
[35] Final Progress Payment Document given by constructor company, Aydiner Insaat A.S., dated 31/08/2012. Provided to DOE.

the order of the electromechanical equipment, the main component of which are the Pelton turbines is the most important milestone for investment.[36]	
Contract Agreement about the Supply of Electrical Equipment for the Power Plant (Control Systems and Control Cables, Auxiliary Equipment, AC/DC Supplies and Power Cables, 12 kV Medium Voltage, except HV switchyard and main transformers) for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Austria) and the Project Proponent.[37]	07/04/2010
Contract Agreement about the Supply of Electrical Equipment for the Power Plant (154 kV Switchyard and TEIAS Havza Substation) for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Turkey) and the Project Proponent.[38]	13/04/2010
Contract for Supplying Power Transformers for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Turkey) and the Project Proponent.[39]	14/04/2010
Completion and Submission of Financial Feasibility Report to Creditor Bank (Turkiye Is Bankasi A.S.).[40]	15/04/2010
Credit Agreement with Creditor Bank (Turkiye Is Bankasi A.S.)[41]	12/08/2010
Connection Agreement made between the Project Proponent and TEIAS (Turkish Electricity Transmisson Company).[42]	20/12/2010
Additional Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Buyukduz HEPP regarding some new regulations.[43]	07/02/2011
The Second Amendment in the Generation Licence[1]. The subject of the amendment is the increase in the installed capacity and the predicted average annual generation amount.	04/08/2011
Additional Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Büyükdüz HEPP regarding the increase in the installed capacity and the predicted average annual generation amount.[44]	08/09/2011

[36] Contract Agreement about Turbine Purchase and Service for Büyükdüz Hydroelectric Power Plant made between the Turbine Supplier Company (Alstom) and the Project Proponent. Dated 19/03/2010. Provided to DOE.
[37] Contract Agreement about the Supply of Electrical Equipment for the Power Plant (Control Systems and Control Cables, Auxiliary Equipment, AC/DC Supplies and Power Cables, 12 kV Medium Voltage, except HV switchyard and main transformers) for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Austria) and the Project Proponent. Dated 07/04/2010. Provided to DOE.
[38] Contract Agreement about the Supply of Electrical Equipment for the Power Plant (154 kV Switchyard and TEIAS Havza Substation) for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Turkey) and the Project Proponent. Dated 13/04/2010. Provided to DOE.
[39] Contract for Supplying Power Transformers for Büyükdüz Hydroelectric Power Plant made between the Supplier Company (ABB Turkey) and the Project Proponent. Dated 14/04/2010. Provided to DOE.
[40] Financial Feasibility Report Submitted to the Creditor Bank (Turkiye Is Bankasi A.S.). Report provided to DOE.
[41] Credit Agreement with Creditor Bank (Turkiye Is Bankasi A.S.). Provided to DOE.
[42] Connection Agreement made between the Project Proponent and TEIAS (Turkish Electricity Transmission Company), dated 20/12/2010. Büyükdüz HEPP Provisional Acceptance Protocol Annexes, Annex 5, Pages 33 – 88.
[43] Additional Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Buyukduz HEPP regarding some new regulations, Dated 07/02/2011, Ref No: 2872.. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 4, Pages 28 – 30.
[44] Additional Water Usage Agreement between General Directorate of State Hydraulic Works of Ministry of Forestry and Water Affairs and Ayen Enerji A.S. for Buyukduz HEPP regarding the increase in the installed

Validation agreement signed between the Project Proponent and the Validator DOE.[45]	30/11/2011
Positive Environmental Impact Assessment Decision about Büyükdüz HEPP regarding the increase in the installed capacity and the predicted average annual generation amount.[46]	24/01/2012
The Third and the Last Amendment in the Generation Licence[1]. The subject of the amendment is the extension of construction and facility completion periods.	01/03/2012
System Usage Agreement made between the Project Proponent and TEIAS (Turkish Electricity Transmission Company).[47]	10/04/2012
Partial Commissioning of Büyükdüz Hydroelectric Power Plant. Beginning of Operation.[2]	31/05/2012
Construction activities ended in the project site.[35]	02/07/2012
Draft Project Description Completed and the documents uploaded to the Registry.	06/05/2014
Validation Site Visit	20/05/2014

As can be seen from the implementation timeline of the project, the revenues from VER credits had been taken into account before electromechanical equipment order agreement and credit agreement.

2.5.2. Assessment and Demonstration of Additionality

The selected baseline methodology for the development of Project Description, "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0" refers to the latest version of the "Tool for the demonstration and assessment of additionality" (Version 07.0.0) (referred to as "The Tool" hereafter in this section) for the demonstration and assessment of the additionality. The methodology procedure of this tool defines a step-wise approach to be applied for the project activity. The application of this step-wise approach to the proposed project activity is as follows:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Realistic and credible alternatives to the project activity are defined through the following sub-steps as per the Tool:

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

Probable realistic and credible alternatives that may be available to the Project Proponent are assessed in the following alternate scenarios:

(a) The proposed project activity undertaken without being registered as a CDM (VER) project activity

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capacity and the predicted average annual generation amount, Dated 08/09/2011, Ref No: 18697.. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 4, Pages 31 – 32.

[45] Agreement on Validation, signed between the TÜV Rheinland Japan, Ltd. and Ayen Enerji A.S., on 30 November 2011, for Büyükdüz Hydroelectric Power Plant.

[46] Positive Environmental Impact Assessment Decision about Büyükdüz HEPP, granted by Gumushane Governorate Provincial Directorate of Environment and Urban Affairs of Ministry of Environment and Urban Affairs, regarding the increase in the installed capacity and the predicted average annual generation amount. Dated 24/01/2012, Decision No: 2012/01, Document No: 2012/111. Buyukduz HEPP Provisional Acceptance Protocol Annexes, Annex 17, Pages 200 – 201.

[47] System Usage Agreement made between the Project Proponent and TEIAS (Turkish Electricity Transmission Company), dated 10/04/2012. Büyükdüz HEPP Provisional Acceptance Protocol Annexes, Annex 6, Pages 89 – 104.

This alternative would be realistic and credible if the project proponent had found the project financially feasible as a result of investment analysis. But the investment analysis showed that the project is not financially feasible without the incentive coming from the VER revenues. So the project is not considered as credible and feasible by the project proponent although it may be realistic without being registered as a CDM (VER) project activity.

(b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g., cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;

The project activity is a power plant using renewable energy sources to generate electricity without emitting any greenhouse gases. So, any other realistic and credible alternative scenario to the proposed project activity scenario that delivers services (electricity) with comparable quality would be another power plant utilising another renewable energy source to generate electricity without emitting any greenhouse gases.

But, in the project area there are no other available renewable or non-renewable energy sources to be used for electricity generation. Hence, there are no other realistic and credible alternative scenarios to the proposed project activity that delivers electricity with comparable quality. Therefore, this alternative is not realistic or credible.

(c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken).

The investment decision for the project activity depends on financial feasibility analysis and risk assessment performed by the project proponent. If the financial feasibility analysis and risk assessment had not been positive, the project would not have been realized. Hence, this scenario in which there would be no project activity is a realistic and credible alternative scenario.

This scenario is the continuation of the current situation and corresponds to the case in which the same amount of electricity would be generated by the existing national grid which is composed of a generation mix largely depending on fossil fuels. This alternative is the same as baseline scenario in which the same amount of electricity that would be delivered to the national grid by the project activity would have otherwise been generated by the power plants connected to the national grid whose current composition is mainly dependent on fossil fuels.

Outcome of Step 1a: As a result, the above alternatives (a) and (c) are identified as realistic alternative scenarios, but only alternative (c) is found to be the credible alternative scenario to the project activity.

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

Both the above identified alternatives, whether they are realistic and credible or not are in compliance with all mandatory applicable legal and regulatory requirements, as described in detail in Section 1.11 of this document about Compliance with Laws, Statutes and Other Regulatory Frameworks.

Outcome of Step 1b: All the alternatives to the project whether they are realistic and credible or not are in compliance with all mandatory applicable and regulatory requirements.

Step 2: Investment analysis

The purpose of investment analysis is to determine whether the proposed project activity is not

(a) The most economically or financially attractive; or

(b) Economically or financially feasible, without the revenue from the sale of emission reductions.

To conduct the investment analysis, "Guidelines on the assessment of investment analysis" (Version 05.0) (referred to as "The Guidelines" hereafter in this section) has also been used apart from The Tool.

To conduct the investment analysis, stepwise approach of the Tool has been used.

Sub-step 2a: Determine appropriate analysis method

The Tool offers three alternative methods to conduct the investment analysis:

Option I : Simple Cost Analysis
Option II : Investment Comparison Analysis
Option III : Benchmark Analysis

Since the project activity and the alternatives identified in Step 1 generate financial or economic benefits by electricity sales, Option I (Simple Cost Analysis) cannot be applied.

To decide between Option II (Investment Comparison Analysis) and Option III (Benchmark Analysis), Paragraph 19 of the Guidance (page 5) has been used. According to this clause, since the alternative to the project activity is the supply of the electricity from the existing grid, Benchmark Analysis (Option III) is considered appropriate.

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

IRR (Internal Rate of Return) is identified as the most suitable financial/economic indicator for the demonstration and assessment of additionality.

Equity IRR is selected as the IRR type to be used in the benchmark analysis. According to the Guidelines, Required/expected returns on equity are appropriate benchmarks for an equity IRR. When applying the benchmark analysis, the parameters that are standard in the market are used, according to the Paragraph 37 of the Tool.

Both the Equity IRR and the Benchmark Rate used as the reference are considered and calculated on a pre-tax approach.

Sub-step 2c: Calculation and comparison of financial indicators (only applicable to Options II and III):

When calculating the financial indicators, a 5-year period was selected as the reference period, and the 5-year annual average is taken as the basis to calculate the relevant indicators. Using a single year would be misleading, and a 5-year period is an accepted and widely used duration to calculate the financial indicators, historical trends and future forecasts.[48,49,50,51,52,53,54,55]

A) Benchmark Rate Calculation

Since the investment decision date is 19/03/2010, the execution date of the agreement for the order of the main electromechanical equipment (turbines), the data available at this specific date is considered for

[48] http://en.wikipedia.org/wiki/Financial_analysis
[49] http://investing.money.msn.com/investments/key-ratios?symbol=aapl
[50] http://profit.ndtv.com/stock/hdfc-bank-ltd_hdfcbank/financials-ratio
[51] http://www.ebrd.com/downloads/research/annual/fr12ed.pdf
[52] https://www.retailowner.com/Benchmarks.aspx
[53] http://www.kitchener.ca/en/insidecityhall/resources/FP_Monthly_Financial_Indicators_2013_11.pdf
[54] http://www.toyota-global.com/investors/financial_data/
[55] http://www.turkstat.gov.tr/IcerikGetir.do?istab_id=241

the investment analysis. Hence, the five year period of [2005-2009] is accepted as the reference period for the investment analysis. For most of the parameters, the average value for this period is taken as the reference value.

To find the benchmark rate, option (a) of the Paragraph 38 of the Tool is used:

"38. Discount rates and benchmarks shall be derived from:

(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;"

The benchmark rate is specified as the expected returns on equity (expected return on the capital asset / cost of equity); and calculated using the Capital Asset Pricing Model (CAPM), as follows:

X 1

$$E(R) = R_f + \beta(ERP_m) + CRP$$

where:

$E(R)$: Expected returns on equity (Cost of Equity)
R_f : Risk Free Return Rate in the Market (e.g. government bond yield)
β : Beta Coefficient – Sensitivity of the Expected Returns to Market Returns

ERP_m : Equity Risk Premium for Mature Equity Market
CRP : Country Risk Premium

The assumptions and references for the calculation of the rates and coefficients above are explained below:

i) Risk Free Rate (R_f)

As the representative of the risk free rate, long-term average returns of US treasury bond with a maturity of 20 years is chosen. U.S. Department of the Treasury data [56] has been used to calculate this rate. The 5-year period of [2005-2009] was assumed as the reference period. The arithmetic average of the annual averages for these years was accepted as the government bond yield rate; hence the risk free rate. This value was calculated as 4.46 %.

ii) Beta Coefficient (β)

Beta Coefficient is taken from the data included in the studies of Aswoth Damodaran, a well-known independent researcher and an academician at the Stern School of Business at New York University.[57].

[56] U.S. Department of the Treasury, Resource Centre, Interest Rate Statistics, Daily Treasury Yield Curve Rates. http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

[57] The Data Page of Personal Homepage of Aswath Damodaran, Professor of Finance at the Stern School of Business at New York University
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html

Since US Market is assumed to be a mature market in the studies of Prof. Damodaran[58], and the historical data for Implied Equity Risk Premiums for US Market is taken as the reference for the Equity Risk Premium, the related beta for the US Market is taken, and the arithmetic average of the annual values is accepted as the Beta Coefficient. The project activity is a power generating project, and the project proponent is in the sector of power industry. Hence, the average levered beta values for power industry in US for the reference period is considered to calculate the beta coefficient value[59]. The value of the Beta Coefficient was found to be 1.88.

iii) Equity Risk Premium (ERP_m)

To assess the equity risk premium, US market is assumed to be a mature market, as stated in Prof Damodaran's article[58], and Implied Equity Risk Premiums for US Market is taken for the reference period of [2005-2009], and the arithmetic average of the annual values for this period is accepted as the equity risk premium[60]. The resultant value for Equity Risk premium is found to be 5.05 %.

iv) Country Risk Premium (CRP)

Country Risk Premiums for Turkey for the same 5-year reference period above ([2005-2009]) are taken and their arithmetic average is accepted as the country risk premium of Turkey as at the end of 20009. The country risk premium value is found to be 5.51 %.

v) Expected Returns on Equity (Cost of Equity) ($E(R_i)$)

The expected returns on equity (cost of equity), the benchmark rate that is be used, is found, using the calculations above, as:

X 2

$$E(R) = R_f + \beta(ERP_m) + CRP = 4.46\ \% + 1.88 * 5.05\ \% + 5.51\ \% = 19.48\ \%$$

So, the benchmark discount rate to be used in the investment analysis is 19.48 %. This rate can be assumed as reliable and conservative since it takes a period long enough (a five year period of [2005-2009]) as the reference and the beta coefficient takes all the companies in the power (electricity generation and trading sector) in US.

A) Equity IRR Calculation for the Project

The following assumptions were made in calculating the Equity IRR for the project:

1) Carbon Credit (VER) revenues were excluded in the IRR calculation used for benchmark analysis. But they are kept in the spreadsheet for information purposes and included in the sensitivity analysis. The VER revenues were calculated assuming a VCS-VER credit unit price of 4.80 USD/tCO_2-eq, the average market value indicated for Turkey in the Ecosystem Marketplace State of the Voluntary Carbon Markets 2012 Report[61].

[58] Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2013 Edition. Aswath Damodaran. New York University - Stern School of Business. March 23, 2013
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2238064

[59] Levered and Unlevered Betas by Industry, Archived Historical Data from the Personal Homepage of Aswath Damodaran, Professor of Finance at the Stern School of Business at New York University.
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html

[60] Implied Equity Risk Premiums for US Market, Archived Historical Data from the Personal Homepage of Aswath Damodaran, Professor of Finance at the Stern School of Business at New York University.
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/implpr.html
http://www.stern.nyu.edu/~adamodar/pc/datasets/histimpl.xls

[61] Ecosystem Marketplace State of the Voluntary Carbon Markets 2012 Report, page 87.

2) Equity IRR is calculated using Before-Tax (Pre-tax) Method approach. This approach was chosen since it is a more reliable and a more widely used method in the investment analysis in the financial world[62,63,64]. But After-Tax (Post-tax) values were kept in the investment analysis spreadsheet for the sake of informational completeness. Benchmark values are also selected as pre-tax values, hence Equity IRR is compatible and consistent with the Benchmark Rate.

3) The Energy Sales Unit Price was accepted as the guaranteed feed-in-tariff specified in the Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No: 5346, Issuance Date: 18.05.2005)[65], which is 5 Eurocent/kWh, the valid price at the date of investment decision. This price can be accepted as conservative, since it represents the minimum guaranteed price for electricity originating from hydropower projects. The price in the free electricity trade market is generally higher than that.

4) EUR/TRY and USD/TRY Exchange Rates, as well as the EUR/USD Exchange Cross Rate, which are used to convert currencies of Turkish Lira, US Dollars and Euro to each other, are calculated using the Turkish Central Bank data[66]. This can be accepted as reliable and conservative since it assumes a period long enough (a five year period of [2005-2009]) as the reference.

5) The Average Expected Annual Electricity Generation Amount is accepted as the specified value given in the Generation Licence, since this is the closest value available to real expected generation. [1]

6) To find the net amount of electricity generated by the project activity, the electricity drawn from the grid by the project should also be taken into account and subtracted from the amount of electricity fed into the grid. However, no reliable and official data could be found regarding the energy drawn from the grid by power plants. Hence, this estimated amount of energy drawn from the grid is simply ignored. This can also be assumed as acceptable since this drawn energy is small enough to be included in the error range of estimated energy fed into the grid.

7) The Libor EURO values used in the calculation for loan repayment and interests in the investment analysis were also received from a reliable source[67], and calculated for the same 5-year reference period ([2005-2009]), as in the other parameters.

8) The project and investment cost values are taken from the Feasibility Study Report. These are the data available at the date of the investment decision.[68]

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http://www.forest-trends.org/documents/files/doc_3164.pdf

[62] http://www.investopedia.com/terms/p/pretax-rate-of-return.asp

[63] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/225363/02_pfi_internalratesguidance1_210307.pdf

[64] http://www2.mccombs.utexas.edu/faculty/Lenore.Sullivan/Documents/RE3862_REInvestmentDevelopment/RE386.2LectureNotes2.16.04.ppt

[65] Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No: 5346, Issuance Date: 18.05.2005)
http://www.epdk.gov.tr/documents/elektrik/mevzuat/kanun/Elk_Kanun_Yek_Kanun.doc

[66] http://evds.tcmb.gov.tr/cgi-bin/famecgi?cgi=$ozetweb&DIL=UK&ARAVERIGRUP=bie_dkdovizgn.db

[67] http://global-rates.com/interest-rates/libor/european-euro/euro.aspx

[68] Revised Feasibility Report for Elmali – Tasoba Weirs and Buyukduz HEPP, prepared by EN-SU Engineering Consultancy Ltd. Co, dated October 2010. Section 8 – Installation Costs, and Section 9 – Economic Analysis, pages 219 - 256.

9) The values for credit were taken from the Credit Loan Agreement made between the Creditor Bank and the Project Proponent.

10) The project lifetime period was accepted as 35 years, as explained in the Section 1.8. But the investment analysis was done for a 20-year period, as explained in "Guidelines on the assessment of investment analysis (Version 05.0.0)"[69] and in "Clarification - Applicability of the "Guidelines on the assessment of investment analysis" (Version 01.0)"[70].

A summary of the benchmark analysis and the relevant parameters can be found in the following table:

Table 9. Summary of Benchmark Analysis and Financial Data

Parameter	Unit	Value	Reference / Source / Justification
Installed Capacity	MW	68.862	Project Activity Electricity Generation Licence
Expected Annual Firm Energy Generation	MWh	192,021	Project Activity Electricity Generation Licence
Carbon Credit Unit Price	USD/tCO_2-eq	4.80	Ecosystem Marketplace State of the Voluntary Carbon Markets 2012 Report
Energy Unit Price	EURcent/kWh	5.00	Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy (Law No: 5346, Issuance Date: 18.05.2005)
Emission Factor	tCO_2/MWh	0.535	Emission Factor Calculation, made according to "Tool to calculate the emission factor for an electricity system (Version 04.0"[71]
Risk Free Rate (R_f)	%	4.46	U.S. Department of the Treasury, Resource Centre, US Treasury Bond Rates with maturity of 20 years for the period of [2005-2009].
Beta Coefficient (β)	-	1.88	Data for US Power Industry for the 5-year period of [2005-2009] from Studies of Prof. Aswath Damodaran.
Equity Risk Premium (ERP_m))	%	5.05	Data for US Market, accepted as a mature equity market, from Studies of Prof. Aswath Damodaran.
Country Risk Premium	%	5.51	Data for Turkey for the 5-year period of [2005-2009] from Studies of Prof. Aswath Damodaran.
Benchmark Discount Rate (Expected Returns on Equity)	%	19.48	Calculated using the relevant parameters according to the Capital Asset Pricing Model (CAPM).
EUR/TRY Exchange Rate	-	1.8585	Turkish Central Bank Data for the 5-year period of [2005-2009]

[69] Guidelines on the assessment of investment analysis (Version 05.0.0)
http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf
[70] Clarification - Applicability of the "Guidelines on the assessment of investment analysis" (Version 01.0)
https://cdm.unfccc.int/filestorage/n/v/extfile-20130604103656299-meth_guid53.pdf/meth_guid53.pdf?t=UTN8bjR5bDA4fDAel5d0kCqj3sZrPLOuDVAB
[71] Tool to calculate the emission factor for an electricity system (Version 04.0)
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

USD/TRY Exchange Rate	-	1.3826	Turkish Central Bank Data for the 5-year period of [2005-2009]
EUR/USD Exchange Cross Rate	-	1.3478	Turkish Central Bank Data for the 5-year period of [2005-2009]
Total Investment Cost	EUR	85,497,603	Investment Analysis
Total Operation and Maintenance Costs	EUR	17,681,313	Estimation of the project Proponent based on Previous Experiences
Equity / Total Investment Cost Ratio	%	44	Investment Analysis
Debt / Total Investment Cost Ratio	%	56	Investment Analysis
Project Lifetime	Years	20	Assumption
Equity IRR (Before Tax)	%	8.73	Investment Analysis Cash Flow (VER Revenues ignored)

Comparison results of financial indicators can be summarized and depicted in the table below:

Table 10. Comparison results of financial indicators

Indicator	Value
Benchmark Discount Rate	19.48 %
Equity IRR (Before Tax, without Carbon Revenues)	8.73 %

The results of the comparison show that without the extra income of carbon revenues, the Equity IRR of the project activity is equal to 8.73 % and lower than the benchmark discount rate, which is 19.48 %. This clearly indicates that the project activity cannot be considered as financially attractive.

With carbon revenues, Equity IRR value is 9.44 %, which is also lower than the benchmark discount rate of 19.48 %. But carbon revenues give extra financial support to the project development and alleviate the financial hardships. Taking the VER Carbon Revenues into account brings some extra co-benefits to the project developer like fulfilling the Social Corporate Responsibility in an environment-friendly way, helping promote the image of the project developer, and increasing the chance of getting future incentives. Most importantly, additional financial income, extra detailed financial and environmental feasibility and documentation studies, and extra care taken in by developing the project as a CDM-VER Project greatly increases the probability of finding debt from a credit institution.

Sub-step 2d: Sensitivity analysis (only applicable to Options II and III)

A Sensitivity Analysis was made in order to show whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. For this purpose, the sensitivity analysis is applied to following parameters:

1) Total Project Cost
2) Operational, Service and Maintenance Costs
3) Electrical Energy Generation
4) Electrical Energy Sales Price

The sensitivity analysis was applied to these parameters for two cases, one with carbon revenues, and the other without carbon revenues; and for a range of ± 20 %, with increments of 5 %. The results are summarized in the table below:

Table 11. Parameters and Variances Used in Sensitivity Analysis

Total Project Cost								
-20%	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**	**20%**
66,792,086	70,966,592	75,141,097	79,315,602	**83,490,108**	87,664,613	91,839,118	96,013,624	100,188,129
14.85%	12.97%	11.53%	10.38%	**9.44%**	8.64%	7.95%	7.35%	6.83%
13.69%	11.98%	10.66%	9.60%	**8.73%**	7.99%	7.35%	6.79%	6.30%
Operational, Service & Maintenance Costs								
-20%	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**	**20%**
14,145,050	15,029,116	15,913,182	16,797,247	**17,681,313**	18,565,379	19,449,444	20,333,510	21,217,575
9.79%	9.70%	9.61%	9.52%	**9.44%**	9.35%	9.26%	9.17%	9.09%
9.08%	8.99%	8.90%	8.81%	**8.73%**	8.64%	8.55%	8.47%	8.38%
Electrical Energy Generation								
-20%	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**	**20%**
153,617	163,218	172,819	182,420	**192,021**	201,622	211,223	220,824	230,425
5.65%	6.58%	7.52%	8.47%	**9.44%**	10.41%	11.40%	12.39%	13.40%
5.11%	6.00%	6.90%	7.81%	**8.73%**	9.66%	10.60%	11.55%	12.51%
Electrical Energy Sales Price								
-20%	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**	**20%**
4.00	4.25	4.50	4.75	**5.00**	5.25	5.50	5.75	6.00
5.78%	6.68%	7.59%	8.51%	**9.44%**	10.37%	11.32%	12.28%	13.25%
5.11%	6.00%	6.90%	7.81%	**8.73%**	9.66%	10.60%	11.55%	12.51%
VER Credit Price								
-20%	**-15%**	**-10%**	**-5%**	**0%**	**5%**	**10%**	**15%**	**20%**
2.85	3.03	3.21	3.38	**3.56**	3.74	3.92	4.10	4.27
9.29%	9.33%	9.36%	9.40%	**9.44%**	9.47%	9.51%	9.54%	9.58%

The same results are also illustrated in the following figure:

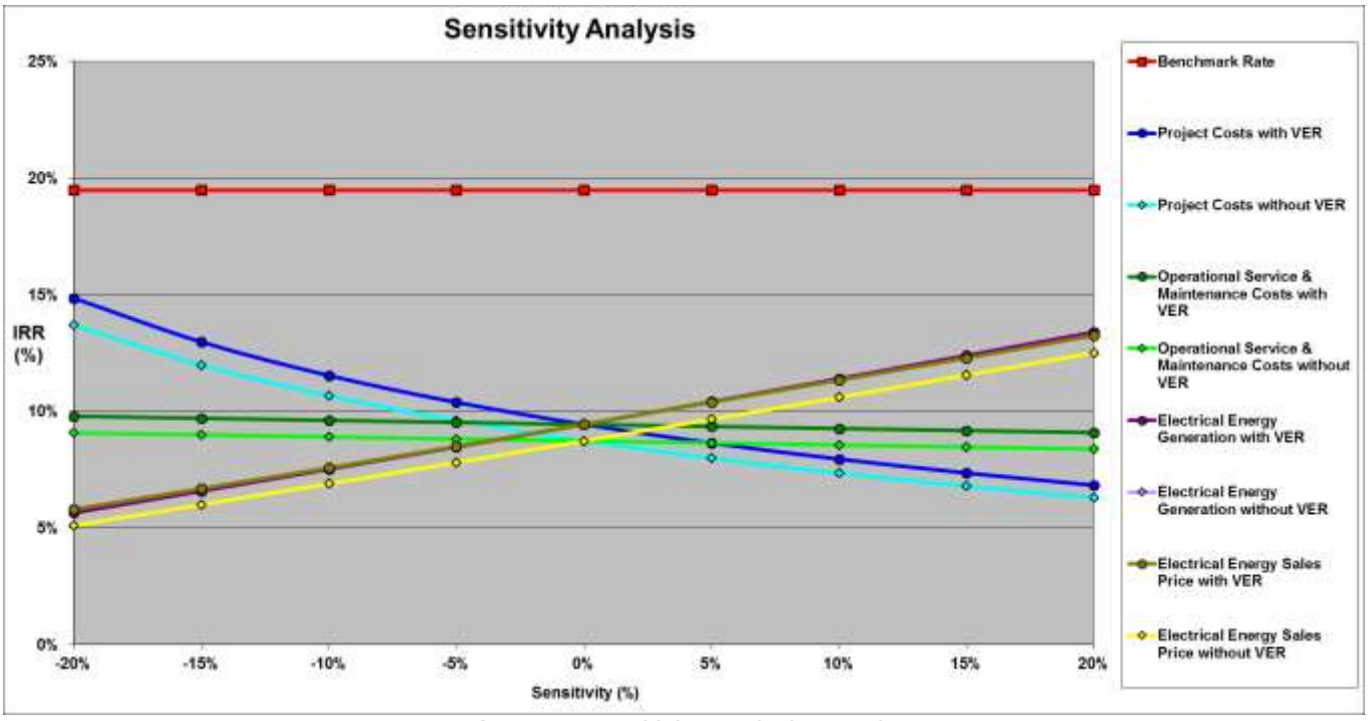

Figure 3. Sensitivity Analysis Results

The results found in the sensitivity analysis indicated that under all alternative scenarios for all the parameters selected with different variances, the Equity IRR value could not reach the Benchmark Discount Rate of 19.48 %.

Hence, the sensitivity analysis showed that the conclusion regarding financial/economic attractiveness of the project is robust to reasonable variations in the critical assumptions.

The details of investment analysis can be found in the separate spreadsheet file supplied as an annex to this Project Description.

Outcome of Step 2: The project activity is unlikely to be financially/economically attractive.

Step 3: Barrier analysis

This step is not applied.

Step 4: Common practice analysis

According to "Tool for the demonstration and assessment of additionality-Version 07.0.0"[72] (Hereafter referred to as "The Tool" in this section regarding the Common Practice Analysis) and "Guidelines on common practice-Version 02.0"[73], (Hereafter referred to as "The Guidelines" in this section regarding the Common Practice Analysis), the Common Practice Analysis procedure was applied for the project activity.

[72] Tool for the demonstration and assessment of additionality-Version 07.0.0
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[73] Guidelines on common practice-Version 02.0
http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf

The project activity is a run-of –river type hydroelectric power plant realizing power generation based on renewable energy. Hence, it falls under the category defined in the sub-clause (ii) in the "Measure" definition of the Tool (page 5) and sub-clause (b) in the "Measure" definition of the Guidelines (page 1):

"Switch of technology with or without change of energy source including energy efficiency improvement as well as use of renewable energies (example: energy efficiency improvements, power generation based on renewable energy); "

As a result, sub-step 4a was applied.

Sub-step 4a: The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section above

According the rules of the Guideline, the applicable geographical area is Turkey, and the output of the project activity is electricity.

Since Turkey has no binding regulations under the Kyoto Protocol, there are no CDM projects in Turkey. For that reason, VER (Verified Emission Reduction) Projects developed voluntarily were accepted as CDM projects in applying the common practice analysis.

The stepwise approach for common practice described in the second section of the Guidelines was applied.

For Step 1 of this stepwise approach, the calculation of the output range is done based on the installed capacity of the project. Since the installed capacity of the project is 68.862 MW, the output range will be 68.862 +/- 50 % = [34.431 – 103.293] MW.

For Step2, firstly, identification of the similar projects was done according to the sub-paragraphs (a), (b), (c), (d) and (f) of paragraph 6 of the stepwise approach, as described on page 2 - 3 of the Guidelines.

381 hydroelectric power plants were operational at the end of 2012, 64 of which were dammed type, and 317 of which were run-of-river type.[27]. A list of these could be found in TEIAS Capacity Projection Report for 2013.[74] Since there is no clear-cut distinction between dammed and run-of-river type hydro power plants in this report, all the hydro power are taken into consideration for common practice analysis. Projects with outputs outside the specified output range, CDM projects, the projects categorized under the name of "Others" (Mainly projects with very small outputs. Since they are nearly all below the lower limit of the specified output range, they should already automatically been out of consideration), and the projects that could be detected as having started commercial operation after the start date of the proposed project activity were removed from the list and taken out of consideration. The remaining 33 projects can be seen in the following list:

Table 12. Power Plants (As at the end 2012) Used for Common Practice Analysis - Only Non-CDM Hydroelectric Power Plants in the Output Range that Started Commercial Operation Before the Start date of Proposed project Activity - "Others" and the Project Activity Itself Removed.

No	Legal Status	POWER PLANT NAME	Installed Capacity MW	Firm Generation Capacity GWh	Commissioning Date	Location (Province)

[74]TEIAS 5-year Generation Capacity Projection 2013-2017. Annex-1, Current System (As at the end of 2012), pages 81-98.
http://www.teias.gov.tr/YayinRapor/APK/projeksiyon/KAPASITEPROJEKSIYONU2013.pdf

1	BOT	ÇAMLICA (AYEN ENERJİ)	84.0	429.0		Kayseri
2	BOT	YAMULA	100.0	422.0	30.07.2005	Kayseri
3	EUAS	YENİCE	37.9	50.0		Ankara
4	EUAS	KARACAÖREN II	46.4	90.0		Burdur
5	EUAS	KEMER	48.0	45.0		Aydin
6	EUAS	MANAVGAT	48.0	110.0		Antalya
7	EUAS	ŞANLI URFA	51.0	85.0	01.03.2006	Sanliurfa
8	EUAS	KAPULUKAYA	54.0	120.0		Kirikkale
9	EUAS	KADINCIK II	56.0	165.0		Mersin
10	EUAS	DERBENT	56.4	150.0		Samsun
11	EUAS	SEYHAN I	60.0	212.0		Adana
12	EUAS	ADIGÜZEL	62.0	80.0		Denizli
13	EUAS	DEMİRKÖPRÜ	69.0	32.0		Manisa
14	EUAS	SUAT UĞURLU	69.0	250.0		Samsun
15	EUAS	KADINCIK I	70.0	180.0		Mersin
16	EUAS	DOĞANKENT	74.5	200.0		Giresun
17	EUAS	KESİKKÖPRÜ	76.0	80.0		Ankara
18	EUAS	KÜRTÜN	85.0	140.0	26.09.2003	Gumushane
19	EUAS	KÖKLÜCE	90.0	300.0		Tokat
20	EUAS	KRALKIZI	94.5	90.0		Diyarbakir
21	EUAS	TORUL	103.2	130.0	16.10.2008	Gumushane
22	IPP	BEREKET (DALAMAN)	37.5	179.0		Mugla
23	IPP	MURATLI HES (ARMAHES ELEK.)	37.7	55.0		Sivas
24	IPP	DİM HES (DİLER ELEK.)	38.3	70.0	08.07.2010	Antalya
25	IPP	BEREKET (MENTAŞ)	39.9	140.0		Adana
26	IPP	TEKTUĞ-ANDIRIN	40.5	60.0	03.09.2010	K.Maras
27	IPP	EŞEN-II (GÖLTAŞ)	43.4	80.0		Mugla
28	IPP	ERENLER REG.(BME BİRLEŞİK EN.)	45.0	48.0	04.06.2010	Artvin
29	IPP	BAYRAMHACILI (SENERJİ EN.)	47.0	95.0	20.01.2011	Nevsehir
30	IPP	ENERJİ-SA BİRKAPILI	48.5	17.0	11.03.2004	Mersin
31	IPP	SEYRANTEPE HES (SEYRANTEPE BARAJI)	56.8	161.0		Elazig
32	IPP	AKKÖY ENERJİ (AKKÖY HES)	101.9	263.0		Gumushane
33	TOOR	KOVADA-II(BATIÇİM EN.)	51.2	24.0		Isparta
			2,022.6	**4,552.0**		

Abbreviations for Legal Status: **EUAS**: EUAS (Electricity Generation Corporation), **EUAS Subs.**: EUAS (Electricity Generation Corporation) Subsidiary, **TOOR**: Transfer of Operating Rights, BO: Build Operate, BOT: Build Operate Transfer, AP: Autoproducer, **IPP**: Independent Power Producer

When we consider the projects listed in the above table, we see that 22 of these projects have been developed in a different legal status than Büyükdüz HEPP. These belong to EUAS, the state owned Electricity Generation Incorporation, and owned, developed and operated by the government, or included in state funded or incentivized investment schemes. These 22 power plants have been developed for public interest by the state, or highly subsidized by the government, and their investment schemes cannot be deemed as equal or similar to those of Independent Power Producers. Most of these are old power plants which were commissioned when CDM (VER) projects were not widespread, and it can easily be said that if they were developed today by Independent Power Producers, they would seek CDM status as voluntary verified emission reduction projects. The same is true for the projects developed before 2005 or 2006 by the independent power producers, The projects with no commissioning dates are available are almost entirely were commissioned before 2003, since from the year 2003 on, the commissioning dates for all power plants are available in the energy investment data of Ministry of Energy and Natural Resources[117]. Although not in a strictly technical manner, the projects that can be identified as older than a certain date and developed under a different legal status can be considered as those that apply technologies that are different to the technology applied in the proposed project activity, taking their start dates of operation, and their legal schemes into consideration.

Hence, of these 33 power plants, only 4 projects developed by Independent Power Producers in the years 2010 and 2011 can be accepted as "similar" to the project activity.

Considering this, if we further proceed with Steps (3), (4) and (5) of the same stepwise approach, as explained in the paragraphs, (7), (8) and (9) of the stepwise approach of the Guideline, we will see that 4 projects can be identified as similar to the project. Hence N_{all} = 33, N_{diff} = 29, and the formula F = 1- N_{diff} /N_{all} becomes F = 1 – 29/33 = 1 – 0.88 = 0.12. Also, N_{all} - N_{diff} = 33 – 29 = 4. As per the paragraph (10) of the guidelines[73] , since F = 0.12 is smaller than 0.2, but N_{all} - N_{diff} = 4 is greater 3, and since both the conditions of F being greater than 0.2 and N_{all} - N_{diff} greater than 3 are not satisfied, the proposed project activity is not a "common practice" within its sector in the applicable geographical area.

Outcome of Step 4: The outcome of Step 4 is that the proposed project activity is not regarded as "common practice", hence, the proposed project activity is additional.

2.6 Methodology Deviations

The UNFCCC methodology "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0"[18] and applicable tools referenced in this methodology have been applied without any deviations.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

As also described in Section 2.4 of this document about Baseline Scenario, to establish the baseline scenario for the project, and to calculate the baseline emissions, project emissions, leakage and emission reductions, the latest version of the UNFCCC official Large-scale Consolidated Methodology, "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0"[18] (Hereafter referred to as "The Methodology" in this section regarding the Emission reductions) and the latest version of the official tool "Tool to calculate the emission

factor for an electricity system (Version 04.0)"[71] (Hereafter referred to as "The Tool" in this section regarding the Emission reductions) were used.

The applicability of ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0"[18] (The Methodology) is justified according to the explanation given under the heading of "Applicability" on pages 4 and 5 of the Methodology, as follows[75]:

"2.2. Applicability

3. This 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).

4. The methodology is applicable under the following conditions:

(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 $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.

5. In case of hydro power plants:

6. 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/m^2; 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/m^2.;"

[75] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 2.2. Applicability, pages 4 - 6.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

Since the project is newly installed (greenfield) hydroelectric power plant, the Methodology is applicable.

Baseline Scenario is also identified according to the rules under the heading of "Baseline Methodology Procedure" on page 9 of the Methodology[26]:

"5.2. Identification of the baseline scenario

22. If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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 project activity is a run-of-river-hydroelectric power plant, project emissions are accepted as zero, PEy = 0, as shown in the calculations made in Section 2.4 of this document about Baseline Scenario, as per the relevant explanations in the Methodology[21], using project data[22]. The project activity involves no emissions, except from a diesel generator used for emergency backup purposes. The possible emissions from the use of fossil fuels for the back up or emergency purposes by the operation of this diesel generator are neglected according to the methodology[76].

Leakage emissions are also neglected as per the Methodology[77].

Baseline emissions are considered according to the following explanations and formulas included in the Methodology[78]:

"5.5. Baseline emissions

38. Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

[76] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.4.1. Fossil fuel combustion (PEFF,y), Paragraph 32, page 11.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[77] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.6 Leakage, Paragraph 53, page 17.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ
[78] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.5 Baseline Emissions, Paragraph 38, page 13.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

Equation (6)

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

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)"

5.5.1. Calculation of $EG_{PJ,y}$

39. The calculation of $EG_{PJ,y}$ is different for: Greenfield plants, retrofits and replacements; and capacity additions. These cases are described as follows:

5.5.1.1. Greenfield renewable energy power plants

40. If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

Equation (7)

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

Where:

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

Emission reductions are also calculated according to the relevant section of the methodology[79].

"5.6. Emission reductions

54. Emission reductions are calculated as follows:

[79] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 5.7 Emission reductions, Paragraph 54, page 17.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

Equation (11)

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e/yr)

BE_y = Baseline emissions in year *y* (t CO_2/yr)

PE_y = Project emissions in year *y* (t CO_2e/yr)"

3.2 Project Emissions

As explained before in Sections 2.4 and 3.1 of this document, since the project activity is a run-of-river-hydroelectric power plant, project emissions are accepted as zero, PEy = 0, as shown in the calculations made in Section 2.4 of this document about Baseline Scenario, as per the relevant explanations in the Methodology[21], using project data[22]. The project activity involves no emissions, except from a diesel generator used for emergency backup purposes. The possible emissions from the use of fossil fuels for the back up or emergency purposes by the operation of this diesel generator are neglected according to the methodology[76].

3.3 Leakage

Leakage emissions are neglected and assumed as zero as per the Methodology[77].

3.4 Net GHG Emission Reductions and Removals

Since PE_y = 0, ER_y = BE_y. So, in order to calculate the emission reductions for the project, it will suffice to calculate the baseline emissions. Calculation of the baseline emissions was done according to the Tool as indicated in the Methodology.

Six-steps in the stepwise baseline methodology procedure in the Tool were followed to calculate the baseline emissions[80]:

"Baseline methodology procedure

13. Project participants shall apply the following six steps:

(a) STEP 1: identify the relevant electricity systems;

(b) STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);

(c) STEP 3: Select a method to determine the operating margin (OM);

(d) STEP 4: Calculate the operating margin emission factor according to the selected method;

[80] Tool to calculate the emission factor for an electricity system (Version 04.0), Section 6. Baseline methodology procedure, Paragraph 13, pages 6 – 7.
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

(e) STEP 5: Calculate the build margin (BM) emission factor;

(f) STEP 6: Calculate the combined margin (CM) emission factor."

Step 1: Identify the relevant electricity systems

In the Tool, on page 6, the project electricity system is defined as:

"A grid/project electricity system - is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints;"

Also, on the same page of the Tool, connected electricity system is defined as:

"Connected electricity system - is an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint, and/or the transmission capacity of the transmission line(s) that is connecting electricity systems is less than 10 per cent of the installed capacity either of the project electricity system or of the connected electricity system, whichever is smaller;"

The project activity is connected to the national grid of Turkey. There is no DNA in Turkey which has published a delineation of the project electricity system and the connected electricity systems. Since such information is not available, the criteria for the transmission constraints suggested on page 7 of the Tool were used to clarify the definitions of the project electricity system and the connected electricity systems. There are no available spot electricity markets in Turkey at the time of writing of this report. Also, there are no official data on availability or operational time of transmission lines in Turkey. Hence, these two criteria are not applicable.

There are interconnections between Turkey and all its neighbouring countries. However, these lines are in limited capacity and have significant transmission constraints as compared to national transmission lines in Turkey.[81,82] In addition, international electricity trade through these transboundary transmission lines has legal restrictions and is subject to permission of EMRA (Republic of Turkey Energy Market Regulatory Authority).[83,84,85]

The Turkish National Grid is operated by the responsible authority of TEIAS (Turkish Electricity Transmission Corporation). All the power plants in this system can be dispatched without significant transmission constraints. There are no layered dispatch systems (e.g. provincial/regional/national) within this national system.[86,87,88] So, there are no independent separate grids in the national grid.

In the light of above information and the paragraphs (17) and (18) on the pages 7 -8 of the Tool, the project electricity system is defined as Turkish National Grid, and the connected electricity systems are

[81] http://www.teias.gov.tr/Dosyalar/NetTransferKapasiteleri.doc

[82] http://212.175.131.171/makaleler/ENTSOE%20Bağlantısı%20ICCI%20v3.pdf

[83] http://www.epdk.gov.tr/documents/elektrik/mevzuat/yonetmelik/elektrik/ithalat_ihracat/Elk_Ynt_ithalat_ihracat_SonHali.doc

[84] http://www.epdk.gov.tr/documents/elektrik/mevzuat/yonetmelik/elektrik/ithalat_ihracat/iliskili_mevzuat/KapasiteTahsisiEsaslar.doc

[85] http://www.epdk.gov.tr/index.php/elektrik-piyasasi/lisans?id=818

[86] http://www.teias.gov.tr/Hakkimizda.aspx

[87] http://212.175.131.171/Faaliyet2011/ING_Teias.pdf

[88] http://geni.org/globalenergy/library/national_energy_grid/turkey/

defined as the neighbouring countries of Turkey, all of which are connected to Turkish national grid by transboundary transmission lines.

As per the paragraphs (19), (20), (21), (22) and (23) on page 8 of the Tool, electricity imports and exports and their usage in the emission calculations are defined. For the purpose of determining the operating margin emission factor, the CO_2 emission factor for net electricity imports from the connected electricity systems is accepted as 0 t CO_2/MWh according to paragraph (21), sub-paragraph (a) of the Tool, and the electricity exports are not subtracted from electricity generation data used for calculating and monitoring the electricity emission factors according to paragraph (23) of the Tool.

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

The Tool suggests two options between which the project participants may choose 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.

The rationale behind Option II is explained in the Tool as "Option II provides the option to include off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, that is if off-grid power plants are operated due to an unreliable and unstable electricity grid."

This is not the case for the National Grid of Turkey, the selected project system. The contribution of the off-grid power plants to Turkish grid is negligible and no official or reliable data regarding the off-grid power plants in Turkey could be found. So, Option II is not appropriate.

Hence, Option I is selected and only grid power plants are included in the calculation of the operating margin and build margin emission factors.

Step 3: Select a method to determine the operating margin (OM)

The Tool gives four following method options for the calculation of the operating margin emission factor ($EF_{grid,OM,y}$):

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

Since power plant specific data for generation, emission or emission factors are not available, "Simple adjusted OM" and "Dispatch data analysis OM" methods are not applicable.

In the Methodological Tool – Tool to calculate the emission factor for an electricity system, The Simple OM Method is further sub-divided into two options as follows[89]:

"The simple OM may be calculated by one of the following two options:

(a) Option A: based on the net electricity generation and a CO2 emission factor of each power unit; or

(b) 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."

[89] Tool to calculate the emission factor for an electricity system (Version 04.0), Paragraph 41, page 11. http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

Since the power plant specific data for generation, emission or emission factors are not available, Option A of "Simple OM" method is not applicable. The remaining two methods are Option B of "Simple OM" and "Average OM" methods. To decide between these two alternative methods, we have to take the situation of low-cost/must-run power plants into account. Following table summarizes the generation amounts and percentage of low-cost/must-run power plants for the five most recent years available at the time of writing of this report, that is, the period of [2007 – 2011].

Table 13. The Contribution of Low-Cost/Must-Run Power Plants to the Gross Generation of Turkey for the 5-year period of [2008 – 2012][90]

Primary Energy Resource or Fuel Type	Years					5-Year Total	5-Year Percentage
	2008	2009	2010	2011	2012		
Hard Coal + Imported Coal + Asphaltite	15,857.5	16,595.6	19,104.3	27,347.5	33,324.2	112,229.1	10.46%
Lignite	41,858.1	39,089.5	35,942.1	38,870.4	34,688.9	190,448.9	17.74%
Total Coal	**57,715.6**	**55,685.1**	**55,046.4**	**66,217.9**	**68,013.1**	**302,678.0**	**28.20%**
Fuel-Oil	7,208.6	4,439.8	2,143.8	900.5	981.3	15,674.0	1.46%
Diesel Oil	266.3	345.8	4.3	3.1	657.4	1,276.9	0.12%
LPG	0.0	0.4	0.0	0.0	0.0	0.4	0.00%
Naphtha	43.6	17.6	31.9	0.0	0.0	93.1	0.01%
Total Oil (Liquid Total)	**7,518.5**	**4,803.5**	**2,180.0**	**903.6**	**1,638.7**	**17,044.4**	**1.59%**
Natural Gas	98,685.3	96,094.7	98,143.7	104,047.6	104,499.2	501,470.5	46.72%
Renewables and Wastes	219.9	340.1	457.5	469.2	720.7	2,207.5	0.21%
Thermal	**164,139.3**	**156,923.4**	**155,827.6**	**171,638.3**	**174,871.7**	**823,400.4**	**76.71%**
Hydro + Geothermal + Wind Total	**34,278.7**	**37,889.5**	**55,380.1**	**57,756.8**	**64,625.1**	**249,930.2**	**23.29%**
Hydro	**33,269.8**	**35,958.4**	**51,795.5**	**52,338.6**	**57,865.0**	**231,227.3**	**21.54%**
Geothermal + Wind	**1,008.9**	**1,931.1**	**3,584.6**	**5,418.2**	**6,760.1**	**18,702.9**	**1.74%**
Geothermal	162.4	435.7	668.2	694.3	899.3	2,860.0	0.27%
Wind	846.5	1,495.4	2,916.4	4,723.9	5,860.8	15,842.9	1.48%
General Total (Gross)	**198,418.0**	**194,812.9**	**211,207.7**	**229,395.1**	**239,496.8**	**1,073,330.5**	**100.00%**
General Total (Net)	**189,761.9**	**186,619.3**	**203,046.1**	**217,557.7**	**227,707.3**	**1,024,692.3**	**95.47%**

[90] Electricity Generation-Transmission Statistics of Turkey [2008 - 2012] http://www.teias.gov.tr/istatistikler.aspx

Net / Gross Ratio	**95.64%**	**95.79%**	**96.14%**	**94.84%**	**95.08%**	**95.47%**	
Gross - Low-Cost/Must-Run	**34,278.7**	**37,889.5**	**55,380.1**	**57,756.8**	**64,625.1**	**249,930.2**	**23.29%**
Gross Excluding Low-Cost/Must-Run (Thermal)	**164,139.3**	**156,923.4**	**155,827.6**	**171,638.3**	**174,871.7**	**823,400.4**	**76.71%**
Net - Low-Cost/Must-Run	**32,783.3**	**36,295.9**	**53,240.1**	**54,776.4**	**61,443.9**	**238,539.5**	
Net Excluding Low-Cost/Must-Run (Thermal)	**156,978.6**	**150,323.4**	**149,806.0**	**162,781.3**	**166,263.4**	**786,152.8**	

Since generation from low-cost/must-run resources constitute less than 50% (23.29%) of total (gross) grid generation in average of the five most recent years (2008-2012), Simple Operating Margin Method (Option A) can be used.

The selection of the low-cost/must run power plants was done according to the definition on page 6 of the Tool:

"**Low-cost/must-run resources** - are defined as power plants with low marginal generation costs or dispatched independently of the daily or seasonal load of the grid. They include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If a fossil fuel plant is dispatched independently of the daily or seasonal load of the grid and if this can be demonstrated based on the publicly available data, it should be considered as a low-cost/must-run;"

Hence, the selection in the table which assumes the total of hydro, geothermal and wind as the low-cost/must-run resources is justified. Since there are no nuclear power plants and also no grid-connected solar power plants in Turkey at the time of writing of this report, these resource types are automatically excluded.

As can be seen from the table, low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in average of the five most recent years [2007 – 2012], which is in line with the relevant rule, paragraph 34 on page 10 of the Tool:

"The simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production."

The rules for the usability of Simple OM method Option, which was stated in paragraph 42, on page 11 of the Tool, as below, are also met:

"42. Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2)."

As a result, Option B of Simple OM method was selected as the method to determine the operating margin.

Ex ante option was preferred to calculate the emissions factor, and the reference period was selected as the three-year period of [2010 – 2012], as per the requirements stated in paragraph 36, sub-paragraph (a) on page 10 of the Tool:

"36. For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

(a) Ex ante option: if the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation;"

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

Operating Margin Emission Factor was calculated using the formulation and procedure described in the paragraphs (49) and (50) in sub-section 6.4.1.2., on pages 14 – 15 of the Tool:

"6.4.1.2. Option B: Calculation based on total fuel consumption and electricity generation of the system

49. Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \qquad \text{Equation (7)}$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO2 emission factor in year *y* (t CO2/MWh)
$FC_{i,y}$	=	Amount of 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 fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fuel type *i* in year *y* (t CO_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 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

50. For this approach (simple OM) to calculate the operating margin, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power

plants/units, and including electricity imports5 to the grid. Electricity imports should be treated as one power plant *m*."

Fossil fuel types and their amounts were taken from the official data of Electricity Generation & Transmission Statistics of Turkey, published by TEIAS (Turkish Electricity Transmission Company, the state authority responsible for the national transmission system of Turkey), as indicated in the table below:

Table 14. Fuel Consumption in Electricity Generation in Turkey for the 3-year period of [2010 – 2012][91]

Fuel Consumption in Electricity Generation Excluding Low-Cost/Must-Run (Unit: Ton (solid and liquid) /10^3 m^3 (gas))	**Years**		
	2010	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	7,419,703.0	10,574,434.0	12,258,462.0
Lignite	56,689,392.0	61,507,310.0	55,742,463.0
Fuel Oil	891,782.0	531,608.0	564,796.0
Diesel oil	20,354.0	15,047.0	176,379.0
LPG	0.0	0.0	0.0
Naphtha	13,140.0	0.0	0.0
Natural Gas	21,783,414.0	22,804,587.0	23,090,121.0
*Renewables and Wastes**	0.0	0.0	0.0
* Since heating values and fuel amounts of renewable and waste materials are not included in TEIAS Statistics, these are also ignored here.			

To calculate the Net Calorific Values, data on heating values of fuels consumed in thermal power plants in Turkey by the electric utilities[92] along with the fuel amounts mentioned above were used.

Table 15. Heating Values of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities [2010 – 2012][92]

Heating Values of Fuels Consumed in Thermal Power Plants (Unit: Tcal)	**Years**		
	2010	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	39,546.5	57,567.3	71,270.2
Lignite	96,551.0	107,209.5	93,586.6
Fuel Oil	8,569.1	5,279.9	5,624.8
Diesel oil	209.5	155.1	1,883.6
LPG	0.0	0.0	0.0
Naphtha	105.1	0.0	0.0
Natural Gas	194,487.3	202,064.1	203,766.4
*Renewables and Wastes**			
Turkey's Thermal Total	**339,468.5**	**372,275.9**	**376,131.6**
* Since heating values and fuel amounts of renewable and waste materials are not included in TEIAS Statistics, these are also ignored here.			

[91] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/yakıt48-53/49.xls
[92] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/yakıt48-53/51.xls

Since there are no plant-specific or fuel-type specific emission factor data officially available in Turkey, we have to use the emission factors published by IPCC.[93] The related emission factors are indicated in the following table:

Table 16. IPCC Default Emission Factor Values by Different Fuel Types

Default CO_2 Emission Factors for Combustion	Table 1.4		
	Effective CO_2 Emission Factor (kg/TJ)		
Fuel Type	Default	Lower	Upper
Anthracite	98,300	94,600	101,000
Coking Coal	94,600	87,300	101,000
Other Bituminous Coal	94,600	89,500	99,700
Sub-Bituminous Coal	96,100	92,800	100,000
Lignite	101,000	90,900	115,000
Fuel Oil	77,400	75,500	78,800
Diesel Oil	74,100	72,600	74,800
LPG	63,100	61,600	65,600
Naphtha	73,300	69,300	76,300
Natural Gas	56,100	54,300	58,300

For the sake of conservativeness, the lower limits of the 95 percent confidence intervals were used in the calculation of Operating Margin Emission Factor.

Since the emission factors of IPCC are based on mass-units, and the fuel consumption amounts for natural gas is given in volume units in TEIAS statistics, we should convert the amount of natural gas from volume units to mass units. For this purpose, the density of natural gas must be specified. Natural Gas Density of Turkey for Electricity Generation was calculated using the data for Turkey in International Energy Agency's (IEA) Natural Gas Information (2010 Edition)[94], IEA Key World Energy Statistics 2011[95], and IEA Energy Statistics Manual[96].

Turkey's main natural gas supplier is Russian Federation, along with its neighbouring countries[97]. This fact is also confirmed by IEA Natural Gas Information[94] by comparing average gross calorific value of natural gas of Turkey for consumption and that of Russian Federation for production. So, natural gas produced and exported by Russian Federation and imported and consumed by Turkey was accepted as the representative of natural gas used as fuel in electricity generation in Turkish National Grid.

To calculate the density of natural gas, the following table[94] was used:

[93] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

[94] IEA Statistics, Natural Gas Information 2010, International Energy Agency - Introductory Information, Section 7, Abbreviations and conversion factors, pp. xxvii - xxx.

[95] http://www.iea.org/publications/freepublications/publication/key_world_energy_stats-1.pdf , Conversion Factors, pp. 58 – 60.

[96] http://www.iea.org/publications/freepublications/publication/statistics_manual.pdf , Annex 3 Units and Conversion Equivalents – Natural Gas – pp. 182 – 183.

[97] BOTAS (Petroleum Pipeline Corporation) Natural Gas Purchase Agreements Information (http://www.botas.gov.tr/)

Table 17. Conversion Factors from Mass or Volume to Heat (Gross Calorific Value) for Natural Gas Supplied by Russian Federation

	GAS	
	Russia	
To:	MJ	Btu
From:	multiply by:	
cm*	38.23	36,235
Kg	55.25	52,363
* Standard Cubic Meters		

This gives us a natural gas density of 0.692 kg/m^3, which we used to calculate the mass of natural gas used as fuel in power plants in Turkey for electricity generation.

As a result, the Fuel Consumption in Electricity Generation in Turkey can be shown again with all the amounts in mass units as in the following table:

Table 18. Fuel Consumption in Electricity Generation in Turkey for the 3-year period of [2010 – 2012] (in mass units)

Fuel Consumption in Electricity Generation Excluding Low-Cost/Must-Run (Unit: Ton)	**Years**		
	2012	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	7,419,703.0	10,574,434.0	12,258,462.0
Lignite	56,689,392.0	61,507,310.0	55,742,463.0
Fuel Oil	891,782.0	531,608.0	564,796.0
Diesel oil	20,354.0	15,047.0	176,379.0
LPG	0.0	0.0	0.0
Naphtha	13,140.0	0.0	0.0
Natural Gas	15,072,939.7	15,779,535.9	15,977,110.0
*Renewables and Wastes**			
Turkey's Thermal Total	**80,107,310.7**	**88,407,934.9**	**84,719,210.0**
* Since heating values and fuel amounts of renewable and waste materials are not included in TEIAS Statistics, these are also ignored here.			

Net Calorific Values can be calculated using the heating values and the fuel amounts:

Table 19. Net Calorific Values calculated for fuel types in Electricity Generation in Turkey for the 3-year period of [2010 – 2012]

Net Calorific Values of Fuels Consumed in Thermal Power Plants (Unit: TJ/Gg)	**Years**		
	2010	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	22.3	22.8	24.3

Lignite	7.1	7.3	7.0
Fuel Oil	40.2	41.6	41.7
Diesel oil	43.1	43.2	44.7
LPG	0.0	0.0	0.0
Naphtha	33.5	0.0	0.0
Natural Gas	54.0	53.6	53.4
*Renewables and Wastes**			
* Assumed as zero due to unavailability of data and conservativeness			

It is not very clear whether the heating values given in TEIAS statisitics[92] are lower heating values (Net Calorific Values = NCV) or higher heating values (Gross Calorific Values = GCV). However, some other sources of state, academic and NGO (chamber of engineers) origin confirm that these are lower heating values (net calorific values) by giving values in the same range as the calculated NCV values[98,99,100,101,102,103]. Moreover, these data is compliant with the value given in National Inventory Reports and Common Report Formats of Turkey submitted to UNFCCC, in which it was also stated that the heating values given are NCV values[104,105]. As a result, these values are assumed to be the net calorific values of thermal power plants in Turkey for the relevant period.

Turkey's Net Electricity Generation by primary energy resources was not given in the TEIAS Turkish Electricity Generation – Transmission Statistics[106]. Instead, Gross Electricity Generation by primary energy resources[107], net generation amount and percentages for the whole national grid regardless of the primary energy resources are available[108]. As a result, it becomes necessary to calculate the net generation by primary energy resources by using these two data sets available.

For this purpose, the net/gross electricity generation ratio was assumed to be the same for all primary energy resources. According to some studies made on this subject, the net/gross electricity generation ratio of renewable energy power plants is slightly higher than that of thermal power plants[109,110]. Since the gross generation percentage of renewable energy power plants is lower than the percentage of thermal power plants, using the same average net/gross electricity generation ratio for all power plants would result in a slightly lower share for renewable energy power plants in the total net electricity generation than it would be if we used the actual net/gross electricity generation ratios. Likewise, the net generation

[98] http://enver.eie.gov.tr/DocObjects/Download/60094/TepHesap.xls
[99] http://www.hkad.org/makaleler/cilt1/sayi1/HKAD-12-004.pdf
[100] http://www.enerji.gov.tr/yayinlar_raporlar/Sektor_Raporu_TKI_2011.pdf
[101] http://www.mmo.org.tr/resimler/dosya_ekler/a9393ba5ea45a12_ek.pdf
[102] http://www.mmo.org.tr/resimler/dosya_ekler/b4d09fdaf9131ab_ek.pdf?dergi=1148
[103] http://tez.sdu.edu.tr/Tezler/TF00997.pdf
[104] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur-2013-nir-15apr.zip
[105] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur-2013-crf-12apr.zip
[106] http://www.teias.gov.tr/istatistikler.aspx , http://www.teias.gov.tr/Eng/StatisticalReports.aspx
[107] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/42(06-12).xls
[108] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/34(84-12).xls
[109] http://www.pserc.wisc.edu/documents/publications/special_interest_publications/EPRI_Electricity_Use_Report_Final_1024651.pdf , pp. 2-6 – 2-14.
[110] ftp://ftp.eia.doe.gov/electricity/epatech.pdf , pp 2 – 4.

share of thermal power plants will be slightly higher than that it would normally be. This would cause a slightly higher operational margin emission factor value for the whole system, if we used all the power plants including renewable ones, in the emission factor calculation. This would still be acceptable since the difference between net/gross electricity generation ratio of renewable and non-renewable power plants is very low (about 1 – 2 %), and could be assumed in the allowed error range.

However, by choosing Option B of Simple OM method for operating margin emission factor calculation, we excluded all the low-cost/must-run power plants, that is, renewable ones. So, the impact of net/gross electricity generation ratio for renewable power plants is automatically eliminated. Since the corresponding ratio for different thermal plants is almost the same, using the same average net/gross electricity generation ratio for all thermal power plants is acceptable.

The following table summarizes the calculation of net electricity generation from gross electricity generation distribution by primary energy resources and net/gross electricity generation ratio for all system.

Table 20. Net Electricity Generation Calculation by Primary Energy Resources for Turkey for the 5-year period of [2008 – 2012]

Net Electricity Generation Including Imports and Excluding Low-Cost/Must-Run(Unit: GWh)	**Years**				
	2008	**2009**	**2010**	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	15,165.7	15,897.6	18,366.0	25,936.3	31,683.8
Lignite	40,032.0	37,445.4	34,553.2	36,864.6	32,981.3
Fuel Oil	6,894.1	4,253.0	2,061.0	854.0	933.0
Diesel oil	254.7	331.3	4.1	2.9	625.0
LPG	0.0	0.4	0.0	0.0	0.0
Naphtha	41.7	16.8	30.7	0.0	0.0
Natural Gas	94,380.1	92,053.1	94,351.2	98,678.5	99,355.1
Import	789.4	812.0	1,143.8	4,555.8	5,826.7
Total	**157,557.7**	**150,809.6**	**150,510.0**	**166,892.1**	**171,404.9**

The operating margin emission factor was calculated using the above assumptions, data and formulations, as below:

Operating Margin Emission Factor Calculation:

The calculation was performed according to the Option B of the Simple OM method of the Tool. Only grid connected power plants were included in the project electricity system. Ex-ante option was chosen, and a 3-year generation-weighted average, based on the most recent data available at the time of submission, was taken. The relevant reference period corresponds to the 3 year period of [2010 – 2012]. The gross electricity generations of these years by primary energy sources are as follows.[111,112,113,114]

[111] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/42(06-12).xls
[112] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/46.xls
[113] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2011/uretim%20tuketim(22-45)/44.xls
[114] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/44.xls

Table 21. Gross Electricity Generations of Turkish Electricity System by Primary Energy Sources in Years [2010 – 2012]

Gross Generations by Fuel Types and Primary Energy Resources in [2010 - 2012] (Unit: GWh)				
Primary Energy Resource or Fuel Type	**Years**			**3-Year Total**
	2010	**2011**	**2012**	
Hard Coal + Imported Coal + Asphaltite	19,104.3	27,347.5	33,324.2	79,776.0
Lignite	35,942.1	38,870.4	34,688.9	109,501.4
Total Coal	**55,046.4**	**66,217.9**	**68,013.1**	**189,277.4**
Fuel-Oil	2,143.8	900.5		3,044.3
Diesel Oil	4.3	3.1	657.4	664.8
LPG	0.0	0.0	0.0	0.0
Naphtha	31.9	0.0	0.0	31.9
Total Oil (Liquid Total)	**2,180.0**	**903.6**	**1,638.7**	**4,722.3**
Natural Gas	98,143.7	104,047.6	104,499.2	306,690.5
Renewables and Wastes	457.5	469.2	720.7	1,647.4
Thermal	**155,827.6**	**171,638.3**	**174,871.7**	**502,337.6**
Hydro + Geothermal + Wind Total	**55,380.1**	**57,756.8**	**64,625.1**	**177,762.0**
Hydro	**51,795.5**	**52,338.6**	**57,865.0**	**161,999.1**
Geothermal + Wind	**3,584.6**	**5,418.2**	**6,760.1**	**15,762.9**
Geothermal	668.2	694.3	899.3	2,261.8
Wind	2,916.4	4,723.9	5,860.8	13,501.1
General Total (Gross)	**211,207.7**	**229,395.1**	**239,496.8**	**680,099.6**

Net electricity generation is only available for the whole project electricity system, not for each fuel type or primary energy source[115]:

Table 22. Gross and Net Electricity Generations of Turkish Electricity System in Years [2010 – 2012]

Gross and Net Generations in [2010 - 2012] (Unit: GWh)				
Primary Energy Resource or Fuel Type	**Years**			**3-Year Total**
	2010	**2011**	**2012**	
General Total (Gross)	**211,207.7**	**229,395.1**	**239,496.8**	**680,099.6**
General Total (Net)	**203,046.1**	**217,557.7**	**227,707.3**	**648,311.1**
Net / Gross Ratio	**96.14%**	**94.84%**	**95.08%**	**95.33%**

The corresponding net/gross ratio of each year was applied to gross generations of each primary energy source to find the net generation of group of power plants utilizing that primary energy source, with low-cost/must-run power plants excluded:

Table 23. Net Electricity Generations of Turkish Electricity System by Primary Energy Sources, Excluding Low-Cost/Must-Run Power Plants, (Thermal Power Plants) in Years [2010 – 2012]

[115] http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2012/uretim%20tuketim(23-47)/34(84-12).xls

Net Electricity Generation Excluding Low-Cost/Must-Run (Thermal Power Plants) (Unit: GWh)	Years			3-Year Total
	2010	2011	2012	
Hard Coal+Imported Coal+Asphaltite	18,366.0	25,936.3	31,683.8	75,986.1
Lignite	34,553.2	36,864.6	32,981.3	104,399.1
Fuel Oil	2,061.0	854.0	933.0	3,848.0
Diesel oil	4.1	2.9	625.0	632.1
LPG	0.0	0.0	0.0	0.0
Naphtha	30.7	0.0	0.0	30.7
Natural Gas	94,351.2	98,678.5	99,355.1	292,384.8
Renewables and Wastes	439.8	445.0	685.2	1,570.0
Turkey's Thermal Total	**149,806.0**	**162,781.3**	**166,263.4**	**478,850.8**

Fuel consumptions of thermal power plants were also taken from TEIAS statistics[91]. The amount of natural gas was converted from volume to mass units using the density value of 0.692 kg/m^3, as explained above.

Table 24. Fuel Consumption of Thermal Power Plants by Fuel Type, in Years [2010 – 2012]

Fuel Consumption in Electricity Generation Excluding Low-Cost/Must-Run (Unit: Ton)	Years			3-Year Total
	2010	2011	2012	
Hard Coal+Imported Coal+Asphaltite	7,419,703.0	10,574,434.0	12,258,462.0	30,252,599.0
Lignite	56,689,392.0	61,507,310.0	55,742,463.0	173,939,165.0
Fuel Oil	891,782.0	531,608.0	564,796.0	1,988,186.0
Diesel oil	20,354.0	15,047.0	176,379.0	211,780.0
LPG	0.0	0.0	0.0	0.0
Naphtha	13,140.0	0.0	0.0	13,140.0
Natural Gas	15,072,939.7	15,779,535.9	15,977,110.0	46,829,585.6
Turkey's Thermal Total	**80,107,310.7**	**88,407,934.9**	**84,719,210.0**	**253,234,455.6**

Heating values of fuels consumed in power plants were also taken from the TEIAS statistics[92]. These values were in [Tcal] units, and were converted into [TJ], using the ratio 1 cal = 4.1868 J, given by IEA.[94,95,96]

Table 25. Heating Values of Fuels Consumed in Thermal Power Plants in Turkey, in Years [2010 – 2012]

Heating Values of Fuels Consumed in Thermal Power Plants (Unit: TJ)	Years			3-Year Total
	2010	2011	2012	
Hard Coal+Imported Coal+Asphaltite	165,573.3	241,022.6	298,393.9	704,989.8
Lignite	404,239.7	448,864.9	391,828.5	1,244,933.1
Fuel Oil	35,877.2	22,105.8	23,549.8	81,532.7

Diesel oil	877.1	649.3	7,886.4	9,412.8
LPG	0.0	0.0	0.0	0.0
Naphtha	440.2	0.0	0.0	440.2
Natural Gas	814,279.2	846,002.0	853,129.0	2,513,410.3
Turkey's Thermal Total	**1,421,286.7**	**1,558,644.5**	**1,574,787.7**	**4,554,718.8**

The corresponding net calorific values (NCV) were found as follows:

Table 26. Net Calorific Values of Fuels Consumed in Thermal Power Plants in Turkey, in Years [2010 – 2012]

Net Calorific Values of Fuels Consumed in Thermal Power Plants (Unit: TJ/Gg)	**Years**		
	2010	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	22.3	22.8	24.3
Lignite	7.1	7.3	7.0
Fuel Oil	40.2	41.6	41.7
Diesel oil	43.1	43.2	44.7
LPG	0.0	0.0	0.0
Naphtha	33.5	0.0	0.0
Natural Gas	54.0	53.6	53.4
Turkey's Thermal Total	**17.7**	**17.6**	**18.6**

Due to the absence of power-plant based or fuel based emission factor data, the lower limit of the 95 percent confidence intervals of IPCC default emission factor values were applied[93], and the emission factor for electricity imports were assumed as zero:

Table 27. Emission Factors used in the Operating Margin Emission Factor Calculation.

Emission Factors by Fuel Type (IPCC Values) (kg/TJ)	Table 1.4		
	Default CO_2 Emission Factors for Combustion (kg/TJ)		
	Default	Lower	Upper
Hard Coal+Imported Coal+Asphaltite	94,600	89,500	99,700
Lignite	101,000	90,900	115,000
Fuel Oil	77,400	75,500	78,800
Diesel oil	74,100	72,600	74,800
LPG	63,100	61,600	65,600
Naphtha	73,300	69,300	76,300
Natural Gas	56,100	54,300	58,300

Import	0	0	0

The corresponding emissions and Operating Margin Emission Factors were calculated using the above values:

Table 28. Operating Margin Emission Factor Calculation.

Operating Margin Emission Factor Calculation			
CO_2 Emissions (ton)	**Years**		
	2010	**2011**	**2012**
Hard Coal+Imported Coal+Asphaltite	14,818,807.99	21,571,526.82	26,706,251.95
Lignite	36,745,389.26	40,801,815.79	35,617,213.92
Fuel Oil	2,708,730.18	1,668,984.86	1,778,007.02
Diesel oil	63,674.50	47,138.38	572,555.90
LPG	0.00	0.00	0.00
Naphtha	30,502.68	0.00	0.00
Natural Gas	44,215,362.69	45,937,907.18	46,324,907.21
Import	0.00	0.00	0.00
Total Emission [ton]	**98,582,467.30**	**110,027,373.03**	**110,998,936.01**
Yearly Emission Factor [tCO_2/MWh]	**0.655**	**0.659**	**0.648**
2010-2012 Total Emissions [ton]			**319,608,776.35**
2010-2012 Total Net Electricity Gen. [GWh]			**488,807.0**
2010-2012 OMEF Calculation [tCO_2/MWh]			**0.654**

As a result, the Operating Margin Emission Factor for the selected period was found to be

***$EF_{grid,OM,\ simple}$* = 0.654 tCO_2/MWh.**

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

For this step, Option I indicated in paragraph 68 of the Tool was chosen and the build margin emission factor is calculated ex ante based on the most recent information available at the time of writing this report.

Power plant based generation data is unavailable for Turkish National Grid. However, plant based generation capacity data is available in annually published Capacity Projection Reports of TEIAS[116]. The latest of these reports, "TEIAS 5-year Generation Capacity Projection 2013-2017"[74] was used as the reference for build margin emission calculation.

In this report, there are "Project Generation Capacity" and "Firm Generation Capacity" for each power plant. Project Generation Capacity is the value written on the generation licence given by EMRA for each power plant, and indicates the generation that could be achieved under ideal conditions. Firm Generation Capacity reflects the real generation capacity, taking into account various parameters that could affect the

[116] Electrical Energy Generation Capacity Projection Reports of Turkey
http://www.teias.gov.tr/YayinRapor/APK/projeksiyon/index.htm

generation, and mostly based on the actual generations of the previous years. Hence, firm generation capacities of power plants indicated in this report were selected as the reference generation data for the build margin emission calculation.

The total firm generation capacity in 2012 is calculated as 277,583.5 GWh, a figure higher than total gross generation of 239,496.8 GWh in 2012[111,115]. This is expected, since the full annual firm generation capacities of power plants commissioned in 2012 have been taken into account. Since the real contribution of firm generation capacities of power plants commissioned in 2012 to real gross generation in 2012 is very hard to calculate, the firm generation capacities of all power plants at the end of 2012 is assumed as their gross generation in 2012, to calculate the build margin emission factor calculation. This is also in line with the logic behind the build margin emission factor calculation, that is, this assumption reflects the impact of power plants that started to supply electricity to the grid most recently better.

The "TEIAS 5-year Generation Capacity Projection 2013-2017"[74] gives the definitive situation of the Turkish Energy Generation System as at the end of 2012. At this date, there were 771 power plants in Turkey[27]. 747 of these were listed namely, 24 of them under the categorisation of "Others" in 5 different places in the Annex 1 of the report. So, since it is impossible to specify the names and commissioning dates of the power plants in the "Others" category, these were excluded in the build margin emission factor calculation.

Capacity additions of retrofits of power plants were selected by comparing the installed capacity values and fuel types given in the capacity projection reports for different years[116], and explanations given in energy investment data of Ministry of Energy and Natural Resources of Turkey[117], which includes commissioning dates of all power plants in Turkey beginning from 2003.

CDM-VER project activities in Turkey at the end of 2012 were specified by using the registry web sites of emission reduction standards used in Turkey, i.e. Gold Standard (GS), Verified Carbon Standard (VCS), and VER+ standards[118,119,120,121,122]. A total of 179 power plants have been specified as CDM-VER Projects in Turkey listed in the registry sites of these standards.

The commissioning of power plants in Turkey are often made in multiple stages, as allowed in the "Electrical Installations Acceptance Bylaw"[123]. The rationale of this procedure is mostly to commission the part or group of the power plant that has been completed and ready to be commissioned without having to wait for all the power plant to be completed; and not to lose revenues from electricity sales in this period. These single stages of commissionings are called "provisional acceptance" and represents the date on which the electricity generated by the power plant started to be sold.

As a result, these partial commissionings, which are the individual stages of commissioning process indicated by provisional acceptances, have to be taken into account to calculate the build margin

[117] Ministry of Energy and Natural Resources, Publications/Reports, Energy Investments
http://www.enerji.gov.tr/index.php?dil=tr&sf=webpages&b=yayinlar_raporlar&bn=550&hn=&id=3273
[118] Markit Environmental Registry Public View - Projects in Turkey
http://mer.markit.com/br-reg/public/index.jsp?p=1&r=&u=&scolumn=project_name&sdir=ASC&s=cp&q=Turkey
[119] The VCS Project Database Project Search Results
https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=1&t=1
[120] The VCS Project Database Pipeline Search Results
https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?tc=1&Tab=Pipeline&a=1
[121] Netinform Climate and Energy - VER+ Projects
http://www.netinform.de/KE/Wegweiser/Ebene1_Projekte2.aspx?mode=4
[122] APX Gold Standard Registry Web Site – Obsolete
http://goldstandard.apx.com/
[123] http://www.resmigazete.gov.tr/arsiv/22280.pdf , pp. 2 – 37.

emission factor correctly. For this reason, each single partial commissioning of a power plant was considered as a separate power unit.

The project and firm generation of each power unit was found by multiplying the total project and firm generation of the power plant by the ratio found by dividing the installed capacity of the power unit by that of the whole power plant.

The dates of commissionings, or power units, were taken from Capacity Projection Reports of TEIAS[116] and Energy Investment Data of Ministry of Energy[117]. The commissionings were sorted by their dates beginning from the newest to the oldest to identify the two sets of power units $SET_{5\text{-}units}$, and $SET_{\geq 20\ per\ cent}$, according to paragraph 71 on the page 20 of the Tool.

The calculation of build margin emission factor calculation is done according to the paragraph 73 and 73, on pages 21 – 22 of the Tool:

"73. The build margin emissions factor is the generation-weighted average emission factor (t CO_2/MWh) of all power units m during the most recent year *y* for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \text{Equation (13)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (t CO_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* (t CO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which electricity generation data is available

74. The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$)should be determined as per the guidance in Step 4 section 6.4.1 for the simple OM, using Options A1, A2 or A3, using for y the most recent historical year for which electricity generation data is available, and using for *m* the power units included in the build margin."

Since the power plant based data of emission factors and consumed fuels are not available, but generations and fuel types are available for the sample group of power units m used to calculate the build margin, only Option A2 of the Simple OM method is convenient for a calculation. So, emission factor for power plants for each fuel is calculated as indicated in the following sub-paragraph (b) of paragraph 44 on page 12 of the Tool:

"(b) **Option A2** - If for a power unit *m* only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO_2,m,i,y} \times 3.6}{\eta_{m,y}} \qquad \text{Equation (3)}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit *m* in year *y* (t CO_2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (t CO_2/GJ)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit *m* in year *y* (ratio)
m	=	All power units serving the grid in year *y* except low-cost/must-run power units
y	=	The relevant year as per the data vintage chosen in Step 3

For the average emission factor of fuel types, the emission factors published by IPCC[93] were taken as reference, and the lower limits of the 95 percent confidence intervals were used, as in the calculation of Operating Margin Emission Factor.

For the average net energy conversion efficiency of the power units for each fuel type, Table 1 in Appendix 1 on page 33 of the Tool was taken as reference, as indicated in the table below.

Table 29. Default Efficiency Factors for Grid Power Plants

Appendix 1. Default efficiency factors for power plants - Table 1. Grid power plants		
Grid Power Plant		
Generation Technology	**Old Units (before and in 2000)**	**New Units (after 2000)**
Coal	-	-
Subcritical	37.0%	39.0%
Supercritical	-	45.0%
Ultra-Supercriticial	-	50.0%
IGCC	-	50.0%
FBS	35.5%	-
CFBS	36.5%	40.0%
PFBS	-	41.5%
Oil	-	-
Steam turbine	37.5%	39.0%
Open cycle	30.0%	39.5%
Combined cycle	46.0%	46.0%
Natural gas	-	-
Steam turbine	37.5%	37.5%
Open cycle	30.0%	39.5%
Combined cycle	46.0%	60.0%

For most of the power plants included in the build margin emission factor calculation, power-plant specific data could not be found. For these, the data in the above table was used and maximum applicable values considering conservativeness were taken. The values for new units (after 2000) were used.

However, for the thermal power plants using imported coal that were in the build margin emission calculation set, the efficiency data had been able to be found[124]. For these, generation-weighted average efficiency was calculated and this value is used in the build margin emission factor calculation, as indicated in the following table:

Table 30. Efficiency Factors for Power Plants Using Imported Coal as the Fuel in the Sample Group used in the Build Margin Emission Calculation

POWER PLANT NAME	Installed Capacity MW	Project Generation Capacity GWh	Firm Generation Capacity GWh	Commissioning Date	Location (Province)	Efficiency	Firm Generation x Efficiency
GÖKNUR GIDA[125]	1.6	6.0	6.0	09.08.2012	Nigde	50.0%	3.00
EREN ENERJİ ELEK.ÜR.A.Ş.[126]	30.0	196.0	196.0	29.06.2012	Zonguldak	42.0%	82.31
BEKİRLİ TES (İÇDAŞ ELEKT.)[124]	600.0	4,320.0	4,320.0	15.12.2011	Canakkale	41.5%	1,792.80
EREN ENERJİ ELEK.ÜR.A.Ş.[124]	600.0	3,919.4	3,919.4	29.12.2010	Zonguldak	42.0%	1,646.16
EREN ENERJİ ELEK.ÜR.A.Ş.[124]	600.0	3,919.4	3,919.4	01.11.2010	Zonguldak	42.0%	1,646.16
EREN ENERJİ ELEK.ÜR.A.Ş.[124]	160.0	1,045.2	1,045.2	15.07.2010	Zonguldak	41.0%	428.52
İÇDAŞ ÇELİK[124]	135.000	961.7	961.7	13.10.2009	Canakkale	35.0%	336.58
TOTAL / AVERAGE	**2,126.6**	**14,367.7**	**14,367.7**	**Average Efficiency**		**41.3%**	**5,932.5**

This result is compatible with the information given by IEA (International Energy Agency), in which it was stated that supercritical pulverised (SCPC) is the dominant option for new coal fired power plants and

[124]Panel about "Coal-Fired Power Plants and Investment Models", Middle East Technical University Alumni Association Visnelik Facility, 23 February 2013 / Saturday / 13:30, Presentation given by Muzaffer BASARAN, http://www.odtumd.org.tr/dosyaArsivi/Etkinlik/muzaffer_basaran_odtu_komur_santral_230213.pptx , slides 31 – 40.

[125]No specific data regarding the efficiency of this power plant could be found. Hence the highest possible default efficiency factors for power plants (50%) has been applied. (Tool to calculate the emission factor for an electricity system, version 4.0, Page 33.)
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf

[126] The official explanation given for this commissioning states that this is an extra installed capacity originating from the power output increase in the two existing turbines; which were commissioned in the same year before, and having an installed capacity of 600 MW. The power output became 615 MW. Hence the efficiency has been assumed as the same value of 42%. (Republic of Turkey, Ministry of Energy and Natural Resources, Publications and Reports, Periodical Publications, Energy Investments, Year 2012)
http://www.enerji.gov.tr/yayinlar_raporlar/2012_Yili_Enerji_Yatirimlari.xls

maximum value for generating efficiency of SCPC plants is 46% (lower heating value, LHV), as of 2010[127].

For the power plants using other types of solid fuels (hard coal, lignite, asphaltite, and waste materials incinerated), since there are no specific data that could be found, the efficiency factor is assumed as equal to that of imported coal, and the value that is nearest to the efficiency calculated for power plants using imported coal in the IPCC Default Efficiency Factors Table (Table 23), that is 41.5 %, was accepted as the efficiency factor. This is in line with the rule of conservativeness, since generally efficiency of other types of coal and other solid fuels is expected to be lower than that of imported coal, which is of higher quality. Also, since the share of other types of solid wastes are very small as compared to that of imported coal, their effect is minimal.

For natural gas, the maximum value (60.0 %) was. For naphta, biogas, and liquefied petroleum gas (LPG) The efficiency factor is accepted as equal to natural gas.

For liquid fuels except naphta, that is fuel oil and diesel oil, the efficiency factor is accepted as the maximum value in the table, 46 %, according to the rule of conservativeness.

The results were put into the Equation (13) on page 22 of the Tool to calculate the Build Margin Emission Factor.

Option 1, ex ante based build margin emission factor calculation, was selected.

Capacity additions from retrofits of power plants that could be identified are as follows:

Table 31. Capacity additions from retrofits of power plants that could be identified in commissioned power units (Detailed references can be found in Emission Reduction Spreadsheet)

Capacity Additions from Retrofit of Power Plants (As at the end 2012)							
No	**Fuel / Energy Source**	**POWER PLANT NAME**	**Installed Capacity MW**	**Firm Generation Capacity (year 2012) GWh**	**Commissioning Date**	**Location (Province)**	**Retrofit Type**
1	NG	AKBAŞLAR	3.960	30.06	2003-09-13	Bursa	FS from FO to NG
2	NG	AMYLUM NİŞASTA (Adana)	6.200	34.69		Adana	FS from FO to NG
3	NG	DENİZLİ ÇİMENTO	14.000	113.00	2006-05-04	Denizli	FS from FO to NG
4	NG	ISPARTA MENSUCAT	4.300	33.00		Isparta	FS from FO to NG
5	NG	PAKGIDA (Düzce-Köseköy)	4.800	38.26		Duzce	FS from LPG to NG
6	NG	PAKMAYA (Köseköy)	4.800	38.26		Kocaeli	FS from LPG to NG
7	NG	PAKMAYA (Köseköy)	2.100	16.74	2003-07-02	Kocaeli	FS from LPG to NG
8	NG	KAREGE ARGES	26.280	209.09	2003-07-30	Izmir	FS from FO to NG
GENERAL TOTAL			**66.4**	**513.1**			
Abbreviations: FS: Fuel Switch, NG: Natural Gas, FO: Fuel Oil, LPG: Liquefied Petroleum Gas							

[127] http://www.iea-etsap.org/web/E-TechDS/PDF/E01-coal-fired-power-GS-AD-gct.pdf , p. 1.

CDM project activities are identified as follows[118,119,120,121,122]

Table 32. CDM VER Projects in Turkey as at the end of 2012

	Fuel / Energy Source	Power Plant Name	Installed Capacity MW	Location (Province)	Commissioning Date (If multiple, first date)	Standard	Code / Number / Project ID	Markit Registry ID
1	WS	ITC-KA ENERJİ MAMAK	25.4	Ankara	03.11.2006	GS	GS440	103000000002476
2	WS	ITC-KA ENERJİ SİNCAN	5.7	Ankara	17.07.2009	GS	GS675	103000000002252
3	WS	ITC-KA ENERJİ KONYA (ASLIM BİYOKÜTLE)	5.7	Konya	09.09.2011	GS	GS1016	103000000001914
4	WS	ITC-KA ENERJİ ADANA (BİYOKÜTLE)	15.6	Adana	02.09.2010	GS	GS715	103000000002212
5	WS	ITC BURSA	9.8	Bursa	19.05.2012	GS		103000000001862
6	WS	CEV EN.(GAZİANTEP ÇÖP)	5.7	Gaziantep	01.02.2010	GS		103000000002182
7	WS	ORTADOĞU ENERJİ (Oda yeri)	21.1	Istanbul	29.12.2008	GS		103000000002220
8	WS	ORTADOĞU ENERJİ (KÖMÜRCÜODA)	8.6	Istanbul	15.07.2009	GS	GS707	103000000001594
9	WS	BOLU BEL.ÇÖP (CEV MARMARA)	1.1	Bolu	26.08.2011	GS	GS764	103000000002164
10	WS	KAYSERİ KATI ATIK (HER EN.)	2.9	Kayseri	01.11.2011	GS	GS1061	103000000001869
11	WS	KOCAELİ ÇÖP	2.3	Kocaeli	02.03.2012	GS		103000000001917
12	WS	PAMUKOVA YEN.EN.	1.4	Sakarya	05.05.2012	GS		103000000001857
13	WS	SAMSUN AVDAN KATI ATIK	2.4	Samsun	09.03.2012	GS		103000000001994
14	HE	AKÇAY	28.8	Aydin	14.08.2009	VCS	1174	
15	HE	AKIM (CEVİZLİK HES)	91.4	Rize	28.05.2010	VCS	753	100000000000891
16	HE	ALABALIK REG.(DARBOĞAZ)	13.8	Erzurum	14.12.2012	GS		103000000002081
17	HE	ANADOLU ÇAKIRLAR	16.2	Artvin	13.08.2009	GS	GS917	
18	HE	ARCA HES (GÜRSU EL.)	16.4	Trabzon	06.04.2012	VCS	1152	103000000005346
19	HE	AYANCIK HES (İLK EL.)	15.6	Sinop	21.10.2012	GS		103000000002215
20	HE	AYRANCILAR HES MURADİYE EL.)	41.5	Van	25.03.2011	GS, VCS	GS729, 577	100000000000610
21	HE	ASA EN.(KALE REG.)	9.6	Rize	19.02.2010	GS	GS637	103000000002290
22	HE	BALKUSAN I HES (KAREN)	13.0	Karaman	04.08.2012	VCS	918	100000000001261
23	HE	BALKUSAN II HES (KAREN)	25.0	Karaman	04.08.2012	VCS	918	100000000001261
24	HE	BANGAL REG. KUŞLUK HES(KUDRET EN.)	17.0	Trabzon	16.05.2012	GS		103000000002119
25	HE	CEYKAR BAĞIŞLI	29.6	Hakkari	21.03.2009	VCS	657	100000000000637
26	HE	BALKONDU I HES (BTA ELEK.)	9.2	Trabzon	05.08.2011	VCS	PL1101	103000000004107
27	HE	BEREKET (KOYULHİSAR)	42.0	Sivas	12.06.2009	VCS	713	100000000000855
28	HE	BEYOBASI (SIRMA)	5.9	Aydin	23.05.2009	VCS	603	100000000000649
29	HE	BEYTEK(ÇATALOLUK HES)	9.5	K.Maras	07.04.2010	GS	GS872	103000000002057
30	HE	BULAM	7.0	Adiyaman	10.08.2010	GS	GS642	103000000002285
31	HE	BURÇBENDİ (AKKUR EN.)	27.3	Adiyaman	04.11.2010	VCS	419	100000000000363
32	HE	CEVHER (ÖZCEVHER)	16.4	Trabzon	17.01.2011	GS	GS688	103000000000005
33	HE	CEYHAN HES (BERKMAN HES-ENOVA)	37.8	Osmaniye	20.08.2010	VCS	810	

34	HE	CEYHAN HES (OŞKAN HES-ENOVA)	23.9	Osmaniye	03.06.2010	VCS	810	
35	HE	ÇAKIT HES	20.2	Adana	01.06.2010	VCS	685	100000000000777
36	HE	ÇALDERE ELEKTRİK DALAMAN MUĞLA	8.7	Mugla	02.04.2008	VCS	363	100000000000315
37	HE	ÇAMLICA III	27.6	Kayseri	01.04.2011	VCS	759	100000000000940
38	HE	DAMLAPINAR(CENAY ELEK.)	16.4	Karaman	08.07.2010	VCS, VER+	1066	100000000001300
39	HE	DARCA HES (BÜKOR EL.)	8.9	Bilecik	26.05.2011	GS	GS887	103000000002042
40	HE	DEMİRCİLER HES(PAK EN.)	8.4	Denizli	03.08.2012	GS		103000000002055
41	HE	DEĞİRMENÜSTÜ (KAHRAMANMARAŞ)	38.6	K.Maras	05.12.2008	VCS	565	100000000000594
42	HE	EGEMEN 1 HES (ENERSİS ELEK.)	19.9	Bursa	26.11.2010	GS	GS755	103000000002173
43	HE	ELESTAŞ YAYLABEL	5.1	Isparta	07.09.2009	VCS	582	100000000000612
44	HE	ELESTAŞ YAZI	1.1	Cankiri	02.10.2009	VCS	583	100000000000613
45	HE	ERİKLİ-AKOCAK REG.(AK EN.)	82.5	Trabzon	29.07.2010	VCS	535	100000000000537
46	HE	ESENDURAK (MERAL EL.)	9.3	Erzurum	23.10.2012	GS		103000000002083
47	HE	EŞEN-I (GÖLTAŞ)	60.0	Mugla	24.04.2011	VER+	97-1	
48	HE	FEKE I (AKKUR EN.)	29.4	Adana	27.06.2012	VCS	533	100000000000538
49	HE	FEKE 2 (AKKUR EN.)	69.3	Adana	24.12.2010	VCS	534	100000000000541
50	HE	FİLYOS YALNIZCA HES	14.4	Karabük	16.09.2009	GS	GS618	103000000002309
51	HE	GEMİCİLER REG.(BOZTEPE)	8.0	Adiyaman	18.12.2012	GS		103000000001894
52	HE	GÜLLÜBAĞ (SEN EN.)	96.0	Erzurum	23.03.2012	VCS	391	100000000000043
53	HE	GÜNDER REG.(ARIK)	28.2	Karaman	31.05.2012	VCS	912	100000000001303
54	HE	GÜZELÇAY I-II HES(İLK EN.)	8.1	Sinop	15.06.2010	GS	GS711	103000000002216
55	HE	HAMZALI HES (TURKON MNG ELEK.)	16.7	Kirikkale	08.11.2008	GS	GS633	103000000002294
56	HE	HASANLAR (DÜZCE)	4.7	Duzce	02.12.2011	GS	GS831	103000000002098
57	HE	SELİMOĞLU HES (ARSIN EN.)	8.8	Trabzon	07.01.2010	GS	GS635	103000000002292
58	HE	İNCİRLİ REG.(LASKAR EN.)	25.2	Rize	25.05.2011	VCS		103000000005079
59	HE	KALE HES	34.1	K.Maras	16.06.2010	VCS	893	100000000001197
60	HE	KALEN ENER. (KALEN I-II)	31.3	Giresun	16.04.2008	VCS	932	100000000001123
61	HE	KALKANDERE-YOKUŞLU HES(AKIM EN.)	40.2	Rize	28.01.2011	VCS	905	100000000001296
62	HE	KARADENİZ ELEK.(UZUNDERE I HES)	62.2	Rize	27.05.2010	VCS	964	
63	HE	KARASU I HES (İDEAL EN.)	3.8	Erzurum	19.05.2011	GS	GS927	103000000002002
64	HE	KARASU 4-2 HES (İDEAL EN.)	10.4	Erzincan	24.11.2011	GS	GS928	103000000002001
65	HE	KARASU 4-3 HES (İDEAL EN.)	4.6	Erzincan	05.08.2011	GS	GS929	103000000002000
66	HE	KARASU 5 HES (İDEAL EN.)	4.1	Erzincan	03.08.2011	GS	GS929	103000000002000
67	HE	KAR-EN KARADENİZ ELEK.(ARALIK HES)	12.4	Artvin	30.04.2010	GS	GS663	103000000002264
68	HE	KAYABÜKÜ HES (ELİTE ELEK.)	14.6	Bolu	21.07.2010	GS	GS726	103000000002201
69	HE	KIRAN HES (ARSAN EN.)	9.7	Giresun	04.11.2011	GS, VCS	GS691, 1170	
70	HE	KOZDERE (ADO MAD.)	9.3	Antalya	08.10.2011	GS	G434	
71	HE	KUMKÖY HES (KUMKÖY EN.)	17.5	Samsun	23.02.2011	VCS, VER+	986	103000000000114

72	HE	LAMAS III-IV (TGT EN.)	35.7	Mersin	05.06.2009	VCS	726	100000000000841
73	HE	MARAŞ ENERJİ (FIRNIS)	7.2	K.Maras	05.06.2008	VER+		
74	HE	MENGE (ENERJİ-SA)	89.4	Adana	22.12.2011	VCS	578	100000000000616
75	HE	NİKSAR (BAŞAK REG.)	40.2	Tokat	23.05.2012	VCS, VER+	1019	103000000003156
76	HE	NİSAN EN.(BAŞAK HES)	6.9	Kastamonu	09.04.2010	VCS	1013	
77	HE	OTLUCA I HES (BEYOBASI)	37.5	Mersin	07.04.2011	VCS	755	100000000000858
78	HE	OTLUCA II HES (BEYOBASI)	6.4	Mersin	13.07.2011	VCS	755	100000000000858
79	HE	ÖZGÜR ELEKTR.AZMAK I	11.8	Mersin	01.04.2010	VCS	554	
80	HE	ÖZGÜR ELEKTR.AZMAK II	6.3	Mersin	25.12.2009	VCS	554	
81	HE	ÖZTAY GÜNAYŞE	8.3	Trabzon	13.08.2009	GS	GS636	103000000002291
82	HE	PAPART HES (ELİTE)	26.6	Artvin	02.03.2012	VCS	1300	103000000006012
83	HE	PAŞA HES(ÖZGÜR EL.)	8.7	Bolu	11.06.2010	GS	GS681	103000000002246
84	HE	REŞADİYE I HES(TURKON MNG EL.)	15.7	Sivas	26.11.2010	GS	GS643	103000000002284
85	HE	REŞADİYE II HES(TURKON MNG EL.)	26.1	Tokat	17.09.2010	GS	GS644	103000000002283
86	HE	REŞADİYE III HES(TURKON MNG EL.)	22.3	Tokat	11.11.2009	GS	GS645	103000000002282
87	HE	SARAÇBENDİ (ÇAMLICA)	25.5	Sivas	06.05.2011	VCS	758	100000000000941
88	HE	SAYAN (KAREL)	14.9	Osmaniye	19.11.2011	GS	GS730	103000000002197
89	HE	SEFAKÖY (PURE)	33.1	Kars	12.10.2011	VCS	747	100000000000910
90	HE	SELEN EL.(KEPEZKAYA HES)	28.0	Karaman	06.09.2010	VCS, VER+	954	100000000001299
91	HE	SIRAKONAKLAR(2M)	18.0	Erzurum	06.04.2012	GS		103000000002069
92	HE	SÖĞÜTLÜKAYA (POSOF HES) YENİGÜN EN.	6.1	Ardahan	20.01.2011	GS	GS891	103000000002038
93	HE	SULUKÖY HES (DU EL.)	6.9	Bursa	16.03.2012	GS		103000000001918
94	HE	ŞİRİKÇİOĞLU KOZAK	4.4	K.Maras	08.07.2009	VCS		103000000005082
95	HE	TEKTUĞ-KARGILIK	23.9	K.Maras	24.04.2005	VCS	264	100000000000284
96	HE	TEKTUĞ-KALEALTI HES	15.0	Osmaniye	30.11.2006	VCS	111	100000000000307
97	HE	TEKTUĞ-KEBENDERESİ	5.0	Elazig	09.05.2007	VCS	598	100000000000573
98	HE	TEKTUĞ-ERKENEK	13.0	Adiyaman	26.02.2009	VCS	693	103000000000120
99	HE	TUNA HES (NİSAN)	37.2	Tokat	13.01.2012	VCS	668	
100	HE	TUZKÖY (BATEN)	8.4	Nevsehir	28.09.2012	GS		103000000002044
101	HE	TUZLAKÖY-SERGE (TUYAT) (BATEN)	7.1	Erzurum	31.03.2012	GS		103000000001864
102	HE	TUZTAŞI HES (GÜRÜZ ELEK. ÜR. LTD.ŞTİ.)	1.6	Sivas	04.07.2011	VCS		103000000005078
103	HE	UMUT I HES(NİSAN EL.)	5.8	Ordu	04.10.2012	VCS	1012	
104	HE	UMUT III HES(NİSAN EL.)	12.0	Ordu	13.12.2010	VCS	1010	
105	HE	UZUNÇAYIR	82.0	Tunceli	02.12.2009	VCS	762	100000000000931
106	HE	VİZARA (ÖZTÜRK)	8.6	Trabzon	18.04.2012	GS		103000000001978
107	HE	YAĞMUR (BT BORDO)	8.9	Trabzon	27.11.2012	GS		103000000002056
108	HE	YAMAÇ HES (YAMAÇ ENERJİ ÜRETİM A.Ş.)	5.5	Osmaniye	20.07.2011	GS	GS926	103000000005540
109	HE	YAMANLI III GÖKKAYA (MEM)	28.5	Adana	14.09.2012	VCS	1014	103000000000138
110	HE	YAMANLI III HİMMETLİ (MEM)	27.0	Adana	12.05.2012	VCS	1014	103000000000138
111	HE	YAPRAK II HES (NİSAN EL. ENERJİ)	10.8	Amasya	03.04.2011	VCS	1008	
112	HE	YEDİSU HES (ÖZALTIN)	22.7	Bingol	03.02.2012	VCS	752	
113	HE	YEŞİLBAŞ	14.0	Sivas	04.12.2009	VCS	806	100000000000977
114	HE	YAPISAN KARICA DARICA	110.3	Ordu	10.10.2009	VCS	506	100000000000740

115	HE	YPM ALTINTEPE SUŞEHRİ HES	4.0	Sivas	07.06.2007	VCS	914	
116	HE	YPM BEYPINAR HES	3.6	Sivas	07.06.2007	VCS	914	
117	HE	YPM KONAK HES (SUŞEHRİ/SİVAS)	4.0	Sivas	20.07.2007	VCS	914	
118	HE	YPM GÖLOVA	1.1	Sivas	10.06.2009	VCS	914	
119	HE	YPM SEVİNDİK	5.7	Sivas	09.06.2009	VCS	914	
120	HE	ULUBAT KUVVET TÜN.(AK EN.)	100.0	Bursa	22.10.2010	VCS	536	100000000000540
121	GT	MENDERES JEOTERMAL	8.0	Aydin	10.05.2006	VCS	120	100000000000165
122	GT	MENDERES JEOTERMAL DORA-2	9.5	Aydin	26.03.2010	GS	GS445	103000000002471
123	GT	TUZLA JEO.	7.5	Canakkale	13.01.2010	GS	GS353	103000000002558
124	GT	AYDIN GERMENCİK JEO.(MAREN MARAŞ)	20.0	Aydin	11.11.2011	GS	GS861	103000000002068
125	WD	ALİZE ENERJİ (ÇAMSEKİ)	20.8	Canakkale	24.06.2009	GS	GS399	103000000002517
126	WD	ALİZE ENERJİ (KELTEPE)	20.7	Balikesir	23.07.2009	GS	GS437	103000000002479
127	WD	ALİZE ENERJİ (SARIKAYA ŞARKÖY)	28.8	Tekirdag	19.10.2009	GS	GS577	103000000002339
128	WD	AK ENERJİ AYYILDIZ (BANDIRMA)	15.0	Balikesir	05.09.2009	GS	GS634	103000000002293
129	WD	AKDENİZ ELEK. MERSİN RES	33.0	Mersin	19.03.2010	GS	GS753	103000000002175
130	WD	AKRES (AKHİSAR RÜZGAR)	43.8	Manisa	01.07.2011	GS	GS955	103000000001974
131	WD	AKSU RES (AKSU TEMİZ EN.)	72.0	Kayseri	16.03.2012	GS	GS1134	103000000001796
132	WD	ANEMON ENERJİ (İNTEPE)	30.4	Canakkale	22.02.2007	GS	GS347	103000000002564
133	WD	ASMAKİNSAN (BANDIRMA-3 RES)	24.0	Balikesir	26.02.2010	GS	GS683	103000000002244
134	WD	AYEN ENERJİ (AKBÜK)	31.5	Aydin	19.03.2009	GS	GS436	103000000002480
135	WD	AYVACIK (AYRES)	5.0	Canakkale	23.10.2011	GS	GS956	103000000005541
136	WD	BAKRAS ELEK.ŞENBÜK RES	15.0	Hatay	22.04.2010	GS	GS733	103000000002194
137	WD	BALIKESİR RES	112.8	Balikesir	17.08.2012	GS		103000000001959
138	WD	BARES (BANDIRMA)	35.0	Balikesir	20.04.2006	GS, VER+	GS1072, 52-1	103000000001858
139	WD	BELEN HATAY	36.0	Hatay	02.10.2009	GS	GS390	103000000002526
140	WD	BERGAMA RES (ALİAĞA RES)	90.0	Izmir	16.06.2010	GS	GS735	103000000002192
141	WD	BANDIRMA RES (BORASKO)	60.0	Balikesir	18.09.2009	GS	GS744	103000000002183
142	WD	BOREAS EN.(ENEZ RES)	15.0	Edirne	09.04.2010	GS	GS702	103000000002225
143	WD	BOZYAKA RES (KARDEMİR)	12.0	Izmir	12.03.2012	GS		103000000001624
144	WD	ÇANAKKALE RES (ENERJİ-SA)	29.9	Canakkale	11.02.2011	GS	GS906	103000000002023
145	WD	ÇATALTEPE (ALİZE EN.)	16.0	Balikesir	19.04.2011	GS	GS574	103000000002342
146	WD	DOĞAL ENERJİ (BURGAZ)	14.9	Canakkale	08.05.2008	GS	GS439	103000000002477
147	WD	DAĞPAZARI RES (ENERJİ SA)	39.0	Mersin	20.05.2012	GS		103000000001896
148	WD	DENİZLİ ELEKT. (Karakurt-Akhisar)	10.8	Manisa	28.05.2007	VCS, VER+	66	
149	WD	DİNAR RES (OLGU EN.)	16.1	Afyonkarahisar	22.12.2012	GS		103000000001821
150	WD	GÜNAYDIN RES (MANRES EL.)	10.0	Balikesir	20.11.2012	GS		103000000001752
151	WD	MARE MANASTIR	39.2	Izmir	08.12.2006	GS	GS368	103000000002543

152	WD	MAZI 3	30.0	Izmir	09.09.2009	GS	GS388	103000000002528
153	WD	KAYADÜZÜ RES (BAKTEPE EN.)	39.0	Amasya	16.03.2012	GS		103000000001979
154	WD	KİLLİK RES (PEM EN.)	40.0	Tokat	13.10.2011	GS	GS947	103000000001982
155	WD	KORES KOCADAĞ	15.0	Izmir	23.12.2009	GS	GS601	103000000002326
156	WD	KOZBEYLİ RES (DOĞAL EN.)	20.0	Izmir	22.12.2012	GS		103000000002336
157	WD	KUYUCAK (ALİZE ENER.)	25.6	Manisa	09.12.2010	GS	GS576	103000000002340
158	WD	METRİSTEPE (CAN EN.)	39.0	Bilecik	12.03.2012	GS		103000000001863
159	WD	POYRAZ RES	50.0	Balikesir	04.07.2012	GS		103000000002341
160	WD	ROTOR (OSMANİYE RES-GÖKÇEDAĞ RES)	135.0	Osmaniye	15.10.2010	GS	GS474	103000000002442
161	WD	BAKİ ELEKTRİK ŞAMLI RÜZGAR	114.0	Balikesir	08.08.2008	GS	GS351	103000000002560
162	WD	DATÇA RES	29.6	Mugla	18.12.2008	GS	GS438	103000000002478
163	WD	ERTÜRK ELEKT. (ÇATALCA)	60.0	Istanbul	14.06.2008	GS	GS367	103000000002544
164	WD	İNNORES ELEK. YUNTDAĞ	57.5	Izmir	07.03.2008	GS	GS352	103000000002559
165	WD	LODOS RES (TAŞOLUK)KEMERBURGAZ	24.0	Istanbul	20.06.2008	GS	GS503	103000000002413
166	WD	SAMURLU RES(DOĞAL EN.)	22.0	Izmir	31.08.2012	GS		103000000002337
167	WD	SARES (GARET ENER.)	22.5	Canakkale	22.12.2010	GS	GS963	103000000001967
168	WD	SAYALAR RÜZGAR (DOĞAL ENERJİ)	34.2	Manisa	06.06.2008	GS	GS369	103000000001840
169	WD	SEBENOBA (DENİZ ELEK.)SAMANDAĞ	30.0	Hatay	26.03.2008	VCS, VER+	553	
170	WD	SEYİTALİ RES (DORUK EN.)	30.0	Izmir	22.07.2011	GS	GS578	103000000002338
171	WD	SOMA RES	140.1	Manisa	05.09.2009	GS	GS398	103000000002518
172	WD	SOMA RES (BİLGİN ELEK.)	90.0	Manisa	13.08.2010	GS	GS655	103000000002272
173	WD	SÖKE ÇATALBÜK RES (ABK EN.)	30.0	Aydin	08.01.2012	GS		103000000002274
174	WD	SUSURLUK (ALANTEK EN.)	45.0	Balikesir	13.02.2011	GS	GS854	103000000002075
175	WD	ŞAH RES (GALATA WIND)	93.0	Balikesir	19.05.2011	GS	GS905	103000000002024
176	WD	ŞENKÖY RES (EOLOS RÜZ.)	26.0	Hatay	04.05.2012			103000000001895
177	WD	TURGUTTEPE RES (SABAŞ ELEK.)	24.0	Aydin	30.12.2010	GS	GS610	103000000002317
178	WD	ÜTOPYA ELEKTRİK	30.0	Izmir	11.08.2009	GS	GS672	103000000002255
179	WD	ZİYARET RES	57.5	Hatay	15.07.2010	GS	GS617	103000000002310

The remaining power units constitute the sample group used to calculate the build margin emission calculation. There are 568 power units in this group. Complete list of this sample group is in the Appendix x of this report.

These power units in the sample group were sorted by date from the newest to the oldest. The newest 5 power units, $SET_{5\text{-}units}$, were identified as follows:

Table 33. The set of five power units, excluding power units registered as CDM project activities that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$)

No	Fuel / Energy Source	POWER PLANT NAME	Installed Capacity (MW)	Firm Generation Capacity (year 2012) (GWh)	Commissioning Date	Location (Province)
1	NG	ALES DGKÇ	49.000	370.0	29.12.2012	Aydin
2	HE	TUĞRA REG. (VİRA)	4.900	10.0	29.12.2012	Giresun
3	NG	ACARSOY TERMİK KOM.ÇEV	50.000	375.0	27.12.2012	Denizli
4	HE	FINDIK I HES(ADV)	11.300	27.0	27.12.2012	Gumushane
5	HE	MİDİLLİ REG.(MASAT EN.)	21.000	45.0	27.12.2012	Amasya
Total			**136.2**	**827.0**		
***AEG*$_{SET\text{-}5\text{-}units}$**				**827,000**	MWh	
Abbreviations: NG: Natural Gas, HE: Hydroelectric						

Hence, electricity generation of $SET_{5\text{-}units}$ is found to be $AEG_{SET\text{-}5\text{-}units}$ = 827,000 MWh.

The total generation of the sample group of power units used to calculate is AEG_{total} = 264,143,328 MWh. 20 % of this value is $AEG_{SET\text{-}=20\ per\ cent}$ = 52,828,666 MWh. When sorted from the newest to the oldest, the cumulative firm generation amount up to and including the 280th power unit in the list, Obruk I-II Hydroelectric Power Plant, with an installed capacity of 210.8 MW and firm generation capacity of 337.0 GWh, which was commissioned on 29/07/2009, gives us an firm generation amount of 53,027,150 MWh, and satisfies the condition of $SET_{\geqslant 20\ per\ cent}$.

Hence electricity generation of $SET_{\geqslant 20\ per\ cent}$ is found to be $AEG_{SET\text{-}\geqslant 20\ per\ cent}$ = 53,027,150 MWh.

Since $AEG_{SET\text{-}\geqslant 20\ per\ cent} > AEG_{SET\text{-}5\text{-}units}$, and none of the power units in the $SET_{\geqslant 20\ per\ cent}$ started to supply electricity to the grid more than 10 years ago, it was assumed that $SET_{sample} = SET_{\geqslant 20\ per\ cent}$.

The generation distribution of SET_{sample} by primary energy sources is as follows:

Table 34. The distribution of sample group used to calculate the build margin (SET_{sample}) by primary energy sources (fuels consumed)

Energy Source / Fuel	Installed Capacity (MW)	Firm Generation Capacity (year 2012) GWh
Asphaltite	0.0	0.0
Biogas	10.1	75.0
Diesel Oil	0.0	0.0
Fuel Oil	196.2	1,319.0
Geothermal	48.0	382.0
Hard Coal	0.0	0.0
Hydroelectric	3,419.8	6,464.7
Imported Coal	2,126.6	14,367.7
Lignite	29.0	184.0
Liquefied Petroleum Gas	0.0	0.0
Natural Gas	3,997.6	29,917.7
Naphta	49.0	277.9
Wind	0.0	0.0

Waste	5.0	39.2
Total	**9,881.3**	**53,027.2**

These generation values were put into the formulation as explained above, according to the Tool and the Build margin emission factor was calculated as shown in the following table:

Table 35. Build Margin Emission Factor Calculation

Energy Source / Fuel	Firm Generation Capacity (year 2012) (GWh)	Assumed Emission Factor (kg/TJ)	Assumed Default Efficiency (%)	Calculated Emission Factor ((tCO2/MWh)	Emission (ton)
Asphaltite	0.0	89,500	41.5%	0.776	0.0
Biogas	75.0	46,200	60.0%	0.277	20,790.0
Diesel Oil	0.0	72,600	46.0%	0.568	0.0
Fuel Oil	1,319.0	75,500	46.0%	0.591	779,343.6
Geothermal	382.0	0	0.0%	0.000	0.0
Hard Coal	0.0	92,800	41.5%	0.805	0.0
Hydroelectric	6,464.7	0	0.0%	0.000	0.0
Imported Coal	14,367.7	89,500	41.3%	0.780	11,211,351.5
Lignite	184.0	90,900	41.5%	0.789	145,089.5
Liquefied Petroleum Gas	0.0	61,600	60.0%	0.370	0.0
Natural Gas	29,917.7	54,300	60.0%	0.326	9,747,196.0
Naphta	277.9	69,300	60.0%	0.416	115,545.0
Wind	0.0	0	0.0%	0.000	0.0
Waste	39.2	73,300	41.5%	0.636	24,930.6
Total / Overall	**53,027.2**			**0.416**	**22,044,246.2**

The calculated Build Margin Emission Factor is $EF_{grid,BM,y}$ **= 0.416 tCO_2/MWh.**

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is done preferring the Weighted Average CM method, as indicated in paragraphs 77, 78, and 79 in the sub-section 6.6 on page 22 of the Tool.

The weighted average combined margin emission factor calculation is done according to paragraphs 80 and 81 on page 23 of the Tool, as follows:

"80. The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \text{Equation (14)}$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO2 emission factor in year y (t CO2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO2 emission factor in year y (t CO2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (per cent)
w_{BM}	=	Weighting of build margin emissions factor (per cent)

81. The following default values should be used for w_{OM} and w_{BM}:

(a) Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

(b) All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period,6 unless otherwise specified in the approved methodology which refers to this tool."

Combined Margin Emission Factor Calculation:

Combined Margin Emission Factor calculation was done according to the tool as explained the section B.6.1., by using Weighted Average CM method, with weightings w_{OM} = 0.5 and w_{BM} = 0.5, since the project activity is a hydroelectric power plant:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \text{Equation (14)}$$

$EF_{grid,CM,y}$ = 0.654 * 0.5 + 0.416 * 0.5 = 0.535

The Combined Margin Emission Factor is found to be ***$EF_{grid,CM,y}$* = 0.535 tCO_2/MWh.**

Emission Reduction Calculation:

Emission reduction calculation for the first crediting period was done according to the Methodology, as indicated in Section 5.7. (page 17) as follows:

$ER_y = BE_y - PE_y$ Equation (11)

Where:

ER_y	=	Emission reductions in year y (t CO_2/yr)
BE_y	=	Baseline emissions in year y (t CO_2/yr)
PE_y	=	Project emissions in year y (t CO_2/yr)

Baseline emissions are calculated using the formulation indicated in Section 5.5. on page 13 of the Methodology:

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \qquad \text{Equation (6)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)"

Since the project activity is a greenfield renewable energy power plant, the net electricity generation of the project activity is calculated according to the rule explained in Section 5.5.1. on page 13 – 14 of the Methodology:

"5.5.1. Calculation of $EG_{PJ,y}$

39. The calculation of $EG_{PJ,y}$ is different for: Greenfield plants, retrofits and replacements; and capacity additions. These cases are described as follows:

5.5.1.1. Greenfield renewable energy power plants

40. If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{PJ,y} = EG_{facility,y} \qquad \text{Equation (7)}$$

Where:

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

The net annual electricity generation of the project is assumed specified in the generation licence as $EG_{facility,y}$ = 192,021 MWh[1].

The baseline emission is found as:

$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$ = 192,021 * 0.535 = 102,731 tCO_2/yr.

Hence, the emission reductions is ***ER_y* = 102,731 tCO_2/yr.**

For the first year of the crediting period (2012), the net average electricity generation is found to be 112,275 MWh. Hence for 2012, the emission reductions is ER_{2012} = 60,066 tCO_2.

For the last year of the crediting period (2022), the net average electricity generation is found to be 79,746 MWh. Hence for 2022, the emission reductions is ER_{2022} = 42,664 tCO_2.

Total amount of emission reductions for the first crediting period is 1,027,309 tCO_2. Annual average over the first crediting period is calculated as 102,731 tCO_2/yr.

The details of the emission factor and emission reduction calculations can be found in the emission reduction calculation spreadsheet as an annex to the Project Description.

Table 36. Summary of ex ante estimates of emission reductions

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2012	60,066	0	0	60,066
2013	102,731	0	0	102,731
2014	102,731	0	0	102,731
2015	102,731	0	0	102,731
2016	102,731	0	0	102,731
2017	102,731	0	0	102,731
2018	102,731	0	0	102,731
2019	102,731	0	0	102,731
2020	102,731	0	0	102,731
2021	102,731	0	0	102,731
2022	42,664	0	0	42,664
Total	**1,027,309**	**0**	**0**	**1,027,309**

4 MONITORING

4.1 Data and Parameters Available at Validation

The following data and parameters are available at validation.

Data / Parameter	$EG_{gross,y}$
Data unit	GWh
Description	Total quantity of gross electricity generation of power plants connected to the grid including low-cost/must-run power plants in year y for years in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129].
Purpose of Data	Calculation of baseline emissions.
Comments	-

[128] http://www.turkstat.gov.tr/rip/rip.pdf
[129] http://www.tuik.gov.tr/rip/temalar/4_3.html

Data / Parameter	EG_y
Data unit	GWh
Description	Total net quantity of electricity generation of power plants connected to the grid, not including low-cost/must-run power plants in year y for years in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy.[128,129]
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$EG_{gross,i,y}$
Data unit	GWh
Description	Quantity of gross electricity generation of power plants using fuel type / utilizing primary energy source i connected to the grid including low-cost/must-run power plants in year y for years in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129]. Since power plant based data is unavailable, the amounts of generation for group of power plants using the same fuel type / utilizing the same primary energy source i were used.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$EG_{i,y}$
Data unit	GWh
Description	Net quantity of electricity generation of power plants using fuel type i connected to the grid, not including low-cost/must-run power plants in year y for years in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission

	Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129]. Since power plant based and fuel/primary energy source specific data is not available, net electricity generation of each group of power plants using the same fuel i for that year y was calculated applying the same net/gross electricity generation ratio for that year y to gross generation of each group of power plants using the same fuel i in that year y.
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$EG_{import,y}$
Data unit	GWh
Description	Quantity of electricity imports in year y for years in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129].
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$FC_{i,y}$
Data unit	ton (liquid and solid fuels) / 10^3 m^3 (gaseous fuels)
Description	Amount of fuels consumed in thermal power plants in Turkey by fuel type i in year y for years in the 3-year period of [2010 – 2012].

Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129].
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$NCV_{i,y}$
Data unit	TJ/Gg, GJ/ton
Description	Net calorific value of fuel type i consumed by thermal power plants in year y in the 3-year period of [2010 – 2012].
Source of data	Official data from TEIAS (Turkish Electricity Transmission Company), the responsible authority for the operation of Turkish National Grid.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Official data. According to the regulations regarding the Turkish Statistical Institute, the state organization responsible for the statistical affairs in the Republic of Turkey, TEIAS is the official source of data for energy[128,129]. The net calorific values are calculated using the amount of fuels used[91] and the heating values of the fuels[92].
Purpose of Data	Calculation of baseline emissions.
Comments	In order for all the units of consumed fuels to be compatible with each other, the unit of natural gas consumed should be converted to mass units. Also, heating values given by TEIAS, which are expressed in [cal], must be converted into [J]. For this purpose, conversion factors given in International Energy Agency were used[94],[95],[96]. Natural gas density was accepted as 0.692 kg/m^3, and 1 cal was assumed to be equal to 4.1868 J.

Data / Parameter	$EF_{CO2,i,y}$
Data unit	kg/TJ
Description	Default CO_2 emission factors of fossil fuel type i for combustion.
Source of data	IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories, pages 1.23 – 1.24[93].
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Country or project specific data are not available for power plants using fossil fuels in Turkey. Hence, IPCC default emission factors have been used according to the Tool (Section 7, page 29) and the UNFCCC CDM "Guidance on IPCC Default Values"[130].
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	$\eta_{i,y}$
Data unit	Dimensionless (% ratio)
Description	Average net energy conversion efficiency of power units using fuel i in year y.
Source of data	For power plants using imported coal as fuel, the data given in presentation by Muzaffer Basaran in Panel about "Coal-Fired Power Plants and Investment Models", in Middle East Technical University Alumni Association Visnelik Facility, on 23 February 2013[124] were used. For other types of fuels, the values in Table 1 in Appendix 1 of the Tool were applied.
Value applied:	See Section 3. 4 for details.
Justification of choice of data or description of measurement methods and procedures applied	Power plant and/or fuel type specific of net energy conversion efficiencies are impossible or very hard to find. Hence, the data available for imported coal using power plants from a panel conducted at the alumni association of a technical university (Middle East Technical University)[124] were used. For the other fuel types, default efficiency factors for power plants in Appendix 1 of the Tool were selected taking the conservativeness rule into account.
Purpose of Data	Calculation of baseline emissions.
Comments	-

[130] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid16_v01.pdf

Data / Parameter	CAP_{BM}
Data unit	Power Plant Name, Installed Capacity [MW], Electricity Generation [GWh], Commissioning Date [YYYY-MM-DD]
Description	Capacity additions forming the sample group of power units used to calculate the build margin.
Source of data	TEIAS (Turkish Electricity Transmission Company) Capacity Projection Reports and Ministry of Energy and Natural Resources of Republic of Turkey Energy Investment Data[116,117]. Operational power plants at the end of 2012 were selected as the reference group.
Value applied:	See Section B.6.3 and Appendix 4.
Justification of choice of data or description of measurement methods and procedures applied	Annual electricity generation of the project electricity system AEG_{total} was determined excluding power units registered as CDM project activities and capacity additions from retrofits of power plants. Since generation data for individual power plants are not available, but firm generation capacities of individual power plants are available, firm generation capacities were used as the actual generations. Every single commissioning of each power plant is assumed as a power unit. These power units are sorted by date from the newest to the oldest. The newest 5 power units, $SET_{5\text{-}units}$, their electricity generation $AEG_{SET\text{-}5\text{-}units}$, and the group of power units that started to supply electricity to the grid most recently and that comprise 20 per cent of AEG_{total}, $SET_{\geq 20\ per\ cent}$, and their electricity generation $AEG_{SET\text{-}\geq 20\ per\ cent}$ were identified.
Purpose of Data	Calculation of baseline emissions.
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*.
Source of data	Main source is the data from the web site of PMUM (Market Financial Settlement Centre) or EPIAS (Energy Markets Operation Company, which will replace PMUM according to the new Electricity Market Law in Turkey)[131] or any other equivalent state authority responsible for the operation of national electricity market in Turkey, in case it is enforced by the law before the end of the first crediting period. These data is based on the automatic meter reading from the electricity meters of the project activity, which is performed by TEIAS. This will be the preferred data. Auxiliary sources will be the monthly electricity protocols signed by TEIAS officials or electricity sales invoices. These will be used as confirmative and supportive documents, if necessary.

[131] http://www.resmigazete.gov.tr/eskiler/2013/03/20130330-14.htm

Description of measurement methods and procedures to be applied	There are two groups of electricity meters for two groups of turbines, as indicated in the Section 2.3 about the project boundary. Each group of electricity meters consists of a main meter and a backup meter. The amount of net electricity generation supplied by the project to the grid will be calculated by subtracting the amount of electricity drawn from the grid from the amount fed into the grid for each main electricity meter, and then adding net electricity generation amount for two main meters.
Frequency of monitoring/recording	Unless otherwise enforced by the law, or stated in the monitoring reports, the monitoring will be done on a monthly basis.
Value applied:	192,021 MWh/yr[1] (See related Section 3.4)
Monitoring equipment	Two groups of main and backup electricity meters with an accuracy class of 0.5S.
QA/QC procedures to be applied	TEIAS is responsible for the electricity meter measurements and testing and control of electricity meters according to "Communiqué on Meters to be used in the Electricity Market"[132], and other related legislation. TEIAS performs annual periodic tests on every electricity meter, and the meters are sealed after each test, according to the System Usage Agreement made between the project proponent and TEIAS[133]. These seals can only be broken and re-sealed only by TEIAS authorised personnel. Apart from the annual tests, the companies producing or importing the electricity meters are required to guarantee the accuracy and calibration of the meters[134]. According to the legislation, electricity and other meters must be periodically examined. This procedure is intended for calibration and controlled by Ministry of Science, Industry and Technology. This can be considered as a validation of meters. On the other hand, annual control of the meters is under the control of TEIAS and can be considered as a verification of meters. The data of PMUM (EPIAS, etc.) uses the electricity measurement data of TEIAS. This data is reliable since it is only accessible to project owner apart from PMUM (EPIAS, etc.), and used for invoicing purposes. The data of the SCADA system installed within the project activity can also be used to cross-check the measurements of the electricity meters.
Purpose of data	Calculation of baseline emissions

[132] http://www.epdk.org.tr/documents/elektrik/mevzuat/teblig/elektrik/sayaclar_hakkinda/Elk_Tblg_Sayaclar.doc
[133] http://eud.teias.gov.tr/SKAM/SKAornek.pdf
[134] Measuring Instruments Directive, Clause 9, page 2.
http://www.sanayi.gov.tr/Files/Mevzuat/olcu-ve-olcu-aletleri-mua-2882013184633.pdf

Calculation method	The data are being measured continuously by the meters.
Comments	According to the latest amendment dated 18/09/2012 in Article 81 of the Electricity Market Balancing and Settlement Regulation, all the meter readings in power plants subject to the regulation will be carried out by Automatic Meter Reading (AMR). Manual Reading will only be carried out when AMR is not available.[135]

4.3 Monitoring Plan

Monitoring will be done according to the methodology "ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0".

As per the methodology[136], all data collected as part of monitoring will be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data will be monitored. All measurements will be conducted with calibrated measurement equipment according to relevant industry standards.

There will be no sampling procedures and all the data related with the electricity measurements will be used for monitoring purposes.

Electricity meters are located at the points indicated in the figure regarding the project boundary and simplified one-line single diagram of the project activity in the Section 2.3 about the project boundary.

At the end of each month, the data about the electricity measurements from PMUM (EPIAS, etc.) will be collected from the official web site after it has become definite. This data will be copied to spreadsheets to make the calculations easier. The web pages containing the relevant data will be saved as screenshot s and/or in suitable file formats and be kept for future reference. The monthly electricity meter reading protocols signed by authorised TEIAS officials will also be kept, if these are available. This will be done monthly.

The expected verification period is one year. At the end of each verification period, all the documents collected monthly will be compiled and an emission reduction calculation spreadsheet will be prepared to show the final results of the emission reductions of the corresponding verification period. This spreadsheet and documents about electricity generation and the electricity meter readings will be sent to verifying DOE along with the monitoring report of the corresponding verification period.

Responsibilities and Institutional Arrangements for Data Collection and Archiving

[135] Electricity Market Balancing and Settlement Regulation, Article 81.
http://www.emra.org.tr/documents/electricity/legislation/ElectricityMarketBalancingAndSettlementRegulation.doc
http://www.epdk.org.tr/documents/elektrik/mevzuat/yonetmelik/elektrik/dengeleme_uzlastirma/DUYson.doc
[136] ACM0002: Grid-connected electricity generation from renewable sources --- Version 14.0.0. Section 6. Monitoring methodology, Paragraph 65, page 21.
http://cdm.unfccc.int/UserManagement/FileStorage/A04BWNRKLUEP6O1QX75YVTH28JDICZ

Data collection and archiving will be under the responsibility of the project proponent. Power plant personnel will send the monthly electricity meter reading protocols and other relevant supportive documents, if any, to project proponent company headquarters. Power plant personnel will also give support and help during the site visits of validation, verification and other similar related processes. The data collection, archiving and communication with the DOEs will be done by the responsible personnel in the project proponent company headquarters.

Emergency Action Plan

An Emergency Action Plan was prepared for Occupational Hazards, Fire and Earthquake. The necessary trainings were given to the responsible personnel.

Also, a Diesel Generator is present in the project site area as an energy backup source in case of a power outage occurring in the part of the grid connected to the project.

5 ENVIRONMENTAL IMPACT

An Environmental Impact Assessment Study was performed according to the "Environmental Impact Assessment Regulation"[137], and the outcome was found to be positive by the relevant authorities.[30] The study was renewed when the installed capacity of the project was increased and the outcome was again found to be positive.[46] The results of the Environmental Impact Assessment Studies were indicated in an Environmental Impact Assessment Study Report, both in Turkish and English versions.[138,139]

According to report, the project is found to be compatible with regulations related with the environmental impact assessment, and no harmful effects to the environment could be found. The details are in the referred EIA reports.

6 STAKEHOLDER COMMENTS

A Local Stakeholder and Public Participation Meeting was organized in the scope of Environmental Impact Assessment Study by the project proponent and the consultant company that conducted the EIA study (Topcuoglu Mining, Industry and Trade Co. Ltd.), The meeting was held on 18/09/2007 in Kurtun District Centre, the district where the project is located.

Before the meeting, public announcements were made by newspaper advertisements that were published in national and local newspapers, on 12/09/2007.

[137] http://mevzuat.basbakanlik.gov.tr/Metin.Aspx?MevzuatKod=7.5.12256&sourceXmlSearch=&MevzuatIliski=0
[138] Taşoba – Elmali Weirs, Büyükdüz HEPP and Construction Material Quarries Final EIA Report, prepared by Topcuoglu Mining, Industry and Trade Co. Ltd. Dated February 2008. Turkish Version.
[139] Taşoba – Elmali Weirs, Büyükdüz HEPP and Construction Material Quarries Final EIA Report, prepared by Topcuoglu Mining, Industry and Trade Co. Ltd. Dated February 2008. English Version.

Referans

Merkez Bankası faizi hemen düşürsün

88 yeni otomobil Frankfurt'ta görücüye çıktı

Ekren'in Şener'e Gümüş Kurşun

12 EYLÜL 2007 ÇARŞAMBA FİYATI 60 YKr

TÜRKİYE'NİN İŞ GAZETESİ

Koç, Ramstore'u Enka'ya sattı

13 DÜNYADAN

OPEC toplandı petrol fiyatları 78 doları gördü

yola çıkarak "General Petraeus or General Betray us? (Petraeus mu, "Bize İhanet Et"

olduğunu ilan etmeye karar vermeliler" dedi. Irak hükümeti ise rapor-dan memnun olduğunu

DUYURU

AYEN ENERJİ A.Ş. tarafından Gümüşhane İli, Kürtün İlçesi yakınlarında Taşoba-Elmalı Regülatörleri ve Büyükdüz Hidroelektrik Santrali kurulması ve enerji üretim faaliyetinde bulunulması planlanmaktadır. 16.12.2003 tarih ve 25318 sayılı Resmi Gazetede yayımlanarak yürürlüğe giren "Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliği gereğince halkı bilgilendirmek, görüş ve önerilerini almak için yapılacak ÇED Sürecine Halkın Katılımı Toplantısı'nın aşağıda belirtilen yer, tarih ve saatte yapılması kararlaştırılmıştır. Halkımıza duyurulur.

Toplantı Tarihi : 18.09.2007
Yer : Kürtün Cumhuriyet İlköğretim Okulu Toplantı Salonu
Saat : 14.00

UZELAJANS.COM

Figure 4. Newspaper advertisement published in national newspaper "Referans" on 12 September 2007 (Page 13).

Günlük Siyasi Bağımsız Gazete

gazetegumuskoza@hotmail.com

Gümüşkoza

12 EYLÜL 2007 ÇARŞAMBA YIL: 2 SAYI: 521 Web: www.gumuskoza.com 20 Ykr

İkisu'daki kazada yaşamını yitiren 8 kişiden 4'ü Bahçelik'te gözyaşları ara

10 Haber / Kozası 12 EYLÜL 2007 ÇARŞAMBA

Kelkit İlçe Emniyet Müdürü Yılmaz görevine başladı

Koltuğuna oturdu

Aydın Doğan'ın gizli hedefi

Aydın Doğan, sadece Hilton

planda yer almamıştır. Nesli tehlike altında olan türleri barındıran ve ulusal 'Önemli Bitki Alanı' listesinde bulunan Giresun Dağları ile ilgili koruma önerisi bulunmamaktadır. Kalkınma planlarının dünyamızda artık en kıt kaynak olan suya endeksli ve su havzalarında entegre planlar hazırlayarak yapıldığı

...lerek, "Kaçkar Dağları'nda oluşturduğumuz alanlardaki çadırlarda eğitim verilecek. Başarılı olan dağcılar, daha sonra yapılması planlanan kurtarma ve arama kampına katılmaya hak kazanacaklar" dedi.

Rize'nin dağcılık için çok elverişli olduğunu ifade eden Karaca, "Rize, zorluk

...dan önem... edilmeye... her ay mu... Bundan s... alanlarınd... malarımız... hafta süre...

DUYURU

AYEN ENERJİ A.Ş. tarafından Gümüşhane İli, Kürtün İlçesi yakınlarında Taşoba-Elmalı Regülatörleri ve Büyükdüz Hidroelektrik Santrali kurulması ve enerji üretim faaliyetinde bulunulması planlanmaktadır. 16.12.2003 tarih ve 25318 sayılı Resmi Gazetede yayımlanarak yürürlüğe giren "Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliği gereğince halkı bilgilendirmek, görüş ve önerilerini almak için yapılacak ÇED Sürecine Halkın Katılımı Toplantısı'nın aşağıda belirtilen yer, tarih ve saatte yapılması kararlaştırılmıştır. Halkımıza duyurulur.

Toplantı Tarihi : **18.09.2007**
Yer : Kürtün Cumhuriyet İlköğretim Okulu Toplantı Salonu
Saat : **14.00**

Günlük Siyasi Bağımsız Gazete

Gümüşkoza

Hasanbey Mahallesi
Cumhuriyet Caddesi
No: 128
Tel: 0 456 213 39 98
GÜMÜŞHANE

Figure 5. Newspaper advertisement published in local newspaper "Gumuskoza" on 12 September 2007 (Page 10)

The texts of the both newspaper advertisements were the same and as below:

Text of the original Turkish announcement:

DUYURU

AYEN ENERJİ A. Ş. tarafından Gümüşhane İli, Kürtün İlçesi yakınlarında Taşoba-Elmalı Regülatörleri ve Büyükdüz Hidroelektrik Santrali kurulması ve enerji üretim faaliyetinde bulunulması planlanmaktadır. 16.12.2003 tarih ve 25318 sayılı Resmi Gazetede yayımlanarak yürürlüğe giren "Çevresel Etki Değerlendirmesi" (ÇED) Yönetmeliği gereğince halkı bilgilendirmek, görüş ve önerilerini almak için yapılacak ÇED Sürecine Halkın Katılım Toplantısı'nın aşağıda belirtilen yer, tarih ve saatte yapılması kararlaştırılmıştır. Halkımıza duyurulur.

Toplantı Tarihi : **18.09.2007**

Yer : Kürtün Cumhuriyet İlköğretim Okulu Toplantı Salonu

Saat : **14:00**

English translation of the announcement:

ANNOUNCEMENT

It was planned that Tasoba-Elmali Weirs and Buyukduz Hydroelectric Power Plant would be installed near Gumushane Province, Kurtun District and energy generation activities would be involved by AYEN ENERJI A. S. It was decided that the Public Participation in the EIA Procedure Meeting that would be held to inform the public, and to have their opinions and suggestions, according to the "Environmental Impact Assessment" (EIA) Bylaw, enacted by being published in the Official Gazette dated 16.12.2003 and numbered 25318, would be held in the place and on the date and at the hour specified below. Public invited.

Meeting Date : **18.09.2007**

Place : Kurtun Primary Education School Meeting Hall

Hour : **14:00**

The meeting was also announced to local people via mukhtars. Information concerning the meeting have been given to the Muhtar's which are in the scope of the project and they have been asked to attend the meeting with the villagers. The meeting information has been announced to the Muhtar's by the Gümüşhane Province Environment and Forestry Office through written reports. The meeting place and time has been noticed with bulletins and announcements by the village muhtar's.

The meeting was held at the specified place, date and hour. Kurtun District Governor and mukhtars and inhabitants of the villages near to the project area were among the main participants. The representatives of the Provincial Directorate of Environment and Forestry were also present, along with the representatives of the project proponent and the consultant company which conducted the EIA study. Participant list and minutes of the meeting are below:

TAŞOBA-ELMALI REGÜLATORLERİ VE BÜYÜKDÜZ HİDROELEKTRİK SANTRALİ HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

SIRA NO	ADI SOYADI	KATILIM YERİ	İMZASI
1	Mustafa UZUN	DSİ 22. Bölge Müd. Etüd ve Plan Şube Müdürü	
2	Mustafa Yanık	DSİ 22. Böl. Müd.	
3	Hasan Çobanoğlu	Demirkapı	
4	Halis Gökmak	Çayırcukuru	
5	Recep Gökmak	Üzümözü köyü, muhtarı	
6	Abdi Yücel	Eğri güney köyü muhtarı	
7	Remzi ÖZTÜRK	Elmalı köyü muhtarı	
8	Ali Osman Öztürk	Demirkapı köyü	
9	Ali Tönyalı	Demirkapı köyü	
10	Cengiz YOLCU	Gençlik Rehberlik Müdürlüğü	
11	Olgun SARI	TCK 10. Bölge Müdürlüğü TRABZON	
12	Soner Gül	Kızılcadam köyü	
13	Şahri ZARLU	Kızılcadam Köyü	
14	Şadi GÜL	Kızılcadam K.	
15	Hasan BOLAT	Kızılcadam	
16	Mustafa ŞAHİN	Kızılcadam	
17	Hakkı olgun	Demirkapı	
18	[illegible]	Elmalı	
19	Murat Şahin	Kızılcadam	
20	İlyas Gül	Kızılcadam	
21	[illegible]	[illegible]	
22	[illegible]	[illegible]	

TAŞOBA-ELMALI REGÜLATÖRLERİ VE BÜYÜKDÜZ HİDROELEKTRİK SANTRALİ HALKIN KATILIMI TOPLANTISI KATILIM LİSTESİ

SIRA NO	ADI SOYADI	KATILIM YERİ	İMZASI
	Enver gül - kızılcadam köyü		
	Bayram Demirkapı	Torul	
	Hüseyin Öztürk	Demirkapı Torul	
	Ahmet alyılmaz	Demirkapı Köyü	
	Hasan yılmaz	Demirkapı köyü	
	Salih Cebeci	Demirkapı köyü	
	Bayram Gök	Kışlıcadam köyü	
	Müzeyyer Gül	Kışlıcadam	
	Avni Şaşık	Kızılcadam	
	Ömer Kutlu OĞUR	Köy Odası	
	Bekir karahan	Beşir	
	Ali Zorlu	Kızılcadam	
	Kaya Güh.	kızılcadam	
	Hüseyin Aykut	Demirkapı	
	Hüseyin Aykut	Demirkapı	
	Hüseyin Gül	kızılcadam	
	Ali Zorlu	Kızılcadam	
	Mehmet Aydın	kızılcadam	
	Erol OCBUN	Demirkapı köyü	
	Hasan ÖZTÜRK	Demirkapı	
	Salih Cel.	Kızıl Cadam köyü	
	[illegible]	AYEN ENERJİ	

Figure 6. Participant List of the Local Stakeholder Meeting of Buyukduz HEPP

Konu : Halkın Katılımı Toplantısı
Tarih : 18.09.2007
Yer : Kürtün Cumhuriyet İlköğretim Okulu Toplantı Salonu

GÜMÜŞHANE İLİ KÜRTÜN İLÇESİ TAŞOBA-ELMALI REGÜLATÖRLERİ VE BÜYÜKDÜZ HİDROELEKTRİK SANTRALİ PROJESİ HALKIN KATILIMI TOPLANTI TUTANAĞI

Gümüşhane İli Kürtün ve Torul İlçeleri sınırları içerisinde Ayen Enerji Anonim Şirketi tarafından kurulması planlanan **Hidroelektrik Santrali Projesi** ile ilgili olarak ÇED Yönetmeliğinin 9. maddesi gereği **"ÇED Sürecine Halkın Katılımı Toplantısı"** 18.09.2007 tarihinde Kürtün Cumhuriyet İlköğretim Okuluna ait Toplantı Salonunda saat 14:00 da başlamıştır.

Açılış konuşması Kürtün Kaymakamı Osman BİLGİN tarafından yapıldı. Daha sonra Topçuoğlu Maden San. ve Tic. Ltd. Şirketi adına Meriç BÜTÜN tarafından görüntülü sunum yapıldı. Sunum sonrası halktan görüş , soru ve öneriler kısmına geçildi.

Remzi ÖZTÜRK (Elmalı Köyü Muhtarı)
Proje ne zaman başlayacak?

Ahmet OLGUN (Demirkapı Köyü Sakini)
Kamulaştırma ne zaman başlayacak?

Halis ÇAKMAK (Çayırçukur Köyü Sakini)
Benim buradaki sözüm Çevre ve Orman Bakanlığı yetkililerine, DSİ yetkililerine ve taşeron firma yetkililerinedir. Ben şunu söylemek istiyorum . Bir faaliyete başlanmadan önce o saha teslim alınır. Teslim alınmadan önce bu sahayla ilgili bütün işler halledilirse kimse üzülmez ve mağdur olmaz. Temennim o ki bu iş yapılmadan önce vatandaşın bütün işleri halledilir. İkincisi bizim burası kırsal bir bölge ve her türlü eleman bulunur. Dozercisi de, şoförü de ve de diğer iler eleman bulunmaktadır. Bu nedenle acaba çalışmaya geçtiğinizde eleman nereden temin edeceksiniz?

Bayram GÜL (Kızılcadam Köyü Muhtarı)
Bu projnin çıkış noktası bitiş noktası da Elmalı Köyüne uğramıyor. Aslında bizim Köyün sınırları içerisinde ama niye Elmalı Köyü ile anılıyor da bizim köyün adı geçmiyor?

Mehmet ASLAN (Köy Hizmetleri Şefi)
Bu proje kapsamında çevre ve köy yolları güzergâhında değişiklik olacak mı?

Bayram GÜL (Kızılcadam Köyü Muhtarı)
Projede yer alan barajların gövde yüksekliği kaç metre olacak?

Hüseyin ÖZTÜRK (Demirkapı Köyü Köyü Muhtarı)
Demirkapı Köyünde kaç mahalle su altında kalacaktır?

Osman BİLGİN (Kürtün Kaymakamı)
Tahmini yapım süresi kaç yıl olacaktır?

Konu : Halkın Katılımı Toplantısı
Tarih : 18.09.2007
Yer : Kürtün Cumhuriyet İlköğretim Okulu Toplantı Salonu

Ali BODUR (Araköy Köyü Muhtarı)
Projenin memleketime hayırlı olmasını dilerim.

Osman BİLGİN (Kürtün Kaymakamı)
Araköy Köyünde bir yol problemi vardı. Mevcut yollar mı kullanılacak yoksa yeni yollar mı yapılacak?

Hüseyin ÖZTÜRK (Demirkapı Köyü Köyü Muhtarı)
Araköy Köyü ile Demirkapı Köyü arası yollarda çalışmalar yapılacak mı? Acaba baraj gövdesi hangi yöne kurulacak?

Mehmet ASLAN (Köy Hizmetleri Şefi)
Cebri borular yer üstünde mi yoksa yer altında mı olacak ? Çünkü o bölgede heyelan yapısı var.

Recep ÇAKMAK (Güneysu Köyü sakini)
Projenin alternatifi var mı? Yaşanabilecek her hangi bir durumda alternatif proje yapılacak mı? Ayrıca açılacak tünellerin zemini ne kadar sağlamdır? Çalışma yapıldı mı? Şantiyeyi hangi bölgeye kurmayı düşünüyorsunuz? Biz her zaman yardıma hazırız.

Osman BİLGİN (Kürtün Kaymakamı)
Tünelin güzergahı kaç km olacaktır?

İlyas BİLGİN (Köy Sakini)
Tünelin çapı ne kadar olacaktır?

Hüseyin AYBULUT (Köy Sakini)
Projede halkının işte çalışması ne şekilde olacaktır? Bizim kamyonlarımız var fakat geçen sene Kolin firması ile problemler yaşadık. Onun için bizde kooperatif kurduk. Sizlerden isteğimiz yöre sakinlerinin de bu çalışmalarda yer almasıdır.

Erkan OKUMUŞ (İl Çevre ve Orman Müdürlüğü)
Bölgenin ekosistem yönünden zengin olmasından dolayı flora- faunanın en az bir yıl incelenmesi gerekmektedir mevsimsel açıdan. Bu nedenle firma böyle çalışma yürütüyor mu?

Hayrettin YILDIRIM
İl Çevre ve Orman Müdürü

Erkan OKUMUŞ
Şube Müdür V.

Cemil KÖKSAL
Mühendis

Figure 7. Minutes of the Local Stakeholder Meeting of Buyukduz HEPP

There were some technical questions like diameter and route of the derivation tunnel, alternatives of the project, construction period, timeline of the project, and routes of the roads that would be constructed. Also, employment from the region and expropriation timeline and procedures were also questioned. There were also some questions regarding the possible environmental impacts of the project.

These questions were answered by the representatives of the project proponent and the consultant company conducting the EIA Study.

Information about the necessity of the project, the reason for selecting this region, employment, precautions which would be taken within the environmental causes were given, the questions of the public were answered, their opinions and thoughts were reviewed.

It was emphasized that priority would be given to local people in employment considering their qualifications.

The questions regarding the expropriation procedures were also answered.

The summarized minutes and the outcome of the meeting were incorporated in the EIA Report[140][141] and was taken into account in the "EIA Positive" decision granted by the authorities afterwards.

The contact with the local people continued after the meeting. The project proponent have been in continuous contact with the locals since the construction of the project has begun. Local People were given priority in employment in both the constructional and operational phases of the project. Expropriation procedures have been conducted according to the legislation considering the interests of the land owners.

[140] Taşoba – Elmali Weirs, Büyükdüz HEPP and Construction Material Quarries Final EIA Report, prepared by Topcuoglu Mining, Industry and Trade Co. Ltd. Dated February 2008. Turkish Version. Section IX – Public Participation, Page 147.
[141] Taşoba – Elmali Weirs, Büyükdüz HEPP and Construction Material Quarries Final EIA Report, prepared by Topcuoglu Mining, Industry and Trade Co. Ltd. Dated February 2008. English Version. Section IX – Attendance of the People, Page 152.

APPENDIX I: FURTHER BACKGROUND INFORMATION ON EX ANTE CALCULATION OF EMISSION REDUCTIONS

Power Plants Used to Calculate the Build Margin Emission Reduction Sorted by Commissioning Date from the Newest to the Oldest (The System at the End of 2012 with CDM-VER Projects and Capacity Additions from Retrofits of Power Plants Removed)

No	Fuel / Energy Source	POWER PLANT NAME	Installed Capacity (MW)	Firm Generation Capacity (GWh)	Commissioning Date	Location (Province)
1	NG	ALES DGKÇ	49.0	370.0	29.12.2012	Aydin
2	HE	TUĞRA REG. (VİRA)	4.9	10.0	29.12.2012	Giresun
3	NG	ACARSOY TERMİK KOM.ÇEV	50.0	375.0	27.12.2012	Denizli
4	HE	FINDIK I HES(ADV)	11.3	27.0	27.12.2012	Gumushane
5	HE	MİDİLLİ REG.(MASAT EN.)	21.0	45.0	27.12.2012	Amasya
6	HE	BAĞIŞTAŞ II (AKDENİZ EL.)	32.4	69.0	23.12.2012	Erzincan
7	NG	BİNATOM ELEKTRİK ÜRT. A.Ş.	2.022	15.2	19.12.2012	Kutahya
8	HE	KILAVUZLU	40.5	100.0	18.12.2012	K.Maras
9	NG	İZMİR BÜYÜK EFES OTELİ KOJEN.	1.2	9.0	14.12.2012	Izmir
10	HE	ARAKLI I REG.(YÜCEYURT EN.)	13.1	28.0	07.12.2012	Trabzon
11	HE	BEKTEMUR HES (DİZ-EP)	3.5	11.0	30.11.2012	Amasya
12	HE	BOYABAT	513.0	830.0	29.11.2012	Sinop
13	NG	KIVANÇ TEKSTİL	2.145	11.7	23.11.2012	Adana
14	HE	YILDIRIM HES (BAYBURT)	3.559	7.3	23.11.2012	Bayburt
15	HE	ÇAĞLAYAN HES	6.0	12.0	22.11.2012	Trabzon
16	HE	ŞİFRİN (BOMONTİ)	6.7	10.0	22.11.2012	Adiyaman
17	NG	GÜRTEKS İPLİK	6.7	53.0	17.11.2012	Gaziantep
18	NG	AKDENİZ KİMYA	2.00	15.0	16.11.2012	Izmir
19	NG	BİLECİK DGKÇ (TEKNO)	25.8	190.0	16.11.2012	Bilecik
20	NG	AGE DGKÇ (DENİZLİ)	47.0	352.3	15.11.2012	Denizli
21	HE	ALPARSLAN 1	80.0	209.0	13.11.2012	Mus
22	NG	BİNATOM ELEKTRİK ÜRT. A.Ş.	4.044	30.5	03.11.2012	Kutahya
23	WS	İZAYDAŞ (İzmit çöp)	0.33	2.2	31.10.2012	Kocaeli
24	WS	EKİM BİYOGAZ	1.2	10.0	30.10.2012	Konya
25	GT	DENİZ JEO.(MAREN MARAŞ)	24.0	191.0	30.10.2012	Aydin
26	HE	ERMENEK	151.2	408.5	17.10.2012	Karaman
27	GT	SİNEM JEO.(MAREN MARAŞ)	24.0	191.0	16.10.2012	Aydin
28	WS	AREL EN.BİYOKÜTLE	1.20	9.0	13.10.2012	Afyonkarahisar
29	NG	GOODYEAR İZMİT	5.2	39.0	12.10.2012	Kocaeli
30	HE	TELLİ I-II HES (FALANJ)	8.7	18.0	10.10.2012	Giresun
31	NG	ŞANLIURFA OSB (RASA EN.)	11.72	82.1	05.10.2012	Sanliurfa
32	HE	MURAT I-II REG.	35.6	107.0	05.10.2012	Adiyaman
33	BG	TRAKYA YENİŞEHİR CAM SAN.	6.0	45.0	28.09.2012	Bursa
34	HE	CUNİŞ REG.(RİNERJİ)	5.6	14.0	28.09.2012	Trabzon
35	HE	YILDIRIM HES (BAYBURT)	7.118	14.7	28.09.2012	Bayburt
36	NG	JTI TORBALI KOJEN.	4.0	30.0	21.09.2012	Izmir
37	HE	DUMLU HES	4.0	5.0	15.09.2012	Erzurum

38	HE	ERİK	6.5	21.0	14.09.2012	Karaman
39	HE	ERMENEK	151.2	408.5	14.09.2012	Karaman
40	LN	KÜÇÜKER TEKSTİL	5.0	40.0	14.09.2012	Denizli
41	NG	DURUM GIDA	3.6	29.0	14.09.2012	Mersin
42	NG	BİNATOM ELEKTRİK ÜRT. A.Ş.	2.145	16.2	08.09.2012	Kutahya
43	HE	ÇARŞAMBA HES	11.3	36.0	30.08.2012	Samsun
44	NG	ODAŞ DOĞAL GAZ	18.32	138.0	17.08.2012	Sanliurfa
45	WS	SEZER BİYOENERJİ (KALEMİRLER EN.)	0.5	4.0	17.08.2012	Antalya
46	HE	ARPA HES (MCK EL.)	32.4	44.0	16.08.2012	Artvin
47	IC	GÖKNUR GIDA	1.6	6.0	09.08.2012	Nigde
48	NG	AFYON DGKÇ (DEDELİ DG)	126.1	945.0	05.08.2012	Afyonkarahisar
49	HE	ALPARSLAN 1	80.0	209.0	03.08.2012	Mus
50	NG	AGE DGKÇ (DENİZLİ)	94.0	704.7	01.08.2012	Denizli
51	HE	TELEME (TAYEN)	1.6	6.0	31.07.2012	K.Maras
52	HE	CUNİŞ REG.(RİNERJİ)	2.8	7.0	28.07.2012	Trabzon
53	NG	PANCAR ELEK.	17.460	130.0	27.07.2012	Izmir
54	NG	TEKİRDAĞ -ÇORLU KOJ.(ODE YALITIM)	2.0	15.0	20.07.2012	Tekirdag
55	HE	CAN I HES(HED ELEK.)	1.8	6.0	20.07.2012	Kars
56	NG	NAKSAN A.Ş.	8.0	60.0	14.07.2012	Gaziantep
57	HE	ÜÇKAYA (ŞİRİKÇİOĞLU)	1.0	3.0	14.07.2012	K.Maras
58	NG	PANCAR ELEK.	17.460	130.0	13.07.2012	Izmir
59	NG	İŞBİRLİĞİ ENERJİ ÜR.A.Ş.	19.5	146.0	12.07.2012	Izmir
60	NG	BAMEN KOJEN.(BAŞYAZICIOĞLU TEKS.)	2.1	14.0	08.07.2012	Kayseri
61	NG	ALTINYILDIZ (TEKİRDAĞ)	5.5	38.0	06.07.2012	Tekirdag
62	HE	AKKÖY ENERJİ II (AKKÖY HES)	114.84	254.0	05.07.2012	Gumushane
63	HE	KAYAKÖPRÜ II HES (ARSAN ELEK.)	10.2	36.0	04.07.2012	Giresun
64	NG	BİS ENERJİ (Bursa San.)	48.0	361.6	30.06.2012	Bursa
65	IC	EREN ENERJİ ELEK.ÜR.A.Ş.	30.0	196.0	29.06.2012	Zonguldak
66	HE	KARTALKAYA(SIR)	8.0	15.0	28.06.2012	K.Maras
67	NG	BOSEN (Bursa San.)	27.96	209.9	26.06.2012	Bursa
68	WS	BEREKET EN ÜR.BİYOGAZ	0.6	5.0	17.06.2012	Denizli
69	NG	DURMAZLAR MAK.	1.3	10.0	16.06.2012	Bursa
70	NG	ASAŞ ALÜMİNYUM	8.6	65.0	15.06.2012	Sakarya
71	NG	BEYPİ BEYPAZARI	8.6	63.0	15.06.2012	Bolu
72	NG	MUTLU MAKARNACILIK	2.0	16.0	15.06.2012	Gaziantep
73	HE	HORYAN	5.7	15.0	15.06.2012	Trabzon
74	NG	BİLECİK DGKÇ (DEDELİ)	106.7	799.6	09.06.2012	Bilecik
75	HE	AKKÖY ENERJİ II (AKKÖY HES)	114.84	254.0	07.06.2012	Gumushane
76	HE	BÜYÜKDÜZ HES (AYEN EN.)	68.9	109.0	31.05.2012	Gumushane
77	WS	AREL EN.BİYOKÜTLE	1.20	9.0	25.05.2012	Afyonkarahisar
78	NG	BİLECİK DGKÇ (DEDELİ)	19.4	145.4	20.05.2012	Bilecik
79	NG	BİNATOM ELEKTRİK ÜRT. A.Ş.	2.145	16.2	18.05.2012	Kutahya
80	NG	ERZURUM MEYDAN AVM (REDEVKO)	2.4	16.0	12.05.2012	Erzurum
81	HE	AKKÖY ESPİYE(KONİ İNŞ.)	8.9	22.0	06.05.2012	Giresun
82	HE	YAVUZ HES (AREM EN.)	5.8	8.0	04.05.2012	Kastamonu

83	NG	ODAŞ DOĞAL GAZ	54.96	413.9	30.04.2012	Sanliurfa
84	HE	ANAK HES(KOR-EN EL.)	3.8	9.0	27.04.2012	Antalya
85	HE	SEYRANTEPE HES (SEYRANTEPE BARAJI)	7.14	20.2	27.04.2012	Elazig
86	HE	ZEYTİNBENDİ HES	5.2	10.0	27.04.2012	K.Maras
87	NG	ÖZMAYA SAN.	5.4	40.0	22.04.2012	Amasya
88	NG	BİLKUR TEKSTİL	2.0	14.0	20.04.2012	K.Maras
89	NG	KESKİNOĞLU TAVUKÇULUK	6.0	44.8	20.04.2012	Manisa
90	HE	DOĞANKAYA (MAR-EN)	20.6	56.0	20.04.2012	Adiyaman
91	FO	ERDEMİR	53.9	351.2	13.04.2012	Zonguldak
92	HE	POLAT HES (ELESTAŞ)	3.28	10.0	07.04.2012	Sivas
93	HE	MURATLI HES (ARMAHES ELEK.)	11.0	16.0	05.04.2012	Sivas
94	HE	AVCILAR HES	16.7	28.0	04.04.2012	K.Maras
95	HE	KÖKNAR(AYCAN)	8.0	15.0	04.04.2012	Duzce
96	NG	AKDENİZ KİMYA	2.00	15.0	30.03.2012	Izmir
97	HE	GÖKGEDİK (UHUD) HES	3.776	11.7	30.03.2012	K.Maras
98	HE	AKKÖPRÜ	57.5	88.0	29.03.2012	Mugla
99	BG	GAZKİ MERKEZ ATIK SU AR.	1.7	12.0	29.03.2012	Gaziantep
100	HE	ÇINAR I HES	9.3	19.0	23.03.2012	Duzce
101	HE	POLAT HES (ELESTAŞ)	3.28	10.0	23.03.2012	Sivas
102	NG	AKSA AKRİLİK KİMYA (İTH.KÖM.+D.G)	75.0	525.0	22.03.2012	Yalova
103	NG	SELVA GIDA	1.7	14.0	16.03.2012	Konya
104	HE	GÖKGEDİK (UHUD) HES	20.490	63.3	16.03.2012	K.Maras
105	NG	OFİM EN.	2.1	16.0	12.03.2012	Ankara
106	NG	BALSUYU MENSUCAT	9.7	68.0	10.03.2012	K.Maras
107	NG	HATİPOĞLU PLASTİK YAPI ELEM.	2.0	14.0	10.03.2012	Eskisehir
108	NG	YENİ UŞAK ENERJİ	9.73	71.3	02.03.2012	Usak
109	NG	YONGAPAN (Kastamonu)	15.04	109.4	24.02.2012	Kocaeli
110	HE	SANCAR REG.(MELİTA)	0.7	2.0	24.02.2012	Malatya
111	BG	ES ES ESKİŞEHİR EN.	2.0	15.0	16.02.2012	Eskisehir
112	HE	HORU REG.(MARAŞ)	4.240	8.5	16.02.2012	Osmaniye
113	HE	KÜRCE REG.(DEDEGÖL)	12.0	36.0	15.02.2012	Antalya
114	HE	AKKÖPRÜ	57.5	88.0	14.02.2012	Mugla
115	NG	SELÇUK İPLİK	8.6	65.0	02.02.2012	Gaziantep
116	HE	MURSAL I (PETA MÜH.)	4.2	13.0	28.01.2012	Sivas
117	NG	MANİSA O.S.B.	12.000	89.8	27.01.2012	Manisa
118	HE	SARIHIDIR HES(MOLU)	6.0	18.0	22.01.2012	Nevsehir
119	HE	EGER HES	1.9	6.0	19.01.2012	Kutahya
120	NG	ZORLU ENERJİ (B.Karıştıran)	25.70	192.8	13.01.2012	Kirklareli
121	HE	GÜDÜL II (YAŞAM EN.)	4.9	15.0	13.01.2012	Malatya
122	HE	HORU REG.(MARAŞ)	4.240	8.5	12.01.2012	Osmaniye
123	NG	TİRENDA TİRE	58.4	410.0	30.12.2011	Izmir
124	NG	AKSA AKRİLİK KİMYA (İTH.KÖM.+D.G)	25.0	175.0	30.12.2011	Yalova
125	NG	ALİAĞA Çakmaktepe Enerji	8.73	65.7	29.12.2011	Izmir
126	IC	BEKİRLİ TES (İÇDAŞ ELEKT.)	600.0	4,320.0	15.12.2011	Canakkale
127	HE	SARIKAVAK (ESER)	8.1	24.0	25.11.2011	Mersin
128	FO	MARDİN-KIZILTEPE(AKSA EN.)	32.1	225.0	18.11.2011	Mardin
129	HE	ÇUKURÇAYI HES (AYDEMİR)	1.8	4.0	03.11.2011	Isparta

130	NG	ODAŞ DOĞAL GAZ	55.00	414.2	28.10.2011	Sanliurfa
131	HE	MURATLI HES (ARMAHES ELEK.)	26.7	39.0	27.10.2011	Sivas
132	NG	TEKİRDAĞ TEKS.(NİL ÖRME)	2.7	21.0	25.10.2011	Tekirdag
133	NG	SARAY HALI A.Ş.	4.3	33.0	15.10.2011	Kayseri
134	HE	TEFEN HES (AKSU)	11.000	26.7	13.10.2011	Zonguldak
135	HE	YEDİGÖL REG. VE HES (YEDİGÖL HES)	21.9	42.0	13.10.2011	Erzurum
136	NG	AKSA ENERJİ (Antalya)	190.0	1,321.7	07.10.2011	Antalya
137	NG	GOREN-1 (GAZİANTEP ORG.SAN.)	48.7	277.0	30.09.2011	Gaziantep
138	HE	ÇANAKÇI HES (CAN EN.)	4.633	11.0	29.09.2011	Trabzon
139	NG	AKSA ENERJİ (Antalya)	110.0	765.2	17.09.2011	Antalya
140	HE	BOĞUNTU (BEYOBASI EN.ÜR.)	3.8	10.0	16.09.2011	Mersin
141	HE	POYRAZ HES(YEŞİL EN.)	2.7	6.0	16.09.2011	K.Maras
142	NG	BOSEN (Bursa San.)	93.00	698.1	10.09.2011	Bursa
143	HE	ÇANAKÇI HES (CAN EN.)	4.633	11.0	25.08.2011	Trabzon
144	HE	ÇAMLIKAYA	2.824	3.7	11.08.2011	Trabzon
145	NG	GORDİON AVM (REDEVCO ÜÇ)	2.0	15.0	05.08.2011	Ankara
146	HE	KORUKÖY HES (AKAR EN.)	3.0	13.0	05.08.2011	Adiyaman
147	NG	LOKMAN HEKİM ENGÜRÜ(SİNCAN)	0.5	4.0	29.07.2011	Ankara
148	NG	ŞANLIURFA OSB (RASA EN.)	116.80	817.9	26.07.2011	Sanliurfa
149	NG	HASIRCI TEKSTİL TİC. VE SAN.	2.0	15.0	16.07.2011	Gaziantep
150	NG	KNAUF İNŞ. VE YAPI ELEMANLARI	1.6	12.0	15.07.2011	Ankara
151	NG	MANİSA O.S.B.	43.500	325.5	13.07.2011	Manisa
152	NG	ALİAĞA Çakmaktepe Enerji	130.95	986.0	01.07.2011	Izmir
153	HE	KÖYOBASI HES (ŞİRİKOĞLU ELEK.)	1.1	3.0	30.06.2011	K.Maras
154	HE	YAŞIL HES (YAŞIL ENERJİ EL. ÜRETİM A.Ş.)	2.276	4.8	29.06.2011	K.Maras
155	NG	POLYPLEX EUROPA	3.904	30.7	24.06.2011	Tekirdag
156	HE	ÜZÜMLÜ HES (AKGÜN EN. ÜR. VE TİC. A.Ş.)	11.4	23.0	23.06.2011	Erzincan
157	NG	ALDAŞ ALTYAPI YÖN.	2.0	15.0	15.06.2011	Antalya
158	HE	GÖKMEN REG. (SU-GÜCÜ ELEK.)	2.9	8.0	15.06.2011	Yozgat
159	HE	TEFEN HES (AKSU)	22.000	53.3	10.06.2011	Zonguldak
160	HE	KARASU II HES (İDEAL EN.)	3.1	8.0	03.06.2011	Erzurum
161	HE	ÖREN REG.(ÇELİKLER)	6.6	16.0	26.05.2011	Giresun
162	HE	YAŞIL HES (YAŞIL ENERJİ EL. ÜRETİM A.Ş.)	1.518	3.2	20.05.2011	K.Maras
163	NG	ZORLU ENERJİ (B.Karıştıran)	7.20	54.0	14.05.2011	Kirklareli
164	HE	KESME REG.(KIVANÇ EN.)	2.305	4.5	22.04.2011	K.Maras
165	HE	KESME REG.(KIVANÇ EN.)	2.305	4.5	14.04.2011	K.Maras
166	HE	ALKUMRU BARAJI VE HES(LİMAK)	87.090	156.0	12.04.2011	Siirt
167	NG	GLOBAL ENERJİ (PELİTLİK)	4.000	30.0	08.04.2011	Tekirdag
168	HE	KAZANKAYA REG.İNCESU HES(AKSA)	15.0	27.0	08.04.2011	Çorum
169	NG	CENGİZ ENERJİ (Tekkeköy/SAMSUN)	35.000	281.3	30.03.2011	Samsun
170	NG	BOYTEKS TEKS.	8.6	67.0	19.03.2011	Kayseri
171	HE	HACININOĞLU HES (ENERJİ-SA)	71.140	102.0	17.03.2011	K.Maras
172	HE	NARİNKALE HES (EBD EN.)	30.4	55.4	17.03.2011	Kars

173	HE	ALKUMRU BARAJI VE HES(LİMAK)	174.180	312.0	10.03.2011	Siirt
174	NG	GÜLLE ENTEGRE (Çorlu)	3.904	18.0	04.03.2011	Tekirdag
175	HE	KULP I HES (YILDIZLAR EN.)	22.9	44.0	04.03.2011	Diyarbakir
176	HE	DURU 2 REG.(DURUCASU EL.)	4.5	13.0	25.02.2011	Amasya
177	HE	ÇAKIRMAN (YUSAKA EN.)	7.0	15.0	19.02.2011	Erzincan
178	NG	TÜPRAŞ (Orta Anadolu-Kırıkkale)	12.0	84.8	04.02.2011	Kirikkale
179	HE	HACININOĞLU HES (ENERJİ-SA)	71.140	102.0	03.02.2011	K.Maras
180	NG	İSTANBUL SABİHA GÖKÇEN HAV.	4.0	32.0	31.01.2011	Istanbul
181	NG	HG ENERJİ	52.4	366.0	27.01.2011	Kutahya
182	HE	YEDİGÖZE HES	155.330	134.0	26.01.2011	Adana
183	NG	FRAPORT İÇ İÇTAŞ ANTALYA HAV.	8.0	64.0	24.01.2011	Antalya
184	HE	BAYRAMHACILI (SENERJİ EN.)	47.0	95.0	20.01.2011	Nevsehir
185	HE	AKSU REG.(KALEN EN.)	5.2	12.0	12.01.2011	Giresun
186	HE	ÇEŞMEBAŞI (GİMAK)	8.2	17.0	12.01.2011	Ankara
187	NG	INTERNATIONAL HOSPITAL (İstanbul)	0.8	6.0	31.12.2010	Istanbul
188	NG	RASA ENERJİ (VAN)	10.124	64.4	29.12.2010	Van
189	IC	EREN ENERJİ ELEK.ÜR.A.Ş.	600.0	3,919.4	29.12.2010	Zonguldak
190	NG	ALTEK ALARKO	21.890	151.4	18.12.2010	Kirklareli
191	NG	POLYPLEX EUROPA	7.808	61.3	16.12.2010	Tekirdag
192	FO	TÜPRAŞ (İzmit-Yarımca)	40.0	258.8	15.12.2010	Kocaeli
193	NG	SÖNMEZ ELEKTRİK	2.564	19.8	07.12.2010	Usak
194	HE	YEDİGÖZE HES	155.330	134.0	02.12.2010	Adana
195	BG	FRİTOLEY GIDA	0.330	2.5	26.11.2010	Kocaeli
196	NG	ALİAĞA Çakmaktepe Enerji	69.84	525.9	26.11.2010	Izmir
197	NG	MARMARA PAMUK	26.19	203.6	25.11.2010	Tekirdag
198	HE	MURGUL BAKIR	19.602	31.5	11.11.2010	Artvin
199	IC	EREN ENERJİ ELEK.ÜR.A.Ş.	600.0	3,919.4	01.11.2010	Zonguldak
200	HE	SABUNSUYU II HES (ANG EN.)	7.4	12.0	28.10.2010	Osmaniye
201	HE	KAHTA I HES(ERDEMYILDIZ ELEK.)	7.1	20.0	14.10.2010	Adiyaman
202	NG	ENERJİ-SA (Bandırma)	930.8	7,540.0	07.10.2010	Balikesir
203	NG	UĞUR ENERJİ (TEKİRDAĞ)	12.0	100.9	07.10.2010	Tekirdag
204	HE	ERENKÖY REG.(TÜRKERLER)	21.5	49.0	07.10.2010	Artvin
205	HE	KAHRAMAN REG.(KATIRCIOĞLU ELEK.)	1.4	3.0	30.09.2010	Giresun
206	HE	NARİNKALE HES (EBD EN.)	3.1	5.6	30.09.2010	Kars
207	FO	KIRKA BORAKS (Kırka)	10.0	65.9	29.09.2010	Eskisehir
208	HE	KOZAN HES (SER-ER EN.)	4.0	5.0	21.09.2010	Adana
209	HE	TEKTUĞ-ANDIRIN	40.5	60.0	03.09.2010	K.Maras
210	HE	KARŞIYAKA HES (AKUA EN.)	1.6	5.0	28.08.2010	Gaziantep
211	NG	SÖNMEZ ELEKTRİK	33.242	256.2	26.08.2010	Usak
212	HE	GÜDÜL I (YAŞAM EN.)	2.4	8.0	25.08.2010	Malatya
213	NG	KURTOĞLU BAKIR KURŞUN	1.6	12.0	19.08.2010	Tekirdag
214	NG	CAN ENERJİ ELEK. ÜR.AŞ.(TEKİRDAĞ)	29.1	203.0	19.08.2010	Tekirdag
215	NG	BİNATOM ELEKTRİK ÜRT. A.Ş.	2.0	13.0	17.08.2010	Kutahya
216	NG	KESKİNOĞLU TAVUKÇULUK	3.5	26.2	11.08.2010	Manisa
217	HE	GÖK HES	10.0	24.0	06.08.2010	Mersin

218	NG	CENGİZ ENERJİ (Tekkeköy/SAMSUN)	101.950	819.4	31.07.2010	Samsun
219	NG	RB KARESİ TEKS. (BURSA)	8.6	64.5	23.07.2010	Bursa
220	NG	FLOKSER TEKSTİL (ÇERKEZKÖY)	5.2	42.0	17.07.2010	Tekirdag
221	IC	EREN ENERJİ ELEK.ÜR.A.Ş.	160.0	1,045.2	15.07.2010	Zonguldak
222	HE	YAVUZ HES (MASAT EN.)	22.5	47.0	14.07.2010	Amasya
223	HE	KİRPİLİK HES (ÖZGÜR ELEK.)	6.2	13.0	11.07.2010	Mersin
224	NG	ALTEK ALARKO	60.100	415.6	10.07.2010	Kirklareli
225	HE	DİM HES (DİLER ELEK.)	38.3	70.0	08.07.2010	Antalya
226	HE	DİNAR HES (ELDA ELEK.)	4.4	9.0	03.07.2010	Tunceli
227	NG	AKSA ENERJİ (Antalya)	25.0	173.9	01.07.2010	Antalya
228	HE	ÇAMLIKAYA	5.648	7.3	30.06.2010	Trabzon
229	NG	UĞUR ENERJİ (TEKİRDAĞ)	48.2	405.1	21.06.2010	Tekirdag
230	HE	ERENLER REG.(BME BİRLEŞİK EN.)	45.0	48.0	04.06.2010	Artvin
231	NG	CENGİZ ENERJİ (Tekkeköy/SAMSUN)	101.950	819.4	22.05.2010	Samsun
232	NG	ERDEMİR	78.4	473.3	21.05.2010	Zonguldak
233	HE	BİRİM (ERFELEK HES)	3.225	5.5	14.05.2010	Sinop
234	NT	ATAER ENERJİ (EBSO)	49.000	277.9	05.05.2010	Izmir
235	NG	YILDIZ ENTEGRE	12.368	92.7	22.04.2010	Kocaeli
236	BG	FRİTOLEY GIDA	0.065	0.5	21.04.2010	Kocaeli
237	HE	FIRTINA ELEK.(SÜMER HES)	21.6	39.0	16.04.2010	Giresun
238	HE	BİRİM (ERFELEK HES)	3.225	5.5	03.04.2010	Sinop
239	HE	NURYOL EN.(DEFNE HES)	7.2	13.0	26.03.2010	Duzce
240	NG	AKSA ENERJİ (Antalya)	25.0	173.9	20.03.2010	Antalya
241	HE	DOĞUBAY ELEK.(SARIMEHMET HES)	3.1	6.0	11.03.2010	Van
242	NG	RASA ENERJİ (VAN)	26.190	166.6	03.03.2010	Van
243	HE	HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1.2	3.0	23.02.2010	Trabzon
244	HE	MURSAL II HES (PETA EN.)	4.5	11.0	19.02.2010	Sivas
245	NG	AKBAŞLAR	1.54	11.69	18.02.2010	Bursa
246	HE	ALAKIR (YURT EN.)	2.1	4.0	29.01.2010	Antalya
247	NG	ALTINMARKA	4.6	35.9	28.01.2010	Istanbul
248	NG	CAN TEKSTİL (Çorlu)	7.832	60.1	28.01.2010	Tekirdag
249	HE	BAYBURT HES	14.6	24.0	28.01.2010	Bayburt
250	LN	ETİ SODA	24.0	144.0	22.01.2010	Ankara
251	HE	CİNDERE DENİZLİ	9.573	16.7	21.01.2010	Denizli
252	HE	KULP IV HES (YILDIZLAR EN.)	12.3	23.0	13.01.2010	Diyarbakir
253	NG	TÜPRAŞ (Orta Anadolu-Kırıkkale)	34.0	240.2	25.12.2009	Kirikkale
254	HE	SARITEPE HES DİNAMİK SİSTEMLER	2.450	4.5	24.12.2009	Adana
255	NG	AKSA ENERJİ (Manisa)	10.500	83.2	18.12.2009	Manisa
256	NG	FALEZ ELEKTRİK	11.7	88.0	16.12.2009	Antalya
257	NG	ÇELİKLER RİXOS ANKARA OTEL	2.0	16.0	15.12.2009	Ankara
258	NG	TAV İSTANBUL	3.26	27.3	12.12.2009	Istanbul
259	HE	SARITEPE HES DİNAMİK SİSTEMLER	2.450	4.5	19.11.2009	Adana
260	HE	ÖZYAKUT GÜNEŞLİ HES	0.600	1.3	13.11.2009	K.Maras

261	NG	SELKASAN	9.9	73.0	11.11.2009	Manisa
262	HE	TÜM EN. PINAR	30.1	65.0	06.11.2009	Adiyaman
263	HE	ERVA KABACA HES	4.240	7.5	29.10.2009	Artvin
264	NG	MERSİN KOJEN. (SODA SAN.A.Ş.)	126.1	882.5	19.10.2009	Mersin
265	NG	AKGIDA PAMUKOVA	7.5	61.0	17.10.2009	Sakarya
266	NG	MAURİ MAYA	0.330	2.7	16.10.2009	Balikesir
267	FO	KIRKA BORAKS (Kırka)	8.2	54.1	15.10.2009	Eskisehir
268	NG	DALSAN ALÇI	1.2	9.0	14.10.2009	Kocaeli
269	IC	İÇDAŞ ÇELİK	135.000	961.7	13.10.2009	Canakkale
270	HE	ERVA KABACA HES	4.240	7.5	23.09.2009	Artvin
271	NG	DELTA ENERJİ	13.000	101.2	17.09.2009	Kirklareli
272	FO	ALİAĞA PETKİM	52.0	364.0	28.08.2009	Izmir
273	HE	DENİZLİ EGE 1	0.9	2.0	27.08.2009	Denizli
274	NG	ENTEK (Köseköy) İztek	12.400	98.7	06.08.2009	Kocaeli
275	NG	GLOBAL ENERJİ (PELİTLİK)	8.553	64.1	31.07.2009	Tekirdag
276	NG	RASA ENERJİ (VAN)	78.570	499.9	31.07.2009	Van
277	HE	OBRUK I-II	210.8	337.0	29.07.2009	Corum
278	IC	İÇDAŞ ÇELİK	135.000	961.7	24.07.2009	Canakkale
279	HE	KAYEN ALFA EN.KALETEPE HES (tortum)	10.2	17.0	23.07.2009	Erzurum
280	NG	ZORLU ENERJİ (B.Karıştıran)	49.53	371.6	17.07.2009	Kirklareli
281	HE	AKUA KAYALIK	5.8	20.0	15.07.2009	Erzincan
282	NG	AKSA ENERJİ (Antalya)	300.0	2,087.0	10.07.2009	Antalya
283	HE	CİNDERE DENİZLİ	19.146	33.3	02.07.2009	Denizli
284	NG	MARMARA PAMUK	34.92	271.5	18.06.2009	Tekirdag
285	NG	ANTALYA ENERJİ	41.82	302.3	05.06.2009	Antalya
286	NG	AKSA ENERJİ (Antalya)	300.0	2,087.0	29.05.2009	Antalya
287	HE	ÖZYAKUT GÜNEŞLİ HES	1.200	2.7	29.05.2009	K.Maras
288	NG	MAURİ MAYA	2.000	16.3	28.05.2009	Balikesir
289	BG	CARGİLL TARIM	0.1	1.0	26.05.2009	Bursa
290	HE	TOCAK I HES (YURT ENERJİ ÜRETİM SAN.)	4.8	6.0	08.05.2009	Antalya
291	AS	SİLOPİ ASFALTİT	135.0	945.0	02.05.2009	Sirnak
292	NG	NUH ENERJİ (ENER SANT.2)	46.950	352.2	30.04.2009	Kocaeli
293	NG	TESKO KİPA İZMİR	2.3	17.5	27.04.2009	Izmir
294	NG	KEN KİPAŞ (KAREN)ELEKTRİK	17.460	75.2	23.04.2009	K.Maras
295	NG	DELTA ENERJİ	47.000	365.8	21.04.2009	Kirklareli
296	NG	AKSA ENERJİ (Antalya)	16.2	112.7	17.04.2009	Antalya
297	GT	GÜRMAT EN.	47.4	313.0	02.04.2009	Aydin
298	NG	SÖNMEZ ELEKTRİK	8.730	67.3	27.03.2009	Usak
299	NG	KASAR DUAL TEKS.ÇORLU	5.7	38.0	26.03.2009	Tekirdag
300	NG	TAV İSTANBUL	6.52	54.7	06.03.2009	Istanbul
301	LN	ALKİM (ALKALİ KİMYA) (Konya)	0.4	3.0	26.02.2009	Konya
302	NG	ERDEMİR	39.2	236.7	06.02.2009	Zonguldak
303	NG	TÜPRAŞ ALİAĞA	24.7	170.0	30.01.2009	Izmir
304	HE	TAŞOVA YENİDEREKÖY	2.0	6.0	30.01.2009	Amasya
305	NG	AKSA ENERJİ (Manisa)	52.380	414.9	15.01.2009	Manisa
306	NG	AKSA ENERJİ (Antalya)	46.7	324.9	29.12.2008	Antalya
307	FO	KARKEY (SİLOPİ)	14.780	95.8	19.12.2008	Sirnak

308	HE	SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21.0	54.0	28.11.2008	Trabzon
309	HE	SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21.6	61.0	28.11.2008	Trabzon
310	HE	AKKÖY ENERJİ (AKKÖY HES)	33.980	87.7	26.11.2008	Gumushane
311	NG	AKSA ENERJİ (Antalya)	46.7	324.9	07.11.2008	Antalya
312	NG	AKSA ENERJİ (Antalya)	46.7	324.9	17.10.2008	Antalya
313	HE	TORUL	103.2	130.0	16.10.2008	Gumushane
314	NG	AKSA ENERJİ (Manisa)	17.460	138.3	10.10.2008	Manisa
315	HE	YEŞİL ENERJİ (TAYFUN HES)	0.8	4.0	10.10.2008	K.Maras
316	HE	SEYRANTEPE HES (SEYRANTEPE BARAJI)	24.85	70.4	25.09.2008	Elazig
317	HE	AKKÖY ENERJİ (AKKÖY HES)	67.960	175.3	18.09.2008	Gumushane
318	HE	SEYRANTEPE HES (SEYRANTEPE BARAJI)	24.85	70.4	17.09.2008	Elazig
319	NG	AKSA ENERJİ (Manisa)	34.920	276.6	16.09.2008	Manisa
320	NG	AKSA ENERJİ (Antalya)	43.7	304.0	04.09.2008	Antalya
321	HE	H.G.M.ENER.(KEKLİCEK HES)	8.7	11.0	29.08.2008	Malatya
322	NG	ANTALYA ENERJİ	17.46	126.2	08.08.2008	Antalya
323	NG	POLAT RÖNESANS	1.6	11.0	01.08.2008	Istanbul
324	HE	HİDRO KONTROL YUKARI MANAHOZ	22.4	45.0	31.07.2008	Trabzon
325	NG	SÖNMEZ ELEKTRİK	8.730	67.3	25.07.2008	Usak
326	HE	CANSU ELEKTRİK (ARTVİN)	9.2	31.0	19.07.2008	Artvin
327	NG	MODERN ENERJİ	9.520	66.9	04.07.2008	Tekirdag
328	NG	BAHÇIVAN GIDA (LÜLEBURGAZ)	1.2	8.0	03.07.2008	Kirklareli
329	NG	MELİKE TEKSTİL G.ANTEP	1.6	11.0	03.07.2008	Gaziantep
330	HE	İÇ-EN ELEK. ÇALKIŞLA	7.7	11.0	22.05.2008	Erzincan
331	NG	FOUR SEASONS OTEL	1.2	7.0	17.05.2008	Istanbul
332	NG	CAN ENERJİ	34.920	202.9	02.04.2008	Tekirdag
333	NG	CAN ENERJİ	17.460	101.4	07.03.2008	Tekirdag
334	NG	FRİTOLEY GIDA	0.06	0.4	23.02.2008	Kocaeli
335	NG	YILDIZ SUNTA (Köseköy)	22.6	146.3	22.02.2008	Kocaeli
336	NG	MİSİS APRE TEKSTİL ADANA	2.0	14.0	21.02.2008	Adana
337	NG	ATAÇ İNŞSAN. ANTALYA	5.4	37.0	30.01.2008	Antalya
338	HE	TEMSA ELEKTRİK (GÖZEDE HES)	2.4	6.0	29.01.2008	Bursa
339	HE	ALP ELEKTRİK (TINAZTEPE)	7.7	17.0	24.01.2008	Antalya
340	NG	KESKİN KILIÇ SULTANHANI	8.8	60.0	04.01.2008	Aksaray
341	GT	SARAYKÖY JEOTERMAL	6.9	50.0	04.01.2008	Denizli
342	HE	MERCAN ZORLU	1.275	3.0	01.01.2008	Tunceli
343	FO	KARKEY (SİLOPİ)	29.560	191.6	13.12.2007	Sirnak
344	NG	SÜPERBOY BOYA	1.0	8.0	06.12.2007	Istanbul
345	NG	FLOKSER TEKSTİL (Poliser)	2.1	17.0	04.12.2007	Istanbul
346	HE	KURTEKS (Karasu Andırın HES)	2.4	19.0	29.11.2007	K.Maras
347	NG	ACIBADEM Kadıköy 2	0.6	5.0	24.10.2007	Istanbul
348	NG	TAV Esenboğa	3.9	33.0	20.09.2007	Ankara
349	NG	ALİAĞA Çakmaktepe Enerji	34.84	262.3	14.09.2007	Izmir
350	NG	BİS ENERJİ (Bursa San.)	28.3	213.2	11.09.2007	Bursa
351	NG	BİS ENERJİ (Bursa San.)	48.0	361.6	31.08.2007	Bursa
352	NG	ACIBADEM Bursa	1.3	11.0	29.08.2007	Bursa

353	NG	SWISS OTEL (İstanbul)	1.6	11.0	02.08.2007	Istanbul
354	NG	AKATEKS Çorlu	1.8	14.0	31.07.2007	Tekirdag
355	NG	SAYENERJİ (Kayseri OSB)	5.9	47.0	12.07.2007	Kayseri
356	NG	ACIBADEM Kadıköy 1	0.5	4.0	20.06.2007	Istanbul
357	NG	ENTEK (Demirtaş)	10.750	81.1	15.06.2007	Bursa
358	NG	BİS ENERJİ (Bursa San.)	43.0	323.9	31.05.2007	Bursa
359	HE	ÖZGÜR ELEKTR.K.Maraş Tahta HES	6.250	27.0	25.05.2007	K.Maras
360	HE	ÖZGÜR ELEKTR.K.Maraş Tahta HES	6.250	27.0	04.05.2007	K.Maras
361	NG	HABAŞ (Aliağa)	23.000	184.0	03.05.2007	Izmir
362	NG	T. ENERJİ TURCAS	1.6	13.0	05.04.2007	Istanbul
363	FO	ORS (Polatlı)	7.4	52.0	23.03.2007	Ankara
364	NG	KIVANÇ TEKSTİL	3.900	21.3	21.03.2007	Adana
365	HE	BORÇKA	300.6	600.0	28.02.2007	Artvin
366	NG	KİL-SAN	3.2	25.0	20.02.2007	Istanbul
367	NG	FRİTOLEY GIDA	0.54	3.6	24.01.2007	Kocaeli
368	NG	BOSEN (Bursa San.)	11.80	88.6	19.01.2007	Bursa
369	NG	AKMAYA (Lüleburgaz)	6.9	48.0	23.12.2006	Kirklareli
370	NG	BURGAZ ELEKTRİK	6.9	55.0	23.12.2006	Kirklareli
371	WD	ERTÜRK ELEKT. (TEPE)	0.9	2.0	22.12.2006	Istanbul
372	HE	BEREKET (MENTAŞ)	13.300	46.7	13.12.2006	Adana
373	NG	ÇIRAĞAN SARAYI	1.3	11.0	01.12.2006	Istanbul
374	HE	ENERJİ-SA-AKSU-ŞAHMALLAR	14.0	7.0	16.11.2006	Antalya
375	LN	ELBİSTAN B 1-4	360.0	2,207.5	13.11.2006	K.Maras
376	NG	ENTEK (Köseköy) İztek	37.000	294.6	03.11.2006	Kocaeli
377	NG	ÇERKEZKÖY ENERJİ	49.2	403.0	06.10.2006	Tekirdag
378	NG	YILDIZ ENTEGRE	6.184	46.3	21.09.2006	Kocaeli
379	LN	ELBİSTAN B 1-4	360.0	2,207.5	17.09.2006	K.Maras
380	NG	MERSİN KOJEN. (SODA SAN.A.Ş.)	126.1	882.5	13.09.2006	Mersin
381	HE	ENERJİ SA-SUGÖZÜ-KIZILDÜZ	15.4	8.0	08.09.2006	Antalya
382	HE	EKİN ENERJİ (BAŞARAN HES)	0.6	0.0	11.08.2006	Aydin
383	NG	EROĞLU GİYİM	1.2	9.0	01.08.2006	Tekirdag
384	HE	BEREKET (MENTAŞ)	26.600	93.3	31.07.2006	Adana
385	NG	HAYAT TEMİZLİK	15.0	94.0	30.06.2006	Kocaeli
386	NG	ANTALYA ENERJİ	34.92	252.4	29.06.2006	Antalya
387	HE	SU ENERJİ (ÇAYGÖREN HES)	4.6	4.0	27.06.2006	Balikesir
388	LN	ELBİSTAN B 1-4	360.0	2,207.5	23.06.2006	K.Maras
389	NG	ŞIK MAKAS	1.6	12.6	22.06.2006	Tekirdag
390	NG	AMYLUM NİŞASTA (Adana)	8.10	45.31	09.06.2006	Adana
391	BG	ADANA ATIK	0.8	6.0	09.06.2006	Adana
392	HE	MOLU ENERJİ (BAHÇELİK HES)	4.2	30.0	31.05.2006	Kayseri
393	NG	KASTAMONU ENTEGRE	7.5	48.0	24.05.2006	Balikesir
394	HE	BEREKET (GÖKYAR)	11.6	23.0	05.05.2006	Mugla
395	NG	SÖNMEZ ELEKTRİK	17.460	134.5	03.05.2006	Usak
396	NG	ELSE TEKSTİL	3.2	25.0	15.04.2006	Tekirdag
397	NG	ENTEK (Köseköy) İztek	47.620	379.2	14.04.2006	Kocaeli
398	NG	MARMARA PAMUK	8.73	67.9	13.04.2006	Tekirdag
399	NG	NUH ENERJİ (ENER SANT.2)	26.080	195.6	02.03.2006	Kocaeli

400	HE	ŞANLI URFA	51.0	85.0	01.03.2006	Sanliurfa
401	NG	AYDIN ÖRME	7.5	60.0	25.02.2006	Sakarya
402	NG	ALTEK ALARKO	21.890	151.4	23.02.2006	Kirklareli
403	NG	ERAK GİYİM	1.4	12.0	22.02.2006	Tekirdag
404	NG	EKOTEN TEKSTİL	1.9	15.0	16.02.2006	Izmir
405	NG	BOSEN (Bursa San.)	51.02	383.0	30.12.2005	Bursa
406	FO	KARKEY (SİLOPİ)	6.750	43.8	23.12.2005	Sirnak
407	NT	MENDERES TEKS. (AKÇA ENERJİ)	8.73	63.9	14.12.2005	Denizli
408	IC	KAHRAMANMARAŞ KAĞIT	6.0	45.0	08.12.2005	K.Maras
409	NG	PAKGIDA (Kemalpaşa)	5.7	43.0	07.12.2005	Izmir
410	NG	KORUMA KLOR	9.6	77.0	03.12.2005	Kocaeli
411	IC	İÇDAŞ ÇELİK	135.000	961.7	30.11.2005	Canakkale
412	NG	KÜÇÜKÇALIK TEKSTİL	8.0	64.0	27.11.2005	Bursa
413	NG	ZORLU ENERJİ (Yalova)	15.9	122.0	26.11.2005	Yalova
414	NG	HABAŞ (Aliağa)	23.000	184.0	24.11.2005	Izmir
415	NG	GRANİSER GRANİT	5.5	42.0	14.11.2005	Manisa
416	NG	MANİSA O.S.B.	84.834	634.7	11.11.2005	Manisa
417	NG	AK ENERJİ (Kemalpaşa)	40.0	328.3	09.11.2005	Izmir
418	NG	ZORLU ENERJİ (Kayseri)	38.630	294.9	26.10.2005	Kayseri
419	NG	ALTEK ALARKO	60.100	415.6	14.10.2005	Kirklareli
420	NG	HABAŞ (Aliağa)	44.615	357.0	21.09.2005	Izmir
421	NG	EVYAP	5.1	30.0	27.08.2005	Istanbul
422	NG	ÇEBİ ENERJİ	21.000	164.8	27.08.2005	Tekirdag
423	NG	CAN ENERJİ	3.900	22.7	25.08.2005	Tekirdag
424	NG	NOREN ENERJİ	8.7	70.0	24.08.2005	Nigde
425	NG	ÇEBİ ENERJİ	43.366	340.2	23.08.2005	Tekirdag
426	HE	YAMULA	100.0	422.0	30.07.2005	Kayseri
427	NG	ZORLU ENERJİ (Kayseri)	149.871	1,144.1	22.07.2005	Kayseri
428	BG	BANDIRMA ASİT(ETİ MADEN)	11.5	88.0	15.07.2005	Balikesir
429	HE	BEREKET (DALAMAN)	7.5	35.8	15.07.2005	Mugla
430	NG	ZEYNEP GİYİM	1.2	9.0	07.07.2005	Tekirdag
431	FO	KARKEY (SİLOPİ)	6.150	39.9	30.06.2005	Sirnak
432	NG	AKBAŞLAR	5.04	38.25	24.06.2005	Bursa
433	NG	MODERN ENERJİ	10.240	72.0	13.06.2005	Tekirdag
434	HE	MURATLI	115.0	253.0	02.06.2005	Artvin
435	NG	HABAŞ (Aliağa)	44.615	357.0	02.06.2005	Izmir
436	NG	TEZCAN GALVANİZ GR I-II	3.5	28.0	27.05.2005	Kocaeli
437	NG	HAYAT KAĞIT SAN.	7.2	56.0	27.05.2005	Corum
438	NG	YONGAPAN (Kastamonu)	5.20	37.8	25.05.2005	Kocaeli
439	NG	NUH ENERJİ (ENER SANT.2)	46.950	352.2	24.05.2005	Kocaeli
440	HE	İÇTAŞ YUKARI MERCAN	14.2	20.0	21.05.2005	Erzincan
441	NG	AK ENERJİ (Kemalpaşa)	87.2	715.7	30.04.2005	Izmir
442	WD	SUNJÜT	1.2	2.0	22.04.2005	Istanbul
443	NG	KAREGE ARGES	17.460	138.9	07.04.2005	Izmir
444	NG	BİS ENERJİ (Bursa San.)	43.7	329.2	18.03.2005	Bursa
445	LN	ÇAN 1-2	160.0	1,040.0	15.03.2005	Canakkale
446	LN	ÇAN 1-2	160.0	1,040.0	15.02.2005	Canakkale
447	LN	ELBİSTAN B 1-4	360.0	2,207.5	15.02.2005	K.Maras

448	NG	ENTEK (KOÇ Üniversite)	2.3	19.0	07.02.2005	Istanbul
449	NG	BAYDEMİRLER (Beylikdüzü)	6.210	51.5	04.02.2005	Istanbul
450	NG	MERCEDES BENZ	8.3	68.0	04.02.2005	Istanbul
451	NG	GLOBAL ENERJİ (PELİTLİK)	11.748	88.0	29.01.2005	Tekirdag
452	NG	GLOBAL ENERJİ (HACIŞİRAHMET)	7.8	58.0	29.01.2005	Tekirdag
453	FO	TÜPRAŞ (Batman)	1.5	10.5	31.12.2004	Batman
454	NG	BAHARİYE MENSUCAT	1.0	7.0	31.12.2004	Istanbul
455	NG	ALTINMARKA	3.6	28.1	17.12.2004	Istanbul
456	FO	KARKEY (SİLOPİ)	54.300	351.9	12.11.2004	Sirnak
457	NG	STANDARD PROFİL	6.7	49.0	22.10.2004	Duzce
458	NG	HABAŞ (Aliağa)	89.230	714.0	08.10.2004	Izmir
459	NG	AYEN OSTİM	9.890	84.0	01.10.2004	Ankara
460	NG	KOMBASSAN AMBALAJ (Konya)	5.5	40.0	24.09.2004	Konya
461	HE	BEREKET (FESLEK)	9.5	25.0	05.08.2004	Aydin
462	NG	ÇELİK ENERJİ (Uzunçiftlik)	2.4	19.0	09.07.2004	Kocaeli
463	NG	BERK ENERJİ (BESLER -KURTKÖY)	4.4	30.9	07.07.2004	Istanbul
464	NG	ŞAHİNLER ENERJİ(ÇORLU/TEKİRDAĞ)	3.200	22.8	29.06.2004	Tekirdag
465	NG	ENERJİ-SA (Adana)	49.770	350.6	23.06.2004	Adana
466	NG	BİS ENERJİ (Bursa San.)	73.0	549.9	16.06.2004	Bursa
467	NG	AYEN OSTİM	31.077	264.0	11.06.2004	Ankara
468	NG	KOMBASSAN AMBALAJ (Tekirdağ)	5.5	38.0	09.06.2004	Tekirdag
469	NG	TEKBOY TEKSTİL	2.2	16.0	18.05.2004	Kirklareli
470	IC	ÇOLAKOĞLU-2	45.0	337.5	05.05.2004	Kocaeli
471	HE	İŞKUR (SÜLEYMANLI HES)	4.6	4.0	28.04.2004	K.Maras
472	HE	ELTA (DODURGA)	4.1	12.0	26.04.2004	Denizli
473	LPG	ETİ BOR (EMET)	10.4	77.5	22.04.2004	Kutahya
474	NG	TANRIVERDİ	4.7	38.7	24.03.2004	Tekirdag
475	HE	ENERJİ-SA BİRKAPILI	48.5	17.0	11.03.2004	Mersin
476	NG	ATATEKS	5.6	45.0	20.02.2004	Tekirdag
477	NG	ENTEK (Demirtaş)	31.132	234.7	12.02.2004	Bursa
478	NG	ANKARA	798.0	5,209.0	08.01.2004	Ankara
479	NG	ECZACIBAŞI BAXTER	1.0	6.0	31.12.2003	Istanbul
480	NG	SÖNMEZ FLAMENT	4.1	29.0	31.12.2003	Bursa
481	IC	İSKENDERUN	1,320.0	7,706.0	22.11.2003	Hatay
482	NG	ENERJİ-SA (Mersin)	21.575	177.4	22.11.2003	Mersin
483	HE	BATMAN	198.5	200.0	14.11.2003	Batman
484	NG	ENERJİ-SA (Çanakkale)	21.575	175.0	12.11.2003	Canakkale
485	NG	BATIÇİM EN.	14.50	119.3	26.10.2003	Izmir
486	HE	PAMUK (Toroslar)	23.3	28.0	18.10.2003	Mersin
487	HE	MERCAN ZORLU	19.100	45.0	08.10.2003	Tunceli
488	NG	ENERJİ-SA (Mersin)	41.650	342.6	05.10.2003	Mersin
489	HE	KÜRTÜN	85.0	140.0	26.09.2003	Gumushane
490	FO	ANADOLU EFES BİRA I	3.8	32.0	05.09.2003	Ankara
491	NG	ZORLU ENERJİ (Sincan)	10.66	90.8	18.07.2003	Ankara
492	NG	BAYDEMİRLER (Beylikdüzü)	2.066	17.1	11.07.2003	Istanbul
493	NG	TÜBAŞ	1.4	8.6	11.07.2003	Tekirdag
494	NG	PAKGIDA (Düzce-Köseköy)	2.1	16.8	02.07.2003	Duzce
495	NG	ÖZAKIM ENERJİ (Gürsu)	7.0	60.0	19.06.2003	Bursa

496	NG	KEN KİPAŞ (KAREN)ELEKTRİK	24.340	104.8	14.06.2003	K.Maras
497	HE	YAPISAN HACILAR DARENDE	13.3	54.0	14.06.2003	Malatya
498	NG	ZORLU ENERJİ (Sincan)	39.70	338.2	31.05.2003	Ankara
499	NG	CAN TEKSTİL (Çorlu)	0.900	6.9	17.05.2003	Tekirdag
500	NG	YURTBAY (Eskişehir)	6.9	50.0	16.05.2003	Eskisehir
501	NT	ALKİM KAĞIT	3.385	26.7	03.05.2003	Afyonkarahisar
502	NG	İZMİR	1,590.7	10,780.0	28.03.2003	Izmir
503	NG	BATIÇİM EN.	25.40	208.9	13.03.2003	Izmir
504	NG	HAYAT KİMYA (İzmit)	5.2	32.0	11.03.2003	Kocaeli
505	FO	ALİAĞA PETKİM	21.7	151.9	24.02.2003	Izmir
506	HE	EŞEN-II (GÖLTAŞ)	21.7	40.0	31.01.2003	Mugla
507	NG	BATIÇİM EN.	5.08	41.8	27.01.2003	Izmir
508	LN	ETİ MADEN (BANDIRMA BORAKS)	10.7	78.0	10.01.2003	Balikesir
509	NG	BURSA D.GAZ	1,432.0	1,051.0	01.01.1998	Bursa
510	DO	VAN ENGİL GAZ (ZORLU ENERJİ)	15.0	75.0	01.01.1996	Van
511	LN	KEMERKÖY	630.0	3,311.0	01.01.1993	Mugla
512	LN	ORHANELİ	210.0	1,288.0	01.01.1992	Bursa
513	HC	ÇATALAĞZI-B	300.0	1,721.0	01.01.1989	Zonguldak
514	LN	KANGAL	457.0	2,802.0	01.01.1989	Sivas
515	NG	AMBARLI-D.GAZ	1,350.9	9,000.0	01.01.1988	Istanbul
516	LN	ÇAYIRHAN PARK HOLD.	620.0	3,640.0	01.01.1987	Ankara
517	LN	YENİKÖY	420.0	2,730.0	01.01.1986	Mugla
518	NG	HAMİTABAT	1,156.0	7,653.0	01.01.1985	Kirklareli
519	LN	DENİZLİ JEOTERMAL (Zorlu)	15.0	105.0	01.01.1984	Denizli
520	LN	ELBİSTAN A	1,355.0	4,150.0	01.01.1984	K.Maras
521	LN	YATAĞAN	630.0	3,679.0	01.01.1982	Mugla
522	LN	SOMA B	990.0	5,125.0	01.01.1981	Manisa
523	NG	ALİAĞA-ÇEVRİM	180.0	9,267.0	01.01.1975	Izmir
524	FO	HOPA	50.0	325.0	01.01.1973	Artvin
525	LN	SEYİTÖMER	600.0	3,679.0	01.01.1973	Kütahya
526	FO	AMBARLI	630.0	2,145.0	01.01.1967	Istanbul
527	LN	SOMA A	44.0	0.0	01.01.1957	Manisa
528	HE	BİLGİN ELEK. (HAZAR 1-2)	30.1	0.0	01.01.1957	Elazig
529	LN	TUNÇBİLEK	365.0	2,078.0	01.01.1956	Kütahya
530	DO	HAKKARİ ÇUKURCA	1.0	0.0		Hakkari
531	HE	ADIGÜZEL	62.0	80.0		Denizli
532	HE	ALMUS	27.0	30.0		Tokat
533	HE	ALTINKAYA	702.6	740.0		Samsun
534	HE	ASLANTAŞ	138.0	320.0		Osmaniye
535	HE	ATATÜRK	2,405.0	5,230.0		Sanliurfa
536	HE	BERDAN	10.2	15.0		Mersin
537	HE	ÇATALAN	168.9	330.0		Adana
538	HE	ÇAMLIGÖZE	32.0	68.0		Sivas
539	HE	DEMİRKÖPRÜ	69.0	32.0		Manisa
540	HE	DERBENT	56.4	150.0		Samsun
541	HE	DİCLE	110.0	220.0		Diyarbakir
542	HE	DOĞANKENT	74.5	200.0		Giresun
543	HE	GEZENDE	159.4	130.0		Mersin

544	HE	GÖKÇEKAYA	278.4	240.0		Eskisehir
545	HE	HASAN UĞURLU	500.0	820.0		Samsun
546	HE	HASANLAR	9.4	9.0		Bolu
547	HE	HİRFANLI	128.0	140.0		Kirsehir
548	HE	KAPULUKAYA	54.0	120.0		Kirikkale
549	HE	KARACAÖREN-1	32.0	60.0		Burdur
550	HE	KARAKAYA	1,800.0	5,310.0		Diyarbakir
551	HE	KARKAMIŞ	189.0	320.0		Gaziantep
552	HE	KEBAN	1,330.0	4,120.0		Elazig
553	HE	KEMER	48.0	45.0		Aydin
554	HE	KESİKKÖPRÜ	76.0	80.0		Ankara
555	HE	KILIÇKAYA	120.0	277.0		Sivas
556	HE	KÖKLÜCE	90.0	300.0		Tokat
557	HE	KRALKIZI	94.5	90.0		Diyarbakir
558	HE	KISIK	9.3	20.0		K.Maras
559	HE	MENZELET	124.0	360.0		K.Maras
560	HE	ÖZLÜCE	170.0	290.0		Elazig
561	HE	SARIYAR	160.0	180.0		Ankara
562	HE	SUAT UĞURLU	69.0	250.0		Samsun
563	HE	TORTUM	26.2	85.0		Erzurum
564	HE	YENİCE	37.9	50.0		Ankara
565	HE	BERKE	510.0	790.0		Osmaniye
566	HE	SEYHAN I	60.0	212.0		Adana
567	HE	SEYHAN II	7.5	7.0		Adana
568	HE	SIR	283.5	500.0		K.Maras
569	HE	KARACAÖREN II	46.4	90.0		Burdur
570	HE	MANAVGAT	48.0	110.0		Antalya
571	HE	KADINCIK I	70.0	180.0		Mersin
572	HE	KADINCIK II	56.0	165.0		Mersin
573	HE	YÜREĞİR	6.0	4.0		Adana
574	HE	KEPEZ I-II	32.4	55.0		Antalya
575	HE	OTHERS	45.0	100.0		
576	HE	ADİLCEVAZ(MOSTAR EN.)	0.4	1.0		Bitlis
577	HE	AHLAT(MOSTAR EN.)	0.2	1.0		Bitlis
578	HE	ATAKÖY(ZORLU)	5.5	11.0		Tokat
579	HE	BAYBURT(BOYDAK EN.)	0.4	2.0		Bayburt
580	HE	BESNİ(KAYSERİ VE CİVARI EN.ÜR.)	0.3	0.0		Adiyaman
581	HE	BEYKÖY(ZORLU)	16.8	87.0		Eskisehir
582	HE	BÜNYAN(KAYSERİ VE CİVARI)	1.2	3.0		Kayseri
583	HE	ÇAĞ-ÇAĞ(NAS EN.)	14.4	22.0		Mardin
584	HE	ÇAMARDI(KAYSERİ VE CİVARI EN.ÜR.)	0.1	0.0		Nigde
585	HE	ÇEMİŞKEZEK(BOYDAK EN.)	0.1	1.0		Tunceli
586	HE	ÇILDIR ZORLU	15.4	20.0		Kars
587	HE	DEĞİRMENDERE(KA-FNIH EL.)	0.5	1.0		Osmaniye
588	HE	DERME(KAYSERİ VE CİVARI EN.ÜR.)	4.5	7.0		Malatya
589	HE	ERKENEK(KAYSERİ VE CİVARI EN.ÜR.)	0.3	1.0		Malatya

590	HE	GİRLEVİK(BOYDAK EN.)	3.0	19.0		Erzincan
591	HE	HAKKARİ (OTLUCA)((NAS EN.)	1.3	5.0		Hakkari
592	HE	İKİZDERE ZORLU	18.6	100.0		Rize
593	HE	İNEGÖL(CERRAH)(KENT SOLAR EL.)	0.3	1.0		Bursa
594	HE	İZNİK (DEREKÖY)(KENT SOLAR EL.)	0.2	1.0		Bursa
595	HE	KARAÇAY(OSMANİYE)(KA-FNIH EL.)	0.4	2.0		Osmaniye
596	HE	KAYADİBİ(BARTIN)(İVME ELEKTROMEKANİK	0.5	2.0		Bartin
597	HE	KERNEK(KAYSERİ VE CİVARI EN.ÜR.)	0.8	1.0		Malatya
598	HE	KOVADA-I(BATIÇİM EN.)	8.3	2.0		Isparta
599	HE	KOVADA-II(BATIÇİM EN.)	51.2	24.0		Isparta
600	HE	KUZGUN ZORLU	20.9	0.0		Erzurum
601	HE	KUZUCULU (DÖRTYOL)(KA-FNIH EL.)	0.3	1.0		Hatay
602	HE	M.KEMALPAŞA(SUUÇTU)(KENT SOLAR EL.)	0.5	1.0		Bursa
603	HE	MALAZGİRT(MOSTAR EN.)	1.2	3.0		Mus
604	HE	PINARBAŞI(KAYSERİ VE CİVARI EN.ÜR.)	0.1	0.0		Kayseri
605	HE	SIZIR(KAYSERİ VE CİVARI EN.ÜR.)	5.8	35.0		Kayseri
606	HE	TERCAN ZORLU	15.0	28.0		Erzincan
607	HE	TURUNÇOVA(FİNİKE)(TURUNÇOVA EL.)	0.5	1.0		Antalya
608	HE	ULUDERE(NAS EN.)	0.6	3.0		Sirnak
609	HE	VARTO(MOSTAR EN.)	0.3	1.0		Mus
610	NG	GEBZE D.GAZ	1,595.4	10,951.0		Sakarya
611	NG	ADAPAZARI	797.7	5,473.0		Sakarya
612	NG	TRAKYA ELEKTRİK ENRON	498.7	3,797.0		Tekirdag
613	NG	ESENYURT (DOĞA)	188.5	1,400.0		Istanbul
614	NG	OVA ELEK.	258.4	2,019.0		Kocaeli
615	NG	UNİMAR	504.0	3,797.0		Tekirdag
616	HE	BİRECİK	672.0	2,092.0		Sanliurfa
617	HE	AHİKÖY I-II	4.2	21.0		Sivas
618	HE	AKSU (ÇAYKÖY)	16.0	35.0		Burdur
619	HE	ÇAL (LİMAK) (Denizli)	2.5	12.0		Denizli
620	HE	ÇAMLICA (AYEN ENERJİ)	84.0	429.0		Kayseri
621	HE	DİNAR-II (METAK)	3.0	16.0		Afyonkarahisar
622	HE	FETHİYE	16.5	89.0		Mugla
623	HE	GAZİLER (Iğdır)	11.2	48.0		Igdir
624	HE	GİRLEVİK-II / MERCAN	11.0	39.0		Erzincan
625	HE	GÖNEN	10.6	47.0		Balıkesir
626	HE	SUÇATI (ERE EN.)	7.0	28.0		K.Maras
627	HE	SÜTCÜLER	2.3	13.0		Isparta
628	HE	TOHMA MEDİK (ALARKO)	12.5	59.0		Malatya
629	WD	ARES (ALAÇATI)	7.2	19.0		Izmir
630	WD	BORES (BOZCAADA)	10.2	31.0		Canakkale
631	FO	AKSU SEKA (MİLDA KAĞIT)	8.0	20.0		Giresun

632	FO	ALİAĞA PETKİM	148.3	1,038.1		Izmir
633	FO	ALBAYRAK TURİZM(BALIKESİR SEKA)	9.3	56.0		Balikesir
634	FO	BOR ŞEKER	9.6	6.0		Nigde
635	FO	OYKA KAĞ.(CAYCUMA SEKA)	10.0	70.0		Zonguldak
636	FO	ERDEMİR	73.5	478.8		Zonguldak
637	FO	HALKALI KAĞIT	5.1	39.0		Istanbul
638	FO	MED UNİON A.Ş. (EBSO)	3.4	27.0		Izmir
639	FO	MOPAK (Dalaman)	26.2	106.0		Mugla
640	FO	S.ŞEHİR (ETİ) ALÜMİNYUM	11.9	35.0		Konya
641	FO	TÜPRAŞ İZMİR (ALİAĞA RAF.)	44.0	306.0		Izmir
642	FO	TÜPRAŞ (İzmit-Yarımca)	45.0	291.2		Kocaeli
643	FO	TÜPRAŞ (Batman)	8.8	61.5		Batman
644	FO	TİRE-KUTSAN (Tire)	8.0	37.0		Izmir
645	FO	OTHERS (Isolated)	96.0	300.0		
646	DO	TÜPRAŞ (Batman)	10.3	72.0		Batman
647	DO	OTHERS	0.1	1.0		
648	IC	ÇOLAKOĞLU-2	145.0	1,087.5		Kocaeli
649	HC	İSDEMİR	220.4	772.0		Hatay
650	HC	KARDEMİR	35.0	300.0		Zonguldak
651	LN	ALKİM (ALKALİ KİMYA) (Dazkırı)	2.5	17.0		Afyonkarahisar
652	LN	PETLAS	6.0	40.0		Kirsehir
653	LN	MARMARA KAĞIT (Bilorsa)	2.0	9.0		Bilecik
654	LN	OTHERS	147.5	285.0		
655	LPG	ETİ BOR (EMET)	0.6	4.5		Kutahya
656	LPG	GOODYEAR (Adapazarı)	9.6	79.0		Sakarya
657	LPG	MOPAK KAĞIT (Işıklar)	4.6	33.0		Izmir
658	LPG	ORTA ANADOLU MENSUCAT	10.0	65.0		Kayseri
659	NT	MENDERES TEKS. (AKÇA ENERJİ)	10.40	76.1		Denizli
660	NT	ALKİM KAĞIT	1.815	14.3		Afyonkarahisar
661	NT	DENTAŞ (Denizli)	5.0	38.0		Denizli
662	NT	MENSA MENSUCAT	10.4	85.0		Adana
663	NT	TOROS (Ceyhan)	4.7	38.0		Adana
664	NT	TOROS (Mersin)	12.1	96.0		Mersin
665	NG	AKIN ENERJİ (B.Karıştıran)	4.9	37.0		Kirklareli
666	NG	ARÇELİK (Eskişehir)	6.3	49.0		Eskisehir
667	NG	ARÇELİK (Çayırova)	6.5	48.0		Kocaeli
668	NG	ATLAS HALICILIK (Çorlu)	1.0	7.0		Tekirdag
669	NG	BAYDEMİRLER (Beylikdüzü)	1.000	8.3		Istanbul
670	NG	CAN TEKSTİL (Çorlu)	4.300	33.0		Tekirdag
671	NG	ÇOLAKOĞLU-1	123.4	1,047.0		Kocaeli
672	NG	DOĞUŞ (B.Karıştıran)	1.0	8.0		Tekirdag
673	NG	EGE SERAMİK	13.1	90.0		Izmir
674	NG	GÜLLE ENTEGRE (Çorlu)	6.300	29.0		Tekirdag
675	NG	İGSAŞ (Yarımca)	11.0	76.0		Kocaeli
676	NG	SANKO (İSKO) (İnegöl)	9.2	63.0		Bursa
677	NG	KALESERAMİK (Çan Seramik+Kalebodur)	21.6	157.0		Canakkale
678	NG	KARTONSAN (İzmit)	24.0	192.0		Kocaeli

679	NG	NUR YILDIZ (GEM-TA)*	1.4	7.0		Tekirdag
680	NG	PİSA TEKSTİL SAN.A.Ş.(İSTANBUL)	1.0	7.0		Istanbul
681	NG	SARKUYSAN (Tuzla)	7.7	60.0		Kocaeli
682	NG	SAMUR HALI A.Ş.	4.3	33.0		Ankara
683	NG	TERMAL SERAMİK (Söğüt)	4.6	34.2		Bilecik
684	NG	TRAKYA İPLİK (Çerkezköy)	4.2	29.0		Tekirdag
685	NG	YILFERT (TÜGSAŞ GEMLİK GÜB.)	8.0	50.0		Bursa
686	NG	TÜP MERSERİZE (B.Karıştıran)	1.0	7.0		Tekirdag
687	NG	YILDIZ SUNTA (Köseköy)	5.2	33.7		Kocaeli
688	NG	YONGAPAN (Kastamonu)	5.20	37.8		Kocaeli
689	NG	OTHERS	88.5	296.0		
690	BG	BELKA (Ankara)	3.2	22.0		Ankara
691	BG	KEMERBURGAZ	4.0	7.0		Istanbul
692	BG	BANDIRMA BAĞFAŞ	10.0	57.0		Balikesir
693	HE	OYMAPINAR (ETİ ALİMİNYUM)	540.0	1,170.0		Antalya
694	HE	BAĞCI SU ÜRÜNLERİ	0.3	1.7		Mugla
695	HE	MOLU	3.4	10.6		Kayseri
696	HE	YEŞİLLİLER (Kırşehir)	0.5	1.0		Kirsehir
697	NT	ATAER ENERJİ (EBSO)	70.200	398.1		Izmir
698	NG	AK ENERJİ (Bozüyük)	126.6	817.0		Bilecik
699	NG	AK ENERJİ (Çerkezköy)	98.0	805.0		Tekirdag
700	NG	ARENKO ELEKTRİK DENİZLİ	12.0	84.0		Denizli
701	NG	AKIM EN. BAŞPINAR(SÜPER FİLM)G.ANTEP	25.3	177.0		Gaziantep
702	NG	AKSA AKRİLİK KİMYA (YALOVA)	42.5	298.0		Yalova
703	NG	BERK ENERJİ (BESLER -KURTKÖY)	10.4	73.1		Istanbul
704	NG	BİS ENERJİ (Bursa San.)	174.0	1,310.7		Bursa
705	NG	BOSEN (Bursa San.)	80.00	600.5		Bursa
706	NG	BİL ENERJİ (Ankara)	36.6	255.0		Ankara
707	NG	CAM İŞ ELEKTRİK (B.Karıştıran)	32.9	270.0		Kirklareli
708	NG	CENGİZ ENERJİ ÇİFT YAK.	131.3	985.0		Samsun
709	NG	DESA ENERJİ	9.8	70.0		Izmir
710	NG	ENERJİ-SA (Adana)	80.400	566.4		Adana
711	NG	ENERJİ-SA (Çanakkale)	42.525	345.0		Canakkale
712	NG	ENERJİ-SA (Kentsa) Köseköy	120.0	930.0		Kocaeli
713	NG	ENTEK (Köseköy) İztek	60.100	478.5		Kocaeli
714	NG	ENTEK (Demirtaş)	104.000	784.2		Bursa
715	NG	MAKSİ ENERJİ	7.7	55.0		Istanbul
716	NG	MODERN ENERJİ	77.000	541.1		Tekirdag
717	NG	NUH ENERJİ 1 (Nuh Çimento)	38.0	326.0		Kocaeli
718	NG	SAMSUN TEKKEKÖY (AKSA EN.)	131.3	980.0		Samsun
719	NG	ŞAHİNLER ENERJİ(ÇORLU/TEKİRDAĞ)	22.800	162.2		Tekirdag
720	NG	YENİ UŞAK ENERJİ	8.70	63.7		Usak
721	NG	ZORLU ENERJİ (Bursa)	90.0	752.0		Bursa
722	NG	ZORLU ENERJİ (B.Karıştıran)	65.80	493.6		Kirklareli
723	NG	ESKİŞEHİR ENDÜSTRİ ENERJİ(OSB)	59.0	452.0		Eskisehir
724	WS	İZAYDAŞ (İzmit çöp)	5.20	34.8		Kocaeli

725	FO	AKSA ENERJİ (Hakkari)	24.0	175.0		Hakkari
726	FO	HABAŞ (Bilecik)	18.0	144.0		Bilecik
727	FO	HABAŞ (İzmir)	36.0	288.0		Izmir
728	FO	KIZILTEPE	33.0	250.0		Mardin
729	FO	PS3-1 (SİLOPİ)	44.100	285.8		Sirnak
730	FO	PS3-2 (SİLOPİ)	29.500	191.2		Sirnak
731	FO	PS3-A -1	11.0	80.0		Sirnak
732	FO	PS3-A -2 (İDİL)	24.0	180.0		Sirnak
733	FO	SİİRT	24.0	190.0		Siirt
734	HE	BEREKET HES (DENİZLİ)	3.7	12.0		Denizli
735	HE	BEREKET (DALAMAN)	30.0	143.2		Mugla
736	HE	EŞEN-II (GÖLTAŞ)	21.7	40.0		Mugla
737	HE	KAREL (PAMUKOVA)	9.3	55.0		Sakarya
738	HE	MURGUL BAKIR	4.700	7.5		Artvin
739	WD	ALİZE ENERJİ (DELTA PLASTİK)	1.5	4.0		Izmir
TOTAL			**52,154.4**	**264,143.3**		
				52,828.7	**20%**	

AEG_{total}	**264,143,328**	MWh
$AEG_{SET-=20\ per\ cent}$	**52,828,666**	MWh

Abbreviations: AS: Asphaltite, BG: Biogas, DO: Diesel Oil, FO: Fuel Oil, GT: Geothermal, HC: Hard Coal, HE: Hydroelectric, IC: Imported Coal, LN: Lignite, LPG: Liquefied Petroleum Gas, NG: Natural Gas, NT: Naphta, WD. Wind, WS: Waste