DAGBASI HYDROELECTRIC POWER PLANT

Document Prepared By Kilittasi Engineering Consulting & Construction Co. Ltd.

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Abbreviations

BE	Baseline Emission
BM	Build Margin
CDM	Clean Development Mechanism
CO	Combined Margin
DSI	General Directorate of State Hydraulics Works of the Government of Turkey
EF	Emission Factor
EG	Energy Generation
EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
EUAS	Electricity Generation Incorporation
FC	Fuel Consumption
GHG	Greenhouse Gas
HEPP	Hydroelectric Power Plant
IRR	Internal Rate of Return
OM	Operating Margin
HEPP	Hydroelectric Power Plant
IPCC	Intergovernmental Panel on Climate Change
J	Joule
LSC	Local Stakeholder Consultation
N/A	Not Applicable
NCV	Net Calorific Value
PE	Project Emission
UNFCC	United Nations Framework on Climate Change
T	Ton
TEIAS	Turkish Electricity Transmission Incorporation
VER	Voluntary Emission Reduction
WEPM	Wind Energy Potential Map

1 PROJECT DETAILS

1.1 Summary Description of the Project

Dagbasi Hydroelectric Power Plant (HEPP) (in the following: Project, Dagbasi HEPP) is a run-of river type power generating plant that will be constructed on the Sugozu Stream between the elevations of 510 m and 383.5 m. Project site is located in Province of Mersin, Anamur district in the Mediterranean Region. Sugozu Stream is a side branch of the Anamur River, which is also known as Dragon River. Project investor is a private enterprise, ALPEREN Elektrik Üretim A.S. (in the following: ALPEREN).[1]

Dagbasi HEPP project received a 49-year production license from the Energy Market Regulatory Authority of Turkey (EMRA)[2] on 12 May 2011.[3] Water use agreement was signed between ALPEREN and the Directorate of Hydraulic Resources (DSI)[4] of the Government of Turkey. On 12 January 2011, project received an "Environmental Impact Assessment Not Required" statement from the Ministry of Forestry and Environment[5] following the preparation of a "Project Introduction File" in compliance with the Turkish Environmental Impact Assessment Law.

Dagbasi HEPP project will have a weir on the Sugozu stream on 510 m elevation that will divert water to conveyance channel. Dimensions of the weir will be 7.0 m height and 25 m length, which will not reserve water. There will be a settling basin at the end of the conveyance channel. Water will flow to settling basin through conveyance channel. The purpose of settling basin is to remove the particles present in the river water. From the settling basin, water will flow to Head Pond, regulating water before being taken into the Energy Tunnel. Water flowing trough Energy Tunnel will be taken into the Power House where water will be turbined by three units of horizontal axis Francis turbines.

Each turbine will have an installed capacity of 3.58533 MW (3.47766 MWe).[6] Total installed capacity of the project will be 10.756 MW (10.433 MWe).[7] As per the UNFCC CDM EB61 Annex

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[1] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 1, pp.3.

[2] Enerji Piyasası Düzenleme Kurulu –EPDK (in Turkish). http://www.epdk.gov.tr

[3] Dagbasi HEPP Water Usage and Operation Agreement dated 17 March 2011.

[4] Devlet Su İşleri-DSİ (in Turkish). http://www.dsi.gov.tr/

[5] Title of theMinistry of Forestry and Environment is changed to Ministry of Environment and Urbanization in 2012.

[6] During the feasibility stage of the project, two units of Francis turbines were decided to be installed (Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 1, pp.7). However, it was, later, realized that installing three units of Francis turbines instead of two will be more feasible operationally. Therefore, in reality three units of Francies turbines will be installed unlike what is stated in the Feasibility Report. About this issue DSI has sent an official letter to EPDK, explaining the change in the number of turbines (DSI Letter to EPDK with the number of B.23.1DSI.0.20.02.00-118-193269 and dated 9 May 2012. Upon that EPDK revised the Dagbasi HEPP Generation License accordingly on 11 July 2012.

[7] Dagbasi HEPP Electricity Generation License authorized by EMRA with the number of EU/3210-4/1941 dated 12 May 2011.

21, project capacity should be lower than 15 MW. Project maximum generator output capacity is 3.410 MW per unit, in total which is equal to 10.230 MW (3.410x3 unit).[8]

Generated energy will be transmitted to the Otluca HEPP via a 4 km of transmission line. Otluca HEPP will be the connection point of the project activity to the Turkish National Grid System. Project is expected to generate 38.446 GWh amount of energy per year.[9]

Project will have a tunnel to access to the power house and weir.

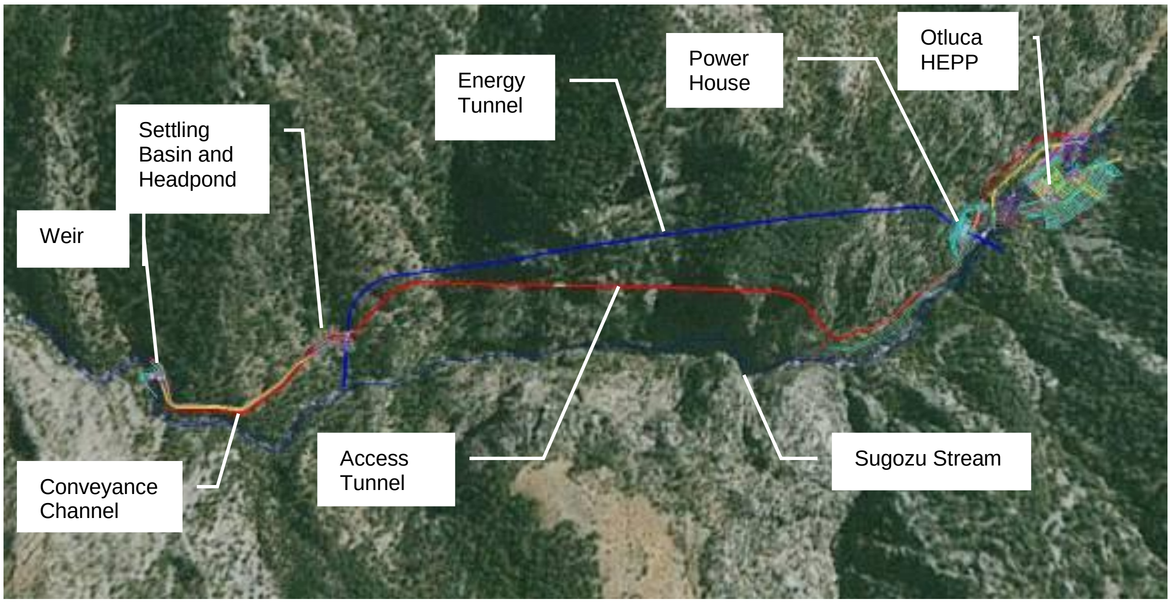

Figure 1: Dagbasi HEPP Project Units

Dagbasi HEPP, as a renewable type energy generation project, will contribute to global CO2 emission reductions efforts. Project will replace the same amount of CO2 emissions which would have been, otherwise, released by fossil fired power plants. Annually, Dagbasi HEPP is expected to generate 20 370 tCO2 amount of emission reduction annually.

In addition to being environmentally friendly, project will have social benefits to local life, creating direct and indirect employment opportunities in the region. Temporary jobs will be available for the local people living in the nearest villages. In addition to that, some materials will be purchased from local market providing an income for the community as well.

1.2 Sectoral Scope and Project Type

According to UNFCCC sectoral scopes definition for Clean Development Mechanism (CDM) projects, Dagbasi HEPP falls under the category of Sectoral Scope 1, Energy Industries (renewable - / non-renewable sources).

[8] Please see the Turbine Generation Agreement between Wasserkraft GmbH&Co KG and : Alperen Elektrik Uretim A.S. pp.3. Turbines will be manufactured based on this agreement which means that Dagbasi HEPP generators will have maximum capacity output of 3.410 MW per generator unit.

[9] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 1, pp.3-4.

Project is a single greenfield investment, not a part of a project group or bundle.

No public funding and no Official Development Aid finance are used for the Project.

1.3 Project Proponent

Organization name	ALPEREN Elektrik Uretim A.S.
Contact person	Mr. Ali Ugur Pabuccu
Title	*Energy Projects Coordinator*
Address	Shell Acemogullari Petrol - Egemenlik Mah. Dogu Cevre Yolu. No:2 Merkez/Kahramanmaras-TURKEY
Telephone	Tel: +90 344 235 14 59 - Fax:+90 344 235 14 69
Email	ugur@balsuyu.com

Mr. Pabuccu is coordinating the construction and operation of the Dagbasi HEPP project. He is also responsible for the implementation of the Dagbasi HEPP Monitoring Plan for Verified Carbon Standard (VCS) verification.

ALPEREN Elektrik Uretim A.S. is the owner of the carbon credits.

1.4 Other Entities Involved in the Project

Kilittasi Engineering Consulting & Construction Co. (in the following: Kilittasi Eng.) is providing consulting services for the development of the carbon asset for the Dagbasi HEPP.

Organization name	Kilittasi Engineering Consulting & Construction Co.
Role in the project	Consulting services for the development of the carbon asset for the Dagbasi HEPP
Contact person	Incigul Polat Erdogan
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1.5 Project Start Date

Commissioning date: 11.04.2014

1.6 Project Crediting Period

- Crediting period start date : 11.04.2014
- Crediting period end date : 11.04.2024
- VCS project crediting period : 10 years 0 month, renewable twice

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Dagbasi HEPP is a small-scale renewable type energy generation project with an installed capacity of 10.433 MWe (10.756 MW); and it will, in the future, remain below the eligibility limit of 15 MW for renewable type small-scale CDM projects as well. Project's annual electricity generation is 38.446 GWh.

Project	X
Mega-project	

Years	Estimated GHG emission reductions or removals (tCO2e)
11.04.2014-31.12.2014	14 734
2015	20 370
2016	20 370
2017	20 370
2018	20 370
2019	20 370
2020	20 370
2021	20 370
2022	20 370
2023	20 370
01.01.2024-11.04.2024	5 636
Total estimated ERs	**203 700**
Total number of crediting years	**10**
Average annual ERs	**20 370**

1.8 Description of the Project Activity

Dagbasi HEPP is a run-of-river type hydropower project with an installed capacity of 10.433 MWe with an expected electricity generation of 38.446 GWh per year. Project will be implemented on the Sugozu Stream, a side branch of the Anamur River in the Province of Mersin, in the Mediterranean Region.

Legally project lifetime is 49 years. In other words, Dagbasi HEPP investor can operate this project for 49 years; beyond this time period, investor has to make a new agreement with the government to be able to continue to operate the plant.[10] However, from the technical point of view, project life time can be referred to the lifetime of turbine. All construction elements have a lifetime of 45 years according to the DSI Report.[11] The only element having shortest lifetime is turbine which is defined as 150 000 in UNFCC CDM EB50-Annex 15[12].

So the technical lifetime of the Dagbasi HEPP Project is 150 000 hr (approximately 17 years). However, since turbines will not operate continuously, this value can be accepted as 20 years which is equal to the time period to which it is being applied for carbon certification to VCS (2 times 10 year. Please see Section 1.6 of this report).

Dagbasi HEPP will generate green electricity from a renewable resource; therefore, it will replace electricity from Turkish grid which is dominated by fossil fuel fired power plants.

Project will generate GHG emission free, clean electricity, feeding into the national Turkish grid where all Turkish power plants are connected and are dispatched centrally by the Turkish grid operator, Turkish Electricity Transmission Incorporation. Electricity supplied to the national grid is dominated by thermal power plants.[13] Electricity generated by the Dagbasi HEPP project will displace power generation by thermal power plants, which leads to savings in fuel combustion and thus to the reduction of GHG emissions, as specified and explained in detail in Section 3 below.

Following table provides a summary of the technical specifications of the project facilities.

Table 1: Technical Characteristics of Dagbasi HEPP[14]

Project Main Characteristics			**Powerhouse**	
Type	Run-of-river		Type	Above Ground
Gross Head	126.10 m		Width	17.7 m
Design Discharge	9.50 m3/s		Length	35.6 m
Total Installed Power	10.756 MW		Height	10.3 m
Power Generation	38.446 GWh/year		Tailwater Elevation	383.5 m
Weir, Water Intake Structure			**Generator**	

[10] Dagbasi HEPP Water Usage and Operation Agreement dated 17 March 2011.

[11] DSI.Yatirim Projelerinin Ekonomik Analizi. 1985. In Turkey, all projects implement for and/or in cooperation with DSI, use the technical lifetime values defined in this report. Similary, Dagbasi Feasbility Report, 2009 also based on these data provided in this report.

[12] UNFCC CDM, EB50-Annex 15, pp.4. http://cdm.unfccc.int/EB/050/eb50_repan15.pdf. Visited on 11 Sep 2013.

[13] See Section 2.4 below.

[14] Table is derived from the Dagbasi HEPP Feasibility Report 2009. Section 1, pp.4-9.

Type	Concrete Body		Number of Generators	3
Elevation at Crest	510.0 m		Nominal Voltage	6.3 kV (+- 5%)
Thailweg Elevation	502.0 m		Frequency	50 hz
Height from River Bed	8.0 m		Synchronic Rotation Freq.	750 rpm
Length of Weir	10.0 m			
Water Intake	Left Side			
Water Intake Dimension	3x2.5 m			
Channel			**Turbine**	
Type	Box		Type	Horizontal Axis Francis
Gradient	0.0006		Installed Power	3 x 3.585 MW
Bottom Width	3.0 m		Rotation Frequency	750 rpm
Length	328.8 m			
Headpond and Settling Basin			**Transmission Line**	
Length	30.3 m		Voltage	36 kV
Width	5.0 m		Connection Point	Otluca HEPP
Number of Span	2		Length	6.0 km
Headpond Width	10.0 m			
Headpond Length	32.0 m			
Headpond Height	13.5 m			
Headpond Elevation	509.60 m			
Energy Tunnel			**Powerhouse Access Tunnel**	
Type	Horse Shoe		Type	Modified Horse Shoe
Length	1306.8 m		Length	258.5 m
Diameter	3.3 m		Dimensions	4.6 (h) x 4.0 m
Slope	0.095			
Penstock			**Weir Access Tunnel**	
Type	Inside Tunnel		Type	Modified Horse Shoe
Diameter	2.4 m		Length	971.5 m
Length	80.0 m		Dimensions	4.2 (h) x 4.0 m
Branch	3			
Branch Diameter	1.2 m			

As a run-of-river type project, Dagbasi HEPP applies environmentally safe and sound technologies, having no harm to environment. Turbines and generators that will be used in the project will be manufactured abroad and then delivered to the project site. By the time of writing this report, Austrian Wasser Kraft Company was chosen by the project owner to transfer these technology and equipment to the project. Chosen technology is a grid friendly one with low maintenance needs as well as low noise and low environmental impacts.

1.9 Project Location

Dagbasi HEPP is located in the Mediterranean Region in Turkey. Project is in the boundary of the Anamur District of Province of Mersin. Project site is about 45 km north of the center of the Anamur District.

Figure 2 and Figure 3 show its location in Turkey and Province of Mersin respectively.

Geographical coordinates of the project site[15]:

Project Facilities	Latitude (6° UTM)	Longitude (6° UTM)
Dagbasi Weir	40 17 850 (N)	48 00 00 (E)
Powerhouse	40 16 200 (N)	48 00 80 (E)

Figure 2: Project Location in Turkey

[15] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 1, pp.3.

Figure 3: Project Location in Province of Mersin

1.10 Conditions Prior to Project Initiation

Dagbasi HEPP project site is located at about 45 km of Anamur district on the Dragon river. Project site is in a rocky area where there was no settlement before the project. The closest residential area is Sugozu village which is horizontally 2-3 km away from the project site and located at a much higher elevation. Therefore project site has no direct effect on the village life. Since project site is rocky where few trees exist, mostly covered with small plants like *maki*, there was no activity within the site. Only activity is fish farming, but they are located at the downstream of the projects.

Project has no expropriation, however project owner compensated the Ministry for Environment and Forest for the value of trees to be planted somewhere.

Project is a newly implemented renewable energy project. Main purpose is utilization of hydraulic potential of Turkey to meet the increasing demand for energy.

Project activity is not implemented for subsequent reduction of GHG. Project is a hydro power plant implemented to generate electricity from renewable resources.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Dagbasi HEPP project received all necessary authorizations and/or approvals from the relevant entities of the Government of Turkey, showing that project is in compliance with all relevant laws and regulations of Turkey. Following table summarizes these laws and regulations.

Table 2: Laws and Regulations Applicable to the Project and the Alternatives

Relevant Laws	Number / Enactment Date	Aim and Scope
Environmental Law[16]	Nr. 2872 / 11.08.1983	According to the Electricity License Regulation, all energy generation projects have to receive approval from the Ministry of Environment and Urbanization. Energy projects have to comply with the Environmental Law.
*Environmental Impact Assessment Regulation[17]	Nr. 26939 / 17.07.2008	
Electricity Market Law[18]	Nr. 4628 / 20.02.2001	Regulating procedures for electricity generation, transmission, distribution, wholesale and retail for legal entities. Two regulations issued under the law; one for generation license and the other for market price balancing and conciliation.
*Electricity License Regulation[19]	Nr. 24836 / 04.08.2002	
*Electricity Market Balancing and Conciliation Regulation[20]	Nr. 27200 / 14.04.2009	
Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy[21]	Nr. 5346 / 18.05.2005	Aims to extend the utilization of renewable energy for electricity generation, and identifies methods and principles for power generation from renewable resources in an economical and conservative manner as well as certification of the electricity generated from renewable resources.
Energy Efficiency Law[22]	Nr. 5627 / 02.05.2007	Identifies method and principles for industry, power plants, residential buildings and transport to implement necessary measures for energy efficiency during electricity generation, transmission, distribution and consumption

[16] Available at http://www.mevzuat.adalet.gov.tr/html/631.html. Accessed on 2 April 2012.

[17] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=73. Click on the "Çevresel Etki Değerlendirmesi Yönetmeliği" link. Accessed on 28 Dec 2012.

[18] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=143. Click on the "Elektrik Piyasası Kanunu" link. Accessed on 28 Dec 2012.

[19] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=167. Click on the "Lisans Yönetmeliği" link. Accessed on 28 Dec 2012.

[20] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=167. Click on the "Dengeleme ve Uzlaştırma Yönetmeliği İlgili Mevzuatı" link. Accessed on 28 Dec 2012.

[21] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=73. Click on the "Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy" link. Accessed on 28 Dec 2012.

[22] Available at http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=73. Click on the "Enerji Verimliliği Kanunu" link. Accessed on 28 Dec 2012.

1.12 Ownership and Other Programs

1.12.1 Right of Use

Ownership of the plant, equipment and electricity generation license belongs to ALPEREN, to whom all emission reductions/removals will be granted.

1.12.2 Emissions Trading Programs and Other Binding Limits

Dagbasi HEPP project will not be used for compliance with an emissions trading program or to meet binding limits on greenhouse gas (GHG) emissions.

1.12.3 Participation under Other GHG Programs

Not Applicable

1.12.4 Other Forms of Environmental Credit

Dagbasi HEPP project has not created another form of environmental credit or renewable energy certificate.

1.12.5 Projects Rejected by Other GHG Programs

Dagbasi HEPP did not receive any rejection from any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Dagbasi HEPP is not a part of grouped projects.

Leakage Management

According to the AMS-I.D. Version 17.0, If the energy generating equipment is transferred from another activity, leakage is to be considered. In Dagbasi HEPP project, energy generation equipments will be brand new, which are not used previously in any other activity. Therefore, leakage will not be considered in emission reduction calculations.

Commercially Sensitive Information

All contracts signed with other parties for construction, purchase of electromechanical equipment, maintenance and services, board decisions and financial data are commercially sensitive information.

Further Information

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Emission reductions of the project have been calculated in accordance with the approved small scale CDM-methodology AMS-I.D.: "Grid connected renewable electricity generation", Version 17.0.[23]

For baseline calculations, AMS-I.D refers to the "Tool to calculate the emission factor for an electricity system" Version 3.0.0.[24] This methodological tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the Combined Margin emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the Operating Margin (OM) and the Build Margin (BM).

For the demonstration of additionality, "Tool for the demonstration and assessment of additionality", version 7.0.0 is used.[25]

2.2 Applicability of Methodology

The applicability criteria of CDM-methodology AMS-I.D. are listed and justified below:

No	Applicability criteria listed in the AMS-I.D. methodology	Justification
1	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: Supplying electricity to a national or a regional grid; or supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	Dagbasi HEPP project is a grid connected renewable energy generation project, utilizing hydraulic power to generate electricity.
2	This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating 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).	Dagbasi HEPP project installs a new power plant at a site where there was no renewable energy generating power plant operating prior to the implementation of the project activity.

[23] Available at http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X/view.html. Accessed on 6 April 2012.

[24] Available at https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf. Accessed on 28 February 2014.

[25] Available at http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf Accessed on 9 May 2014.

3	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: The project activity is implemented in an existing reservoir with no change in the volume of reservoir; The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	Dagbasi HEPP project does not have a reservoir; it is a run-of-river type project activity. AMS-I.D Version 17.0 methodology refers to the ACM002 for calculating project emission where the Power Density (EW/m2) of the project activity is calculated by using the following formula: $$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ Where PD = Power density of the project activity (W/m2) 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 (m2 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 (m2). For new reservoirs, this value is zero. Reservoir area of the project activity is 2800[26] m^2 and total installed capacity is 10.75x10^6 W, resulting with a power density of 3840 W/m^2 that is far larger than the 4 W/m^2 threshold value provided in the

[26] Dagbasi HEPP Weir Layout drawing with the number of DGB-KT-GE-04.

		ACM002.
4	If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Dagbasi HEPP project has only renewable component, utilizing hydraulic power. Its installed capacity is 10.433 MWe which is less than the 15 MW limit value for small scale renewable type projects.
5	Combined heat and power (co-generation) systems are not eligible under this category	Dagbasi HEPP project is not a combined heat and power system.
6	In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Project is not an additional to an existing renewable power generation facility.
7	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Dagbasi HEPP project is not a retrofit or modification of an existing facility.

2.3 Project Boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO2 emissions that are displaced due to the Project Activity from electricity generation in fossil fuel fired power plants connected to national grid	CO_2	Yes	Main emission source. The dominant emissions from power plants are in the form of CO_2; therefore CO_2 emissions from fossil fuel fired power plants connected to the grid will be accounted in baseline calculations.
		CH_4	No	Minor emission sources.
		N_2O	No	
		Other	No	
Project	Emissions as a result of Project Activity	CO_2	No	Minor emission source. As suggested by the baseline methodology, project emissions (PE_y) are assumed to be zero and will not be considered.
		CH_4	No	
		N_2O	No	
		Other	No	

2.4 Baseline Scenario

According to AMS I.D. (Version 17), if the project activity is an installation of a new grid-connected renewable power plant, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants which are mainly fired by fossil fuel.

The baseline scenario has been developed by the assumption that the energy generation profile of Turkey will not change, and the weight of fossil fired power plants will remain the same during the crediting period.

In Dagbasi HEPP Project, baseline scenario covers the national electricity grid which is mainly dominated by the fossil fuel fired power plants. According to the annual electricity statistical data published by the Turkish Electricity Transmission Incorporation (TEIAS),[27] approximately 73.57% of the total electricity generation is based on fossil fuels which are natural gas, lignite, hard coal, imported coal and liquid fuels. Share of hydroelectric power plants in generation of electricity only remains at 24.52% (Table 3 and Figure 4).[28]

[27] A government-owned company which makes the electricity generation data of Turkey available to public.

[28] Electricity Generation Incorporation (EUAS), *Annual Report*, 2010. p.21. Available at http://www.euas.gov.tr/apk%20daire%20baskanligi%20kitapligi/YILLIK_RAPOR_2010.pdf

Table 3: Electricity Generation by Primary Resources in Turkey-2010[29]

Electricity Generation Sources	Electricity Generation GWh	Percentages
Natural Gas	98143.7	46.47%
Lignite	35942.1	17.02%
Liquid Fuels	2180.0	1.03%
Imported coal-Hard coal-Asphaltite	19104.3	9.05%
Hydraulic	51795.5	24.52%
Wind	2916.4	1.38%
Geothermal	668.2	0.32%
Renewable + Wastes	457.5	0.22%

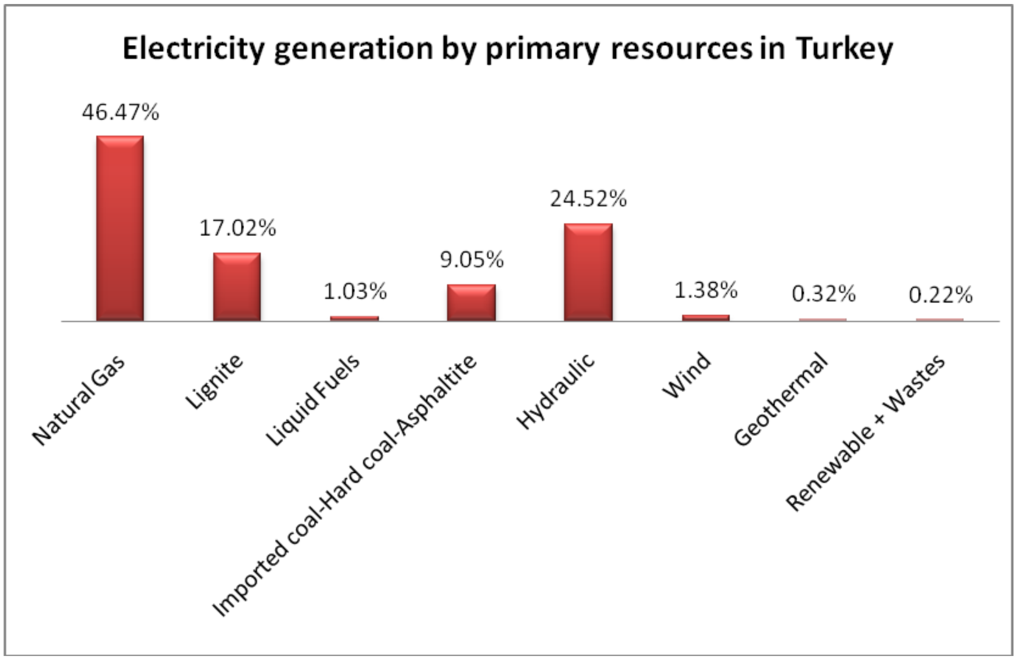

Figure 4: Share of Resources for Electricity Generation in Turkey-2010.

Figure 5 and Table 4 show the expected share of resources in energy generating capacity between 2011- 2020 based on corresponding operational, under construction and licensed power plants. The data shows that fossil fuels will remain dominant in the electricity generation mix in Turkey, at least over the midterm period with an expected share of 57 % in 2020. Hydro power plants will hold approximately 38% of the total share.

[29] EUAS, *Annual Report*, 2010. p.21. Available at http://www.euas.gov.tr/apk%20daire%20baskanligi%20kitapligi/YILLIK_RAPOR_2010.pdf

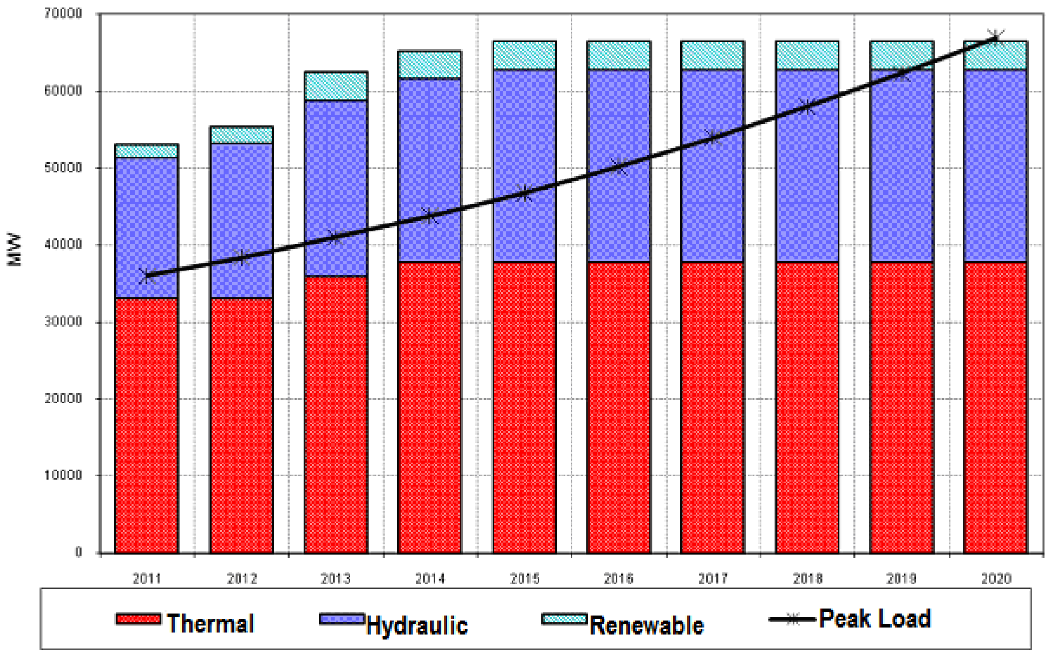

Figure 5: Electricity Generation Forecast (2011-2020)

Table 4: Capacity Development of Thermal, Hydro and Renewable Sources (2011 – 2020)[30]

Year	Thermal		Hydro		Renewable		Total
	MW	%	MW	%	MW	%	MW
2011	32,999	62	18,333	35	1,704	3	53,035
2012	33,083	60	20,027	36	2,211	4	55,321
2013	35,855	57	22,841	37	3,683	6	62,379
2014	37,797	58	23,726	36	3,683	6	65,207
2015	37,797	57	24,926	38	3,683	6	66,407
2016	37,797	57	24,926	38	3,683	6	66,407
2017	37,797	57	24,926	38	3,683	6	66,407
2018	37,797	57	24,926	38	3,683	6	66,407
2019	37,797	57	24,926	38	3,683	6	66,407
2020	37,797	57	24,926	38	3,683	6	66,407

According to the *10 Year Energy Generation Capacity Projection Report 2011* prepared by TEIAS,[31] demand for energy was always high in the last ten years,[32] changing between 6.3% and

[30] TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2011 (In Turkish). pp.50. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx. Click on the “2011” link.

8.8%.[33] Over the next 10 year period, from 2011 to 2019, demand for electricity will continue to increase from 227 000 GWh in 2010 to 398 160 in 2019 GWh in low demand scenario, to 433 900 GWh in high demand scenario.[34]

Furthermore, the same report has found that demand for energy in Turkey will not be met by 2016 and onwards in case of high demand scenario. Similarly, in case of low demand scenario, it will not be met by 2017 and onwards. It means that even if all power plants (operational, under construction and licensed) are taken into account, there is still a projected lack of supply in the near future. And, in the face of the upcoming electricity shortage, it is clear that the most likely installation alternative would be conventional fossil-fuelled power plants.

In Turkey, greatest source of GHG emissions is fossil fuel-based power generation. According to the *National Experience on Carbon Market and Future Perspectives* report published in 2011 by the Ministry of Environment and Urbanization, GHG emission share of thermal power generation is 82.5% in 2008 (366.5 Million Ton CO2).[35] The continuing reliance on fossil fuels in the power sector will further result in an increase the GHG emissions in the coming years.

Dagbasi HEPP will supply electricity to national grid which is dominated by fossil-fired power plants. Therefore; it is an additional alternative to the baseline scenario.

2.5 Additionality

The additionality of the project is assessed according to the “Tool to for the Demonstration and Assessment of Additionality Version 6.0.0.”

Project timeline of the Dagbasi HEPP is given below:

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[31] Capacity Generation reports are published annually by TEIAS since 2003.

[32] With the exception of years of economic recession.

[33] TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2011 (In Turkish). pp.4. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx. Click on the “2011” link.

[34] TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2011 (In Turkish). pp.12-13. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx. Click on the “2011” link.

[35] Directorate of Environment, ***Karbon Piyasalarında Ulusal Deneyim ve Geleceğe Bakış***, 2012. Ministry of Environment and Urbanization (Report is in Turkish). pp.83. Available at http://www.karbonkayit.cob.gov.tr/Karbon/Files/Karbon%20Piyaslar%C4%B1nda%20Ulusal%20Deneyim%20ve%20Gelece%C4%9Fe%20Bak%C4%B1%C5%9F.pdf.

Table 5: Dagbasi HEPP Project Timeline[36]

Milestone	Date	Documentary Proof
Preparing feasibility report	December 2009	Dagbasi HEPP Feasibility Report
Board of directors Decision regarding investing into the project	14 March	2010
EIA Decision	12 Jan 2011	EIA Decision Letter (see Annex IV)
Signing water usage agreement with DSI.	17 March 2011	Dagbasi HEPP Water Usage and Operation Agreement
Acquisition of energy generation license from EPDK	12 May 2011	EPDK-Dagbasi HEPP Energy Production License.
Board of directors Decision regarding to the carbon revenue	16 Aug 2011	Board of Directors decision record.
Construction contract	13 Sep 2011	Contract between the project owner and the subcontractor.
Construction start	28 Sep 2011	Construction material delivery record.
Commissioning	11 April 2014	N/A
Starting date of crediting period	11 April 2014	N/A

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

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

As per the tool, following alternatives will be analyzed:

1) Proposed project activity undertaken without being registered as a CDM project activity;

2) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs or services with comparable quality, properties and application areas;

3) Continuation of the current situation (no project activity or other alternatives undertaken).

First alternative, as per the statement of the tool under this category, is the implementation of the Dagbasi HEPP project without being registered to a VER program. However, this is not an realistic scenario due to that project IRR is below the benchmark IRR value (15%) without having carbon revenue.

Second alternative could be the implementation of a new power plant utilizing renewable resources, which will produce similar services with the project activity. These alternatives are wind, solar and geothermal power generations. However, implementing any of these alternatives

[36] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 9, pp.5-6.

is not realistic although the Electricity Market License Regulation gives priority to these types of renewable projects, which utilize local resources with low environmental impact.[37]

For example, project region technically is not an eligible location for wind power generation. According to the Wind Energy Potential Map (WEPM) of Turkey, developed by the Directorate of Renewable Energy Resources of the Government of Turkey,[38] the speed of the wind should be higher than 7 m/sec for an economically feasible power generation. Figure 6 shows the wind power map of Province of Mersin. Gray colored regions in the Map shows the locations which are not suitable for power generation. It shows that wind speed is lower than 5 m/sec at the project site, showing that it is not suitable for wind power projects. Hence, wind power is not an alternative to the Dagbasi HEPP Project.

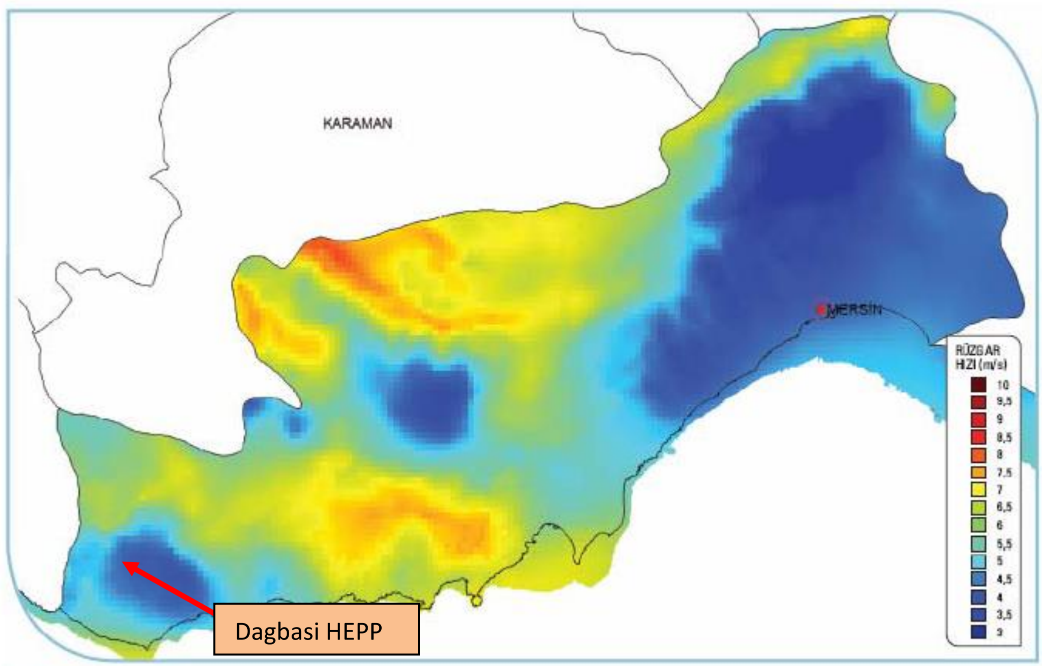

Figure 6: Wind Energy Potential Map- Eligibility of Mersin Province for Wind Power[39]

Geothermal resources eligible for electricity generation are located on the western part of Turkey. At the project location there is no geothermal resource. Using solar power or biomass for electricity generation is still in the infancy state in Turkey. Therefore, utilizing other renewable resources is not a realistic and credible alternative scenario to the proposed project activity.

[37] Electricity Market License Regulation, Sub-clause (5) of Article.9. Available at the EPDK web site. http://www.epdk.org.tr/index.php/elektrik-piyasasi/mevzuat?id=167. Click on the "Lisans Yönetmeliği" link. Accessed on 28 Dec 2012.

[38] EIE Homepage. http://www.eie.gov.tr

[39]General Directorate of Electrical Power Resources Web Site.*Mersin Wind Power Resource Information*. Available at http://www.eie.gov.tr/YEKrepa/REPA-duyuru_01.html. Click on the "ICEL" link.

In case no project activity is taken that is the third alternative as suggested by the Tool, the same amount of electricity will be generated by the existing grid to supply the increasing demand of Turkey. However, this alternative is the same with the baseline scenario.

Sub-step 1b: Consistency with Mandatory Laws and Regulations:

All alternatives to the project activity are in compliance with the existing laws and regulations which are described in Section 1.10, Table 2.

Outcome of Step 1: The only realistic scenario is the third alternative, which is the supply of the same amount of electricity from the existing grid that is in compliance with the relevant mandatory laws and regulations.

Step 2 - Investment Analysis

Since there is no realistic alternative to the Dagbasi HEPP project, the investment analysis will only analyze the financial attractiveness of the project without carbon revenue.

Investment analysis includes the application of the following steps:

- Determining the appropriate analysis method;
- Calculation and comparison of financial indicators;
- Sensitivity analysis.

Sub-step 2a - Determine Appropriate Analysis Method

The "Tool for the Demonstration and Assessment of Additionality, Version 6.0.0", offers three alternative methods for financial analysis:

- Option I: Simple cost analysis
- Option II: Investment comparison analysis
- Option III: Benchmark analysis.

Option I is only applicable if the project activity does not receive any revenue other than the sale of carbon credits. Dagbasi HEPP project will generate revenue from the sale of electricity. Therefore, this option is not applicable.

Option II is applicable if there are alternatives to the project activity. In this case, Dagbasi HEPP does not have alternatives. Only viable alternative is the 'No Activity'. Therefore, investment analysis is not applicable to this alternative.

As a result Option III (Benchmark Analysis) is applicable to the Dagbasi HEPP project.

Sub-step 2b - Option III-Apply Benchmark Analysis

Ministry of Environment and Urbanization is carrying out a project, called Capacity Building for Climate Change Management in Turkey. Under this project, a report was prepared, which came out in July 2010 with the title of *Impact Scenarios of Carbon Finance on the Renewable Power Capacity of Turkey*. The report provides a calculation of Benchmark IRR values for renewable type energy generation projects, besides of other topics. The report determined the Benchmark IRR for small scale hydro power projects as 15%.[40] In the financial analysis of the Dagbasi HEPP project, this benchmark value will be used.

Sub-step 2c - Calculation and Comparison of Financial Indicators

The IRR is calculated on the basis of expected cash flows (investment, maintenance and operating costs, and revenues from electricity sale), as used in the financial analysis for the feasibility assessment of the project.

Plant Load Factor of Dagbasi HEPP is 0.408.

Plant Load Factor is determined by dividing the plant actual output with the maximum possible output.

PLF=38 446 MW/h ((365 day) x (24 hr/day) x (10.756 MW)

PLF=0.408

PLF=%40.8

Where 38 446 MW/h is Dagbasi HEPP expected energy generation per year, and 10.756 MW is the Dagbasi HEPP project power capacity.

Table 6: Financial Parameters Used in Financial Analysis[41]

Parameters		Unit	Value	Source
Expected Electricity Generation		GWh	38.446	Dagbasi HEPP Feasibility Report 2009. pp.5-6.
Total Investment Cost		USD	20,568,400	
1	Construction Cost	USD	11,010,721*	
2	Hydromechanic Eq. Cost	USD	509,170	
3	Electromechanic Eq. Cost	USD	3,764,600	
4	Project Survey, Design, Eng. & Consult. Cost	USD	2,636,575	
5	Expropriation and Forestry expenses	USD	354,660	
6	Unexpected Expenses	USD	2,292,674	
Operational Cost		USD	439,146	
Revenues		USDYear	3,844,600	

[40] Futurecamp of Turkey, *Impact Scenarios of Carbon Finance on the Renewable Power Capacity of Turkey*, 2010. Edited by the The Project Team and the Ministry of Environment and Urbanization Climate Change Department (in English). pp.23. Available at http://www.karbonkayit.cob.gov.tr/Karbon/Files/Carbon%20Finance%20and%20Renewable%20Power%20in%20Turkey.pdf

[41] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 9, pp.5-6.

Exchange Rate[42]	USD/TL	1.4098	

**Construction cost is the summation of all individual construction units. Please see the IRR Input Excel Sheet.*

The IRR for the project is calculated as 10.65 % without the VER revenue. That is much lower than benchmark IRR, which is 15%. Including carbon revenue with assuming VER price will be 1.5 USD/tCO2e, project IRR become 10.81 % which is still lower than the benchmark value.

As a result, the revenue acquired from the operation of the power plant is not financially attractive to do the investment.

Sub-step 2d - Sensitivity Analysis

The sensitivity analysis is applied in order to show that investment decision, financially, is not the most attractive alternative.

For a range of ±10% fluctuations in Investment Cost, Operating Cost and Electricity Sales revenue, following table shows the results of the sensitivity analysis.

Table 7: Sensitivity Analysis for the Project IRR

	Variation				
	-10%	**-5%**	**0%**	**5%**	**10%**
Investment Cost (IRR %)	12.22	11.40	10.65	9.95	9.30
Operating Cost (IRR %)	10.83	10.74	10.65	10.55	10.49
Electricity Sales Revenue (IRR %)	8.96	9.82	10.65	11.45	12.24

The best case scenario in sensitivity analysis is the rise in revenue, and decrease in investment and operational costs. In such cases, project IRR becomes

- 12.24 % with a 10% rise in revenue,
- 12.22 % with a 10% decrease in investment cost
- 10.83 % with a 10% decrease in operational cost

Possible cases hitting the benchmark value

To hit the IRR benchmark values, electricity price should be at least 12.8 USD cents and investment cost should drop 24 % (15,631,000 USD).

However, change in the electricity price was not expected by the time of the investment decision. The Renewable Energy Law enacted in 2005 with the number of 25956, states that the price of the electricity to be purchased under the Renewable Energy Law should be the country average of the electricity wholesale price of the previous year to be determined by the EMRA. In any case, the price cannot be less than the Turkish Lira equivalent of 5 Euro Cent/kWh and more than 5.5

[42] Dagbasi HEPP Feasibility Report 2009 (In Turkish). Section 1, pp.2.

Euro Cent/kWh. The law also provides a purchase guarantee of maximum 10 years.In 2010, an Amending Law[43] to the Renewable Energy Law was enacted, and this new amendment did not change the electricity price for hydropower plants. It rather converted the unit price of electricity from Euro to USD, which is determined as 7.3 Cent/kWh.

By all account, probably rise in electricity price was already taken into account at the time of the investment decision. It was accepted as 10 USD cents/kWh. However, the electricity price should be at least 12.8 USD cent/kWh (28% higher) to hit the benchmark of 15 %; which is not likely to occur.

The investment cost is, also, not likely to decrease, but may increase due to the financial constrains faced by the project. It should be 24 % lower than the actual value to hit the benchmark of 15%.

The operational cost will be approximately be same regarding to the personnel expenses, periodic maintenance and other administrative costs as the installed capacity and the number of personnel would not change. In order to hit an IRR equal to the benchmark, the operational cost should be zero and there should be extra income as much as 2.6 folds of the original value. And this scenario is clearly impossible to occur.

It should also be noted that other risks, such as drought and decrease in rainfall in the region; which would reduce the yearly electricity generation, are not included in the financial analysis. This potentially results in decrease in project revenue, further reducing the IRR.

Outcome of Step 2: Investment analysis confirms that the proposed project is not attractive for investment. Even the maximum IRR values calculated for the best-case scenario is considerably below the 15% benchmark. Thus, there is a strong need for additional revenues from carbon credits to implement the project.

Step 3: Barrier Analysis

The sensitivity analysis has shown that the project is not financially attractive; therefore, as per the Tool, this step is not implemented.

Step 4: Common Practice Analysis

Based on the requirement given in the CDM Validation and Verification Manual Version 1.2, paragraph 119, page 23, common practice analysis is not applied to the project given that it is a small scale project.

CDM Validation and Verification Manual Version 1.2, paragraph 119, page 23 states that

“For proposed **large-scale project activities**, unless the proposed project type is first-of-itskind as determined in accordance with the relevant guidelines, the DOE shall assess whether the project participants have conducted a common practice analysis.”

[43] Published by the Official Gazette with the number of 27809 dated 8 Jan 2011.

Statement only concerns about the large scale projects, not small ones.

Sub-step 4a - Analyze other Activities Similar to the Proposed Project Activity

N/A

Sub-step 4b - Discuss any Similar Options that Occurring

N/A

Outcome of Sub 4:

N/A

2.6 Methodology Deviations

There are no deviations in methodologies used in this report.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

AMS-I.D. methodology defines the baseline scenario as the electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and addition of new generation sources into the grid.

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:

BE_y	Baseline Emissions in year y (t CO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year y (t CO_2/MWh)

According to the AMS-I.D., the emission factor ($EF_{CO2,grid,y}$) can be calculated in a transparent and conservative manner in the following two ways:

A) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the Emission Factor for an electricity system”;

or

B) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Methodology further clarifies that calculations shall be based on data from a publicly available official source. Among these options, Option A is used to calculate the emission factor ($EF_{CO2,grid,y}$)." Using Option B was not an option due to that weighted average emissions data are not available.

The tool that will be used to calculate the emission factor is "Tool to calculate the emission factor for an electricity system, Version 02.2.1. This tool determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "combined margin" emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the "operating margin" (OM) and the "build margin" (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of prospective power plants whose construction and future operation would be affected by the proposed CDM project activity.

Following steps, as per tool, are applied to determine the CM emission factor:

1) STEP 1: Identify the relevant electricity systems;
2) STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);
3) STEP 3: Select a method to determine the operating margin (OM);
4) STEP 4: Calculate the operating margin emission factor according to the selected method;
5) STEP 5: Calculate the build margin (BM) emission factor;
6) STEP 6: Calculate the combined margin (CM) emission factor

STEP 1: Identify the relevant electricity system

Project electricity system is 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.

Connected electricity system, e.g. national or international, 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.

The electricity system in Turkey is interconnected. There is no an independent regional grid system neither in Province of Mersin nor in the Mediterranean Region where the project site is located. Therefore “the project electricity system” and “the connected system” are the same for Dagbasi HEPP.

In addition to this, In Turkey there is no DNA to delineate the project electricity system; therefore, following suggested criteria as per the Tool is used:

1. *In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year;*

There is no spot electricity market available in Turkey, therefore this criteria can not be applied.

2. *The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.*

There is no capacity usage figure for transmission line published, therefore this criteria can not be applied.

If none of these criteria do not result in a clear grid boundary, the Tool suggests to use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national). However, there are no layered dispatch systems in Turkey.

As a result, the national grid system is used as the project electricity system. Hence, the estimation of OM and BM emission factors are based on the definition of the Turkish electricity network as one single interconnected system.

Interconnected electricity transmission grid of Turkey is shown below:

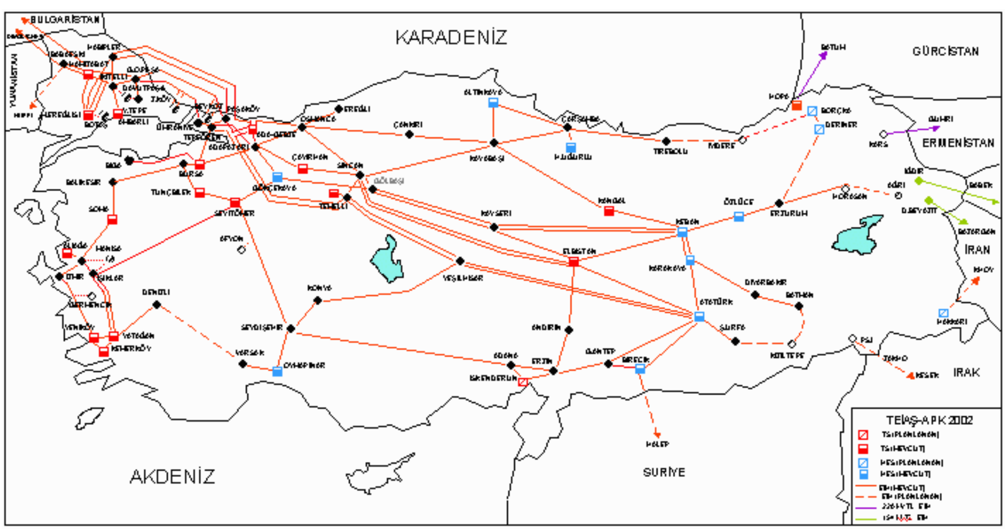

Figure 7: Turkey’s Electricity Transmission Grid[44]

[44] Global Energy Network Institute Web Site. National Energy Grid Map Index, Turkey. http://www.geni.org/globalenergy/library/national_energy_grid/turkey/turkishnationalelectricitygrid.shtml. Accessed on 11 May 2012.

Electricity generated by the power plants is transmitted to the national grid from where it is distributed to consumers via the local distribution companies. Turkey is divided into 21 regions in distributing electricity. Figure 9 shows the physical boundaries of these regions; Table 8 provides the list of these distribution companies.

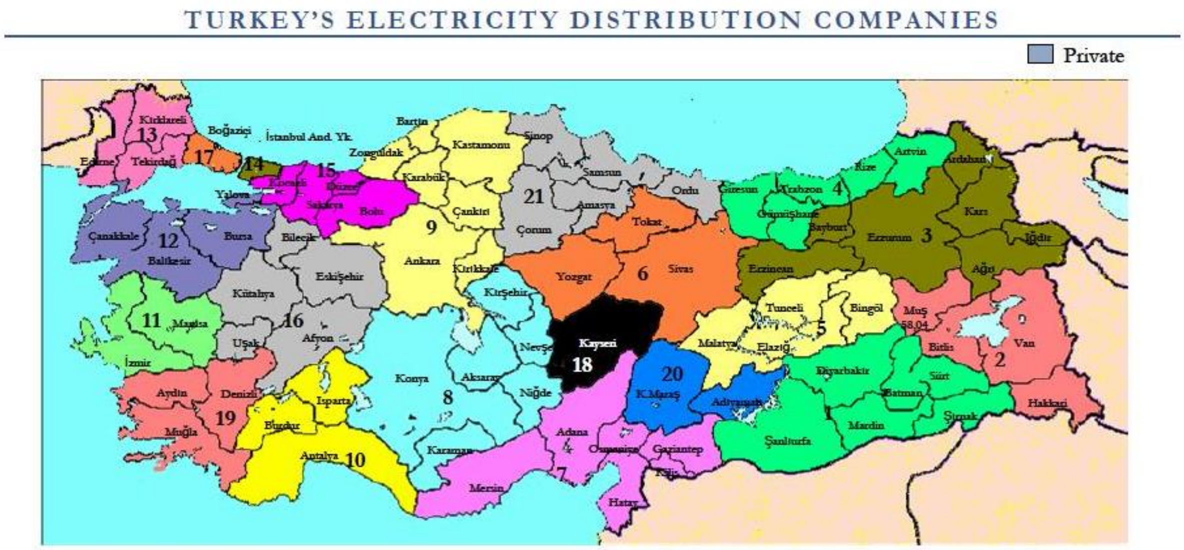

Figure 8: Regional Boundaries of Turkey's Electricity Distribution Companies[45]

Table 8: List of Turkey's Electricity Distribution Companies

Region No	**Provinces Included in the Region**	**Region Centre**	**Region Name**
1	Batman, Diyarbakır, Mardin, Siirt, Şanlıurfa, Şırnak	Diyarbakır	Dicle Electricity Distribution Company (Dicle EDAS)
2	Bitlis, Hakkari, Muş, Van	Van	Vangölü Electricity Distribution Company (Vangölü EDAS)
3	Ağrı, Ardahan, Bayburt, Erzincan, Erzurum, Iğdır, Kars	Erzurum	Aras Electricity Distribution Company (Aras EDAS)
4	Artvin, Giresun, Gümüşhane, Rize, Trabzon	Trabzon	Çoruh Electricity Distribution Company (Coruh EDAS)
5	Bingöl, Elazığ, Malatya, Tunceli	Elazığ	Fırat Electricity Distribution Company (Firat EDAS)
6	Sivas, Tokat, Yozgat	Sivas	Çamlıbel Electricity Distribution Company (Camlibel EDAS)
7	Adana, Gaziantep, Hatay, Kilis, Mersin, Osmaniye	Adana	Toroslar Electricity Distribution Company (Toroslar EDAS)
8	Konya, Karaman, Kırşehir, Nevşehir, Niğde Aksaray	Konya	Meram Electricity Distribution Company (Meram EDAS)
9	Ankara, Bartın, Çankırı, Karabük, Kastamonu, Kırıkkale, Zonguldak	Ankara	Başkent Electricity Distribution Company (Baskent EDAS)
10	Antalya, Burdur, Isparta	Antalya	Akdeniz Electricity Distribution Company

[45] http://www.oib.gov.tr/tedas/teaser_english.pdf, page 2

			(Akdeniz EDAS)
11	İzmir, Manisa	İzmir	Gediz Electricity Distribution Company (Gediz EDAS)
12	Balıkesir, Bursa, Çanakkale, Yalova	Bursa	Uludağ Electricity Distribution Company (Uludag EDAS)
13	Edirne, Kırklareli, Tekirdağ	Tekirdağ	Trakya Electricity Distribution Company (Trakya EDAS)
14	İstanbul Anadolu Yakası	İstanbul Anatolian Side	İstanbul Anadolu Yakası Electricity Distribution Company (AYEDAS)
15	Bolu, Düzce, Kocaeli, Sakarya	Sakarya	Sakarya Electricity Distribution Company (Sakarya EDAS)
16	Afyon, Bilecik, Eskişehir, Kütahya, Uşak	Eskişehir	Osmangazi Electricity Distribution Company (Osmangazi EDAS)
17	İstanbul Avrupa Yakası	İstanbul European Side	Boğaziçi Electricity Distribution Company (BEDAS)
19	Aydın, Denizli, Muğla	Denizli	Menderes Electricity Distribution Company (Menderes EDAS)
20	Adıyaman, Kahramanmaraş	Kahramanm araş	Göksu Electricity Distribution Company (Goksu EDAS)
21	Amasya, Çorum, Ordu, Samsun, Sinop	Samsun	Yeşilırmak Electricity Distribution Company (Yesilirmak EDAS)

The tool states that electricity transfers from connected electricity systems to the project electricity system are defined as *electricity imports* and electricity transfers to connected electricity systems are defined as *electricity exports*.

The tool further states that for the purpose of determining the BM emission factor, the spatial extend is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable significant increases in imported electricity.

The national grid of Turkey is connected to the electricity systems of neighbour countries. As per the tool, ccomplying with the rules of the tool, the emission factor for imports from neighbour countries is considered 0 (zero) tCO_2/MWh for determining the OM.

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

As per the "Tool to calculate the emission factor for an electricity system, Version 02.2.1", project developers may choose between the following two options in emission factor calculations:

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.

Option I is chosen.

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

As per the Tool, to calculate the OM emission factor, project developers can choose one of the following options depending on the data availability:

(a) Simple OM, or
(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or
(d) Average OM

Options (b) and (c) are not preferred due to the scarcity of data for Turkey. Option (d) is not preferred since low-cost/must run resources do not constitute more than 50% of total grid generation. As described in the Tool, the Simple OM (a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Low-cost/must-run resources consist of hydro, geothermal, wind, low-cost biomass, nuclear and solar which are used for power plants with low marginal generation costs or power plants and dispatched independently of the daily or the seasonal load of grid. There is no indication that coal is used as a must-run and no nuclear energy plants are located in Turkey.

Following table shows the share of low-cost/must-run production for the last five years. The low-cost/must-run resources should constitute less than 50% of total grid generation in average of the five most recent years, which is 21,43% in Turkey (Table 9). Therefore the requirements for the use of the Option a (Simple OM) are satisfied.

Table 9: Total Electricity Generation (2006-2010)[46]

Electricity Generation (GWh) / Year	2006	2007	2008	2009	2010
Thermal Total	131,835.1	155,196.2	164,139.3	156,923.4	155,827.6
Hydro+Geothermal+Wind Total	44,464.7	36,361.9	34,278.7	37,889.5	55,380.1
Turkey's Total	176,299.8	191,558.1	198,418.0	194,812.9	211,207.7
Share of low-cost/must-run production	25.22	18.98	17.28	19.45	26.22
Average share (%)	21.43				

The Tool allowes choosing one of the options below based on the data availability;

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 emission factor during the crediting period is required. For grid power plants, 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, without requirement to monitor and recalculate the emissions factor during the crediting period.

Ex post option: For ex post option, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually

[46] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey. Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm. Click on the following link: "Annual Development of Turkey's Gross Electricity Generation by Primary Energy Resources and The Electricity Utilities (2006-2011)." Accessed on 28 Dec 2012.

during monitoring. The year, in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Based on the most recent data available, ex- ante option is chosen for Simple OM method, with the most recent data for the baseline calculation stemming from the years 2008 to 2010.

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

The Simple OM can be calculated by one of the following two options:

- Based on the net electricity generation and a CO_2 emission factor of each power unit (Option A);
- 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 (Option B).

Option B can only be used if:

- The necessary data for Option A is not available,
- 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
- Off-grid power plants are not included in the calculation.

For simple OM calculations, **Option B** is chosen due to following justifications;

- Electricity generation and CO_2 data for individual power units are not available.
- Only renewable power generation plants are considered as low cost/must-run resources.
- Off-grid power plants are not included in calculations.
- The fuel consumption of different fuel type data for power plants/ units is available in the official source, TEIAS.

In Option B, 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y}$$

Where:

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

$FC_{i,y}$ Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year y
y	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

OM emission factor calculations are provided in Annex II.

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

In this step, a generation-weighted average emission factor is calculated based on a sample of power plants, which have been taken into operation recently. According to the "Tool to calculate the emission factor for an electricity system, ver. 02.2.1," the sample group of power units m used to calculate the build margin consists of either:

a) The set of five power units that have been built most recently, or

b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Among these choices, **Option b** is selected due to that it produces larger annual electricity generation than "option a."

In terms of vintage, two options are defined in the tool:

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

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

Option 1 is selected for the data vintage due to that at the time of the document submission for registration to a carbon certification program, most recent information is not available on units already built for sample group m. Most recent data available, which is announced by TEIAS, belongs to 2010.

The build margin emission factor will be calculated by using the following formula;

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

Where:

$EF_{grid, BM, y}$	=	Build margin CO_2 emission factor in year y (tCO_2 /MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	=	Power units included in the Build margin
y	=	Most recent historical year for which power generation data is available

For the power units in Turkey, only electricity generation and fuel type data are available. Therefore, Option A2 (Step 4, Simple OM approach) is used and the emission factor is determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit.

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} * 3{,}6}{\eta_{m,y}}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$EF_{CO2, m,i,y}$	=	Average CO2 emission factor of fuel type i used in power unit m in year y (tCO2/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

$\eta_{m,y}$ data for power plants m in Turkey are not available, therefore these values are taken from the Tool (Appendix-1: Default Efficiency Factors for Power Plants). Following table show these values.

Table 10: Default Efficiency Factors for Power Plants (Appendix 1 of the Tool)

Grid Power Plants		
Generation Technology	**Old Units (before and in 2000)**	**New Units (after 2000)**
Coal	-	-
Subcritical	37%	39%
Supercritical	-	45%
Ultra-Supercritical	-	50%
IGCC	-	50%
FBS	35,5%	-
CFBS	36,5%	40,0%
PFBS	-	-41,5%
Oil	-	-
Steam turbine	37,5%	39%
Open cycle	30%	39,5%
Combined cycle	46%	46%
Natural Gas	-	-
Steam turbine	37,5%	37,5%
Open cycle	30%	39,5%
Combined cycle	46%	60%

In Turkey, the generation technologies for natural gas and oil are “Combined cycle”, and for coal it is “Subcritical”. Since the default values for lpg and naphta are not given in the tool, the efficiency factors of these fuel types are assumed to be 60% (equal to the efficiency figure for Natural Gas-Combined Cycle). In summary, efficiency factors of each fuel type, which are used in BM Emission Factor Calculations, are given in the following table.

Table 11: Efficiency Factors of Fuel Types Used in BM Calculations.

Fuel Type	Generation Technology	Efficiency Factor
Hard Coal	Coal-Subcritical	39%
Lignite	Coal-Subcritical	39%
Fuel Oil	Oil-Combine Cycle	46%
Diesel Oil	Oil-Combine Cycle	46%
Natural Gas	Natural Gas- Combine Cycle	60%
LPG	Natural Gas- Combine Cycle	60%
Naphta	Natural Gas- Combine Cycle	60%

For CO_2 emission factor, Default Emission Factors for Stationary Combustion in the Energy Industries (kg GHG/GJ on a Net Calorific Basis)[47] which are provided in Table 12, are used. In calculations, lower CO_2 emission factors are used to be on the conservative side.

Table 12: Default Emission Factors for Stationary Combustion in the Energy Industries (kg GHG/GJ on a Net Calorific Basis)[48]

Fuel Type	CO_2		
	Default Emission Factor	Lower	Upper
Residual Fuel Oil	77.4	**75.5**	78.8
Gas/Diesel Oil	74.1	**72.6**	74.8
Sub-Bituminous Coal	96.1	**92.8**	100.0
Liquefied Petroleum Gases	63.1	**61.6**	65.6
Naptha	73.3	**69.3**	76.3
Anthracite	98.3	**94.6**	101.0
Lignite	101.0	**90.9**	115.0
Natural Gas	56.1	**54.3**	58.3
Naptha		**63.1**	

[47] IPCC 2006, 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. Volume 2, Chapter 1: Introduction. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

[48] IPCC 2006, 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan. Volume 2, Chapter 1: Introduction. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

The tool further states that "Power plant registered as CDM project activities should be excluded from the sample group m." Based on this statement, projects registered as a CDM project activity between 01.01.2009-31.12.2010 are excluded from the list. Following table provides the list of these projects.

Table 13: Projects Registered to a Carbon Certification Program (2009-2010)[49]

Power Plant	Installation Capacity MW	Capacity Taken Into Operation in 2009/2010[50] (MW)	Energy Generation GW[51]	VER	Commissioning Date
Darica –I HEPP	99.0	99.0	328	VCS506	2009
Sebenoba Wind Power	30.0	10.	36.7	VCS 553	2010
Sirma HEPP	5.9	5.9	23	VCS 603	2009
Erkenek HEPP	12.0	12.0	50	VCS 693	2009
Lamas III-IV HEPP	37.3	37.3	150	VCS 726	2009
Uzuncayir HEPP	82.0	82.0	319.6	VCS 762	2009-2010
Sayalar Wind Farm	34.2	3.6	11.36	GS369	2009
Soma Polat Wind Farm	140.1	79.20	264	GS398	2010
Alize Camseki Wind Farm	20.8	20.8	82	GS399	2009
Akbuk Wind Farm	31.5	16.80	123	GS436	2009
Keltepe Wind Farm	20.7	20.7	71.4	GS437	2009
Dares Datca Wind Farm	29.6	21.5	61.01	GS438	2009
Mamak Landfill Waste Management	19.8	2.8	21.1	GS440	2009
Dora II Geothermal	9.5	9.5	73	GS445	2010
Osmaniye Wind Farm	135.0	112.5	425.8	GS474	2009-2010
Kuyucak Wind Farm	25.6	25.6	110	GS576	2010
Sarıkaya Wind Farm	28.8	28.8	96	GS577	2009
Kores Kocadag Wind Farm	15.0	15.0	56	GS601	2009
Ay Yıldız Wind Farm	15.0	15.0	51	GS634	2009
Duzova Wind Power	30.0	30.0	96	GS672	2009-2010
Senbuk Wind Farm	15.0	15.0	47	GS733	2010
TOTAL			**2588 GWh**		

[49] Projects receiving a VER certification are derived from the VCS and CDM Gold Standard websites. VCS web site: http://www.vcsprojectdatabase.org/, CDM Gold Standard: http://www.cdmgoldstandard.org/

[50] Only the amount of the installed capacity taken into the operation in 2009 and 2010 are used in emission reduction calculations. For example, Sebenoba wind farm project received VER certification in 2010 for its total installed capacity, 30 MW. However, this 30 MW capacity did not start operation in 2010; 20 MW started operation before 2009, and remaining 10 MW started to operation in 2010. Therefore, only 10 MW of this total installed capacity is taken into account in emission reduction calculations.

[51] Energy generation data represents the amount of the installed capacity taken into operation in 2009 and 2010. For example energy generation data for Sebenoba wind farm represents the 10 MW installed capacity, not the total installed capacity of the plant, which is 30 MW.

BM emission factor calculations are provided in Annex III.

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

For Dagbasi HEPP project, the applicable method to calculate the CM emission factor is the Weighted Average CM;

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

where:

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

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

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

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

As per the Tool, following default values should be used for the Dagbasi HEPP project: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period.

$$EF_{grid,CM,y} = 0.655 * 0.5 + 0.4043 * 0.5$$

Dagbasi HEPP $EF_{grid,CM,y}$	**0.5299 tCO_2/MWh**

3.2 Project Emissions

AMS-I.D Version 17.0 methodology refers to the ACM002 for calculating project emission where the Power Density (EW/m2) of the project activity is calculated by using the following formula:

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

Where

PD	=	Power density of the project activity (W/m2)
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 (m2

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 (m2). For new reservoirs, this value is zero.

Reservoir area of the project activity is 2800[52] m^2 and total installed capacity is 10.75x10^6 W, resulting with a power density of 3840 W/m^2 that is far larger than the 10 W/m^2 threshold value provided in the ACM002. Therefore, Dagbasi HEPP project emission is taken as zero.

Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" Version 02" requires the calculation of CO2 emission from internal fossil fuel combustion. At Dagbasi HEPP, the only source of fuel consumption will be diesel generators. These generators will be operated only once the electricity is gone at the plant. Diesel generator at Dagbasi HEPP is of FG Wilson P110-2 model. Its diesel oil consumption at various loads is given below at various: 110% load, 24.1 lt/hr; 100% load, 21.9 lt/hr; 75% load, 16.6 lt/hr; and 50% load, 11.7 lt/hr. For internal consumption, 50 kW energy, approximately, will be needed during the electricity cut. To meet this need, diesel generator will work at 50 % load capacity where approximately 12 lt diesel oil will be consumed per hour. Approximately, generators will be operated 50 to 60 hrs per year. Taking the worst case scenario, it is assumed as 60 hr operation and 12 lt diesel consumption will take place annually. Based on this assumption, CO2 emission from the power plant is given below:

Annual expected total diesel consumption= 60 hrs x12 lt/hr = 720 lt

$$PE = (FD_y) \times NCV_{diesel} \times COEF_{diesel}$$

PE	CO2 Emission due to Diesel Consumption (tCO_{2e})	
(FD_y)	Annual diesel fuel consumption (m^3)	720 lt or 608.4 kg (608.4 x10^{-6} Gg) *Diesel oil density=0.845 kg/lt* *Annual amount of diesel consumption= 0.845 x 720 = 608.4 kg*
NCV_{diesel}	Net calorific value of diesel oil (TJ/m3)	43.3 TJ/Gg[53]
$COEF_{diesel}$	CO2 emission coefficient of diesel oil (tCO_2/TJ)	74800 kg/TJ[54] = 74.8 tCO2/TJ
PE= (608.4 x10^{-6} Gg) x (43.3 TJ/Gg) x (74.8 tCO_2/TJ) PE=1.974 tCO_{2e}		

[52] Dagbasi HEPP Weir Layout drawing with the number of DGB-KT-04.

[53] IPCC default values at upper limit of the uncertainty at a 95% confidence interval as provided in Volume 2 (Energy), Chapter 1, Table 1.4 in the 2006 IPCC Guidelines on National GHG Inventories. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf. Visited on 14 Nov 2013.

[54] IPCC default values at upper limit of the uncertainty at a 95% confidence interval as provided in Volume 2 (Energy), Chapter 1, Table 1.2 in the 2006 IPCC Guidelines on National GHG Inventories. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf. Visited on 14 Nov 2013.

3.3 Leakage

According to the AMS-I.D Version 17.0, leakage should be considered if the energy generating equipment is transferred from another activity. The proposed project is a new power plant and therefore the leakage is taken as zero.

3.4 Summary of GHG Emission Reductions and Removals

GHG Emission reduction calculation of Dagbasi HEPP is done in accordance with the following formula:

$ER_y = BE_y – PE_y – LE_y$

Where

ERy : Project Emission Reduction in year *y* (t CO2)

BEy : Baseline Emissions in year *y* (t CO2)

PE_y : Project Emission in year *y* (t CO2)

LE_y : Leakage Emission in year *y* (t CO2)

Following table provides a summary of the GHG emission reduction of Dagbasi HEPP. Project from 11th April 2014 to 11th April 2024.

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
11.04.2014-31.12.2014	14 735	1.434	0	14 733.6
2015	20 372	1.974	0	20 370
2016	20 372	1.974	0	20 370
2017	20 372	1.974	0	20 370
2018	20 372	1.974	0	20 370
2019	20 372	1.974	0	20 370
2020	20 372	1.974	0	20 370
2021	20 372	1.974	0	20 370
2022	20 372	1.974	0	20 370
2023	20 372	1.974	0	20 370

01.01.2024-11.04.2024	5 637	0.54	0	5 636
Total	**203 720**	**19.74**	**0**	**203 700**

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	**Gross EG_y**
Data unit:	GWh
Description:	Annual Gross Electricity Generation of Turkey in year y. y: 2008,2009 and 2010.
Source of data:	EIAS Web Site, Turkish Electricity Statistics, Year 2010. File name: *Annual Development of Electricity Generation- Consumption and Losses in Turkey (1984-2010)* *Türkiye Elektrik Enerjisi Üretim Tüketim ve Kayıplarının Yıllar İtibariyle Gelişimi (1984-2010)* Available at : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm
Value applied:	Annex II
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	-

Data Unit / Parameter:	**Net EG_y**
Data unit:	GWh
Description:	Annual Net Electricity Generation of Turkey in year y. y: 2008,2009 and 2010.
Source of data:	TEIAS Web Site, Turkish Electricity Statistics, Year 2010. File name: *Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2010)* *Türkiye Elektrik Enerjisi Üretim Tüketim ve Kayıplarının Yıllar İtibariyle Gelişimi (1984-2010)* Available at : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm
Value applied:	Annex II
Justification of choice of data or	TEIAS is the only government organization in Turkey which

description of measurement methods and procedures applied:	makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	This data is used to find out the ratio of the gross to net electricity generation which is later used to calculate the net electricity generation of thermal power plants. TEIAS does not provide the net electricity generation data of thermal power plants. However, it is essential to note that this is a conservative approach, since thermal power plants, in general, consume more electricity internally then hydro, wind power, geothermal and other similar power plants. This approach leads to higher net electricity amounts and lower emission reductions.

Data Unit / Parameter:	**EI_y**
Data unit:	GWh
Description:	Net electricity imported to the grid in year y. y: 2008,2009 and 2010.
Source of data:	TEIAS Web Site, Turkish Electricity Statistics, Year 2010. File name: *Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2010)* *Türkiye Elektrik Enerjisi Üretim Tüketim ve Kayıplarının Yıllar İtibariyle Gelişimi (1984-2010)* Available at : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm
Value applied:	Annex II
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	

Data Unit / Parameter:	**$FC_{i,y}$**
Data unit:	Tonnes or 1000 m^3
Description:	Annual Fuel Consumption by fuel type in year y. y: 2008,2009 and 2010.

Source of data:	TEIAS Web Site, Turkish Electricity Statistics, Year 2010. File name: *Fuels Consumed In Thermal P.Ps In Turkey By The Electricity Utilities (2006-2010)* *Türkiye Termik Santrallarında Kullanılan Yakıt Miktarlarının Üretici Kuruluşlara Dağılımı (2006-2010)* Available at : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm
Value applied:	Annex II
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	

Data Unit / Parameter:	$\mathbf{HV_{i,y}}$
Data unit:	TCal/Mass or TCal/Volume
Description:	Heating Values of fuels consumed for electricity generation by fuel type in year y. y: 2008,2009 and 2010.
Source of data:	TEIAS Web Site, Turkish Electricity Statistics, Year 2010. File name: *Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electricity Utilities ((2006-2010)* *Türkiye Termik Santrallarında Kullanılan Yakıtların Isı Değerlerinin Üretici Kuruluşlara Dağılımı (2006-2010)* Available at : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2011/istatistik%202011.htm
Value applied:	Annex II There is no national NCV data in Turkey. However, TEIAS announces Heating values of fuels. This data is used to calculate the annual NCVs for each fuel type via dividing it with the $FC_{i,y}$.
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	

Data Unit / Parameter:	**$NCV_{i,y}$**
Data unit:	TJ/kton, TJ/million m^3
Description:	Net Calorific Values of fuels consumed for electricity generation by fuel type in year y
Source of data:	NCV data is not available; therefore, NCV is calculated by dividing the Heating Value by the Fuel Consumption. Both data ($HV_{i,y}$ and $FC_{i,y}$) are provided by the TEIAS. $NCV = \frac{HV_{i,y}}{FC_{i,y}}$
Value applied:	Annex II
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	

Data Unit / Parameter:	**Electricity Capacity Additions**
Data unit:	-
Description:	Capacity addition to the national grid between 2009-2010, which comprises the 20% of the total electricity generation in 2010.
Source of data:	TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2011 (In Turkish). pp.88-106. Available at Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx (Click on the “2011” link). TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2010 (In Turkish). pp.85-100. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx (Click on the 2010 link). However, this source does not provide the commissioning date of the capacity additions in terms of day/month/year. Therefore, this missing data is completed by requesting it from TEIAS through the Bilgi Edinme Yasasi (Information Requesting Law) which provides individuals to request any data, which are okay to be publicly available, from government agencies. As per this Law, missing data is obtained from TEIAS.

Value applied:	Annex III
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS is the only government organization in Turkey which makes the electricity generation and transmission statistics available to the public. http://www.teias.gov.tr/
Any comment:	

Data Unit / Parameter:	$\mathbf{EF_{grid,CM,y}}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO2 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"
Source of data:	Dagbasi HEPP VCS PD-Baseline Calculations
Value applied:	0.5299 tCO_2/MWh
Justification of choice of data or description of measurement methods and procedures applied:	"Tool to calculate the emission factor for an electricity system"
Any comment:	"Tool to calculate the emission factor for an electricity system"

4.2 Data and Parameters Monitored

Data Unit / Parameter:	Electricity Generated by the Dagbasi HEPP ($EG_{Facility,y}$)
Data unit:	GWh/yr
Description:	Net electricity supplied to the national grid by the Dagbasi HEPP in year y.
Source of data:	Monthly official TEIAS invoices.
Description of measurement methods and procedures to be applied:	Measured by TEIAS-approved power meters located at the grid interface (TEIAS substation). Measured data is stored at the PMUM web site, which is operated by the TEIAS. Monthly official TEIAS invoices will be used for calculating EG_y. As a note, monthly settlement notifications of PMUM consist of electricity production and withdrawn from the grid on an hourly basis. PMUM data will be used to calculate net amount of electricity generated which will be equal to the electricity supplied to the grid minus electricity withdrawn from the grid.
Frequency of monitoring/recording:	Monthly
Value applied:	38.446 GWh /year (expected)
Monitoring equipment:	Monitoring equipment is the power meters located at the TEIAS substation. They will measure the amount of electricity supplied to the grid and withdrawn from the grid. One power meter will be the main one, and the other will serve as the backup. Power meters will be sealed by the TEIAS to prevent any possible interventions. Power meters will measure data hourly; however, readings will be on a monthly basis. Collected data will be stored at the PUMM by the TEIAS. Power meters calibration date is 20.03.2014. Brand of power meter is EMH and main power meter number is 4241359 and backup power meter number is 4241360.
QA/QC procedures to be applied:	PMUM settlement data will be used for crosschecking monthly TEIAS invoices.
Calculation method:	N/A
Any comment:	

Data Unit / Parameter:	**Apj**
Data unit:	m^2
Description:	Area of the Project reservoir measured on the surface of the

	water, after the implementation of the Project activity, when the reservoir is full.
Source of data:	Project Final Design drawings Dagbasi HEPP Weir Layout DGB-KT-GE-04
Value applied:	2800 m^2
Justification of choice of data or description of measurement methods and procedures applied:	Official detailed design document of the project.
Any comment:	-

Data Unit / Parameter:	**CAPpj**
Data unit:	MWe
Description:	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data:	Project site
Value applied:	10.433 MWe
Justification of choice of data or description of measurement methods and procedures applied:	The parameter will be determined from the labels on the equipment and commissioning approval letter issued by Ministry of Energy and Natural Resources
Any comment:	-

Data Unit / Parameter:	**PE_y**
Data unit:	tCO_{2e}
Description:	Project emission
Source of data:	Annual diesel bills
Value applied:	1.974 tCO_{2e} (expected)
Justification of choice of data or description of measurement methods and procedures applied:	Annual diesel consumption by the diesel generators is the main source of project emission. The only way to measure diesel consumption is the diesel bills. As described in section 3.2, project emission will be calculated.
Any comment:	-

4.3 Description of the Monitoring Plan

The purpose of Dagbasi HEPP Monitoring Plan is to ensure a complete and accurate measurement of the net electricity that will be generated by the project activity. Net electricity generation can be defined as the amount of electrical energy, referring to the difference between gross electricity generation and project's own internal electricity consumption. Multiplying the annual net electricity generation data with the CM emission factor provides the Dagbasi HEPP's annual emission CO_2 reduction.

At the project facility, there will be two power meters to measure the electricity supplied to the grid and drawn from the grid. Among these two power meters, one will serve as a main one; the other will be the backup of the main meter. Power meters will be installed by the project owner, but checked and approved by TEIAS before the commissioning. Technical specifications of the power meters should comply with the Communiqué for Power Meters[55] as announced by the EMRA for energy investors to comply with. Power meters calibration date is 20.03.2014. Brand of power meter is EMH and main power meter number is 4241359 and backup power meter number is 4241360.

As per the Communiqué for Power Meters regulations (Section II, Article 11), the minimum accuracy requirement the metering devices have to fulfill are categorized according to the installed capacity. As the rated output of the Project Activity is between 10 MW and 100 MW, the accuracy class of the active power meters and reactive power metes will be IEC-EN 60687 Class 0.5S and IEC-EN 61268 Class 2 respectively. Both power meters will be installed into the powerhouse and sealed by the TEIAS to prevent any possible intervention by the project owner or any other third party. Only TEIAS officers have access to them.

Calibration and maintenance of these two power meters are performed by the TEIAS once in a year as per the TEIAS System Usage Agreement rules.[56]

Besides that if one of the parties of the agreement feels that power meters are not working appropriately, power meters will be tested by the presence of both parties anyime. If test results show that the power meter is not working properly, then measurements of backup meter will be used, beginning from the last measurement value when both meters are reading the same data (page 3, 2-c). In case of the main meter has a breakdown, the readings of the back-up meter will be used. If both meters failed, the internal Supervisory Control and Data Acquisition System (SCADA) data will be used.

Power meters provide two types of data on an hourly basis. These are gross electricity generated and electricity consumed by the power plant. The difference between these two parameters provides the net electricity data.

TEIAS officers read power meters on a monthly basis, then transmit the data electronically to the TEIAS network to be stored at the PMUM[57], which is an electronic medium operated by the

[55] Elektrik Piyasasında Kullanılacak Sayaçlar Hakkında Tebliğ (in Turkish), enacted on 22.4.2011 with the number of 27913. http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44.

[56] TEIAS System Usage Agreement (Sistem Kullanım Antlaşması -in Turkish), Attachment 2-Section 3.3. pp.13. Available at http://mid.teias.gov.tr/SKAM/SKAornek.pdf

TEIAS where electricity is purchased and sold by free market rules. Based on this reading, a protocol form is printed out, which lists in detail the energy generation and consumption values in a similar way the PMUM web site lists them. Then, it is then signed by the site manager and the TEIAS officers.

The project owners can access its own consumption and generation data at PMUM web site by using their assigned ID and password, and can derive a variety of actual and historical data. These data are used by TEIAS for invoicing. At the PMUM web site, electricity data is available in terms of gross electricity generation and self-electricity consumption with a breakdown into three time periods (T1 for 06:00-17:00, T2 for 17:00-22:00, T3 for 22:00-06:00). However, it does not show the net electricity generation separately. Therefore, this data has to be calculated by using the gross electricity generation and self-electricity consumption for each month. The annual total net electricity generation is then found by summing up monthly net electricity generation values.

Origin of Monitoring Data

TEIAS invoices will be used for monitoring to determine the Dagbasi HEPP annual emission reductions. PMUM settlement web site data will be used for cross-checking.

No additional protocol between project owner and TEIAS will be required for VER crediting.

Monitoring of Project Emission

At Dagbasi HEPP, the only source of fuel consumption will be diesel generators. Annualy bills of fuel will be used to calculate project emission according to Section 3.2.

[57] PMUM Web Site. http://www.teias.gov.tr/mali/maliuz.htm

Monitoring Plan Line Diagram

A brief diagram of monitoring plan is given in the following figure.

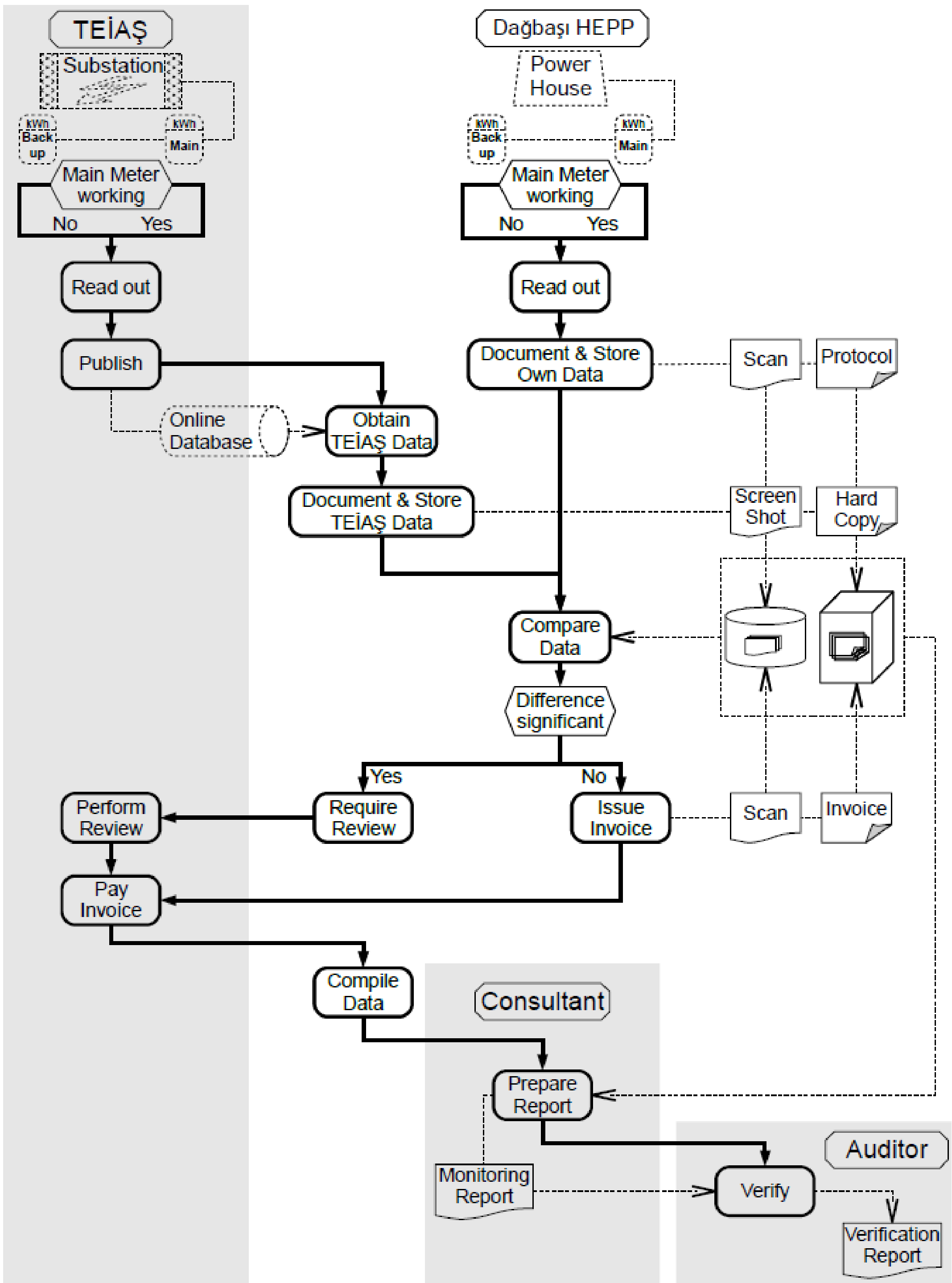

Figure 9: Monitoring Plan Line Diagram

Roles and Responsibilities

Dagbasi HEPP Plant Manager will be responsible for the implementation of the monitoring plan and preparation of the monitoring report. This task includes the archiving of TEIAS invoices, calculation of annual emission reduction for determining VCS VCUs, and crosschecking the TEIAS invoices data with the PMUM settlement web site for quality control purposes.

All relevant data is recorded and kept by the project owner and will be presented to the DOE during verification. Data will be kept for two years following the completion of the crediting period.

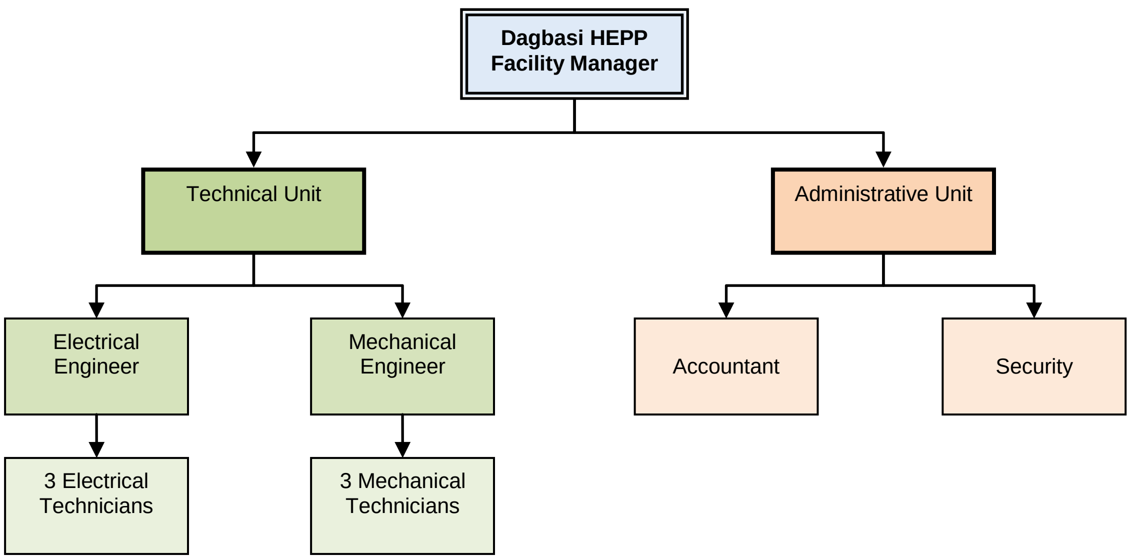

Figure 10: Proposed Line Diagram of the Dagbasi HEPP Facility Personnel

Procedures for handling internal auditing and non-conformities

As above mentioned, the data acquisition and management, and quality assurance procedures are in place as per the agreements with TEIAS and related regulations; therefore there is no need to establish additional procedures for the monitoring plan.

As a note, the two power meters are installed in a redundant manner will keep the uncertainty level of the monitoring parameter (net electricity generated) as low. Higher quality of this data is not only in the interest of the emission reduction monitoring, but also paramount for the business relation between the plant operator and the electricity buyers.

5 ENVIRONMENTAL IMPACT

The Environmental Impact Assessment (EIA) study for Dagbasi HEPP was conducted in 2010, and Dagbasi HEPP Project Description Report was prepared and submitted to the Ministry of Environment and Urbanization [58] in accordance with the Annex II of the Regulation on Environmental Impact Assessment in Turkey that is issued on 17 July 2008 and published in the Official Gazette numbered 26939. The report analyzes the potential environmental impacts of the project and the preventive measures that will be taken to eliminate and/or minimize those impacts

Project received EIA exemption on 12 January 2011 from the Ministry of Environment and Forestry due to that its environmental impact is minimal. The exemption letter indicates that “EIA is not Required” for Dagbasi HEPP project. This official letter will be available to DOE during the validation process. The exemption letter states that the preventive measures described in the Dagbasi HEPP Project Description Report are sufficient.

Per related environmental regulations, two more reports were prepared for the project. One is the Ecosystem Report which analyses the impact of the future on the local ecosystem, and the other is the Water Use Rights Report which studies the local water needs in the project site, such as irrigating farm land, fish warms, drinking water etc. The purpose of this report is to ensure that implementation of the project will not negatively affect the local people life in terms of meeting their water needs.

In general, Dagbasi HEPP project will produce benefits in many ways. First of all it is a renewable type; therefore, its impact on the environment is very limited as compared with the traditional thermal power plants which mainly dominate the Turkish grid system. Besides that, in the design of the project, special efforts spent to make the project in consistent with the sustainable development of the region. In other words, besides being environmentally friendly, project also will improve the life of local people through providing job opportunities.

As a renewable energy generation project, Dagbasi HEPP does not affect the environment in a way that fossil fuelled power plants do. In other words, project will not emit waste heat and gases that is common with fossil fuel driven thermal power plants, which are major contributor to air pollution, global warming and acid raid. Mining and drilling required to acquire fossil fuels for power plants have also significant negative environmental impacts.

Project will support Turkey in stimulating and commercializing the use of grid connected renewable energy technologies and markets, which are far more environmentally friendly than thermal power plants. This will lead a diversification of Turkish electricity generation mix which is currently dominated by the fossil fueled power plants.

Project will contribute to the air quality by indirectly reducing the airborne pollutants that would otherwise be released by the thermal power plants in the national grid.

[58] Its title was Ministry of Environment and Forestry at that time.

Mitigation measures will be taken to minimize possible negative environmental impacts, such as fish migration and sustaining the local habitat. Project will have a fish way, and will release a minimum amount of water to the river bed to sustain the existing aquatic life.

At global scale, project will contribute to the mitigation efforts of global climate change problem.

6 STAKEHOLDER COMMENTS

A stakeholder consultation meeting (LSC) was organized on October 14, 2011. Meeting was held at the Sugozu Primary Village located at the Sugozu village, which is the closest residential area to the project site.

Majority of the meeting participants were from Sugozu village. There were also participants from neighbour villages. Other participants include Mayor of the Anamur Municipality, a representative from the State Hydraulics Works (DSI) and the president of the Irrigation Union.

At the meeting, there was no negative feedback from the meeting participants; the project was welcomed by the residents living in the project region. They believe that project creates a momentum for local sustainable development.

Location of the LSC meeting, Sugozu Village Primary School.

A picture of the participants

One participant is asking a question

Mayor of Anamur Municipality is making a final speech

Mayor of Anamur Village is leaving the meeting. He is saying goodbye to meeting participants, which are mostly from Sugozu village

Cocktail ceremony following the closure of the meeting

ANNEX I : PRIVATELY-OWNED HYDROPOWER PROJECTS BY THE END OF 2010[59]

POWER PLANT	INSTALLED CAPACITY (MW)	PROJECT ENERGY GENERATION CAPACITY (GWh)	RELIABLE ENERGY GENERATION CAPACITY (GWh)
BEREKET (DENİZLİ)	3,7	12	12
AKÇAY	28,8	95	45
AKIM (CEVİZLİK HES)	91,4	330	187
ANADOLU ÇAKIRLAR	16,2	60	28
ASA EN.(KALE REG.)	9,6	32	18
BAYBURT HES	14,6	51	24
CEYKAR BAĞIŞLI	29,6	99	47
BEREKET (DALAMAN)	37,5	179	179
BEREKET (FESLEK)	9,5	41	25
BEREKET (GÖKYAR)	11,6	43	23
BEREKET (MENTAŞ)	39,9	163	140
BEREKET (KOYULHİSAR)	42,0	329	155
BEYOBASI (SIRMA)	5,9	23	11
AKUA KAYALIK	5,8	39	20
AKKÖY ENERJİ (AKKÖY HES)	101,9	408	263
ALAKIR (YURT EN.)	2,1	6	4
ALP ELEKTRİK (TINAZTEPE)	7,7	29	17
BEYTEK(ÇATALOLUK HES)	9,5	31	17
BİRİM (ERFELEK HES)	6,5	19	11
BULAM	7,0	33	19
BURÇBENDİ (AKKUR EN.)	27,3	113	64
CANSU ELEKTRİK (ARTVİN)	9,2	47	31
CEYHAN HES (BERKMAN HES-ENOVA)	25,2	103	58
CEYHAN HES (OŞKAN HES-ENOVA)	23,9	98	55
CİNDERE DENİZLİ	28,2	88	50
ÇAKIT HES	20,2	96	54
ÇALDERE ELEKTRİK DALAMAN MUĞLA	8,7	35	25
ÇAMLIKAYA	5,6	19	11
DAMLAPINAR(CENAY ELEK.)	16,4	92	52
DAREN HES (SEYRANTEPE BARAJI)	49,7	182	161
DEĞİRMENÜSTÜ (KAHRAMANMARAŞ)	38,6	106	52
DENİZLİ EGE 1	0,9	4	2
DİM HES (DİLER ELEK.)	38,3	123	70

[59] TEIAS, “10 Year Energy Generation Capacity Projection Report”, 2011 (In Turkish). pp.98-100. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx. Click on the “2011” link.

DİNAR HES (ELDA ELEK.)	4,4	15	9
DOĞUBAY ELEK.(SARIMEHMET HES)	3,1	10	6
EGEMEN 1 HES (ENERSİS ELEK.)	19,9	72	41
EKİN ENERJİ (BAŞARAN HES)	0,6	5	0
ELESTAŞ YAYLABEL	5,1	20	10
ELESTAŞ YAZI	1,1	6	3
ENERJİ-SA BİRKAPILI	48,5	171	17
ENERJİ-SA-AKSU-ŞAHMALLAR	14,0	45	7
ENERJİ SA-SUGÖZÜ-KIZILDÜZ	15,4	55	8
ERENLER REG.(BME BİRLEŞİK EN.)	45,0	85	48
ERENKÖY REG.(TÜRKERLER)	21,5	87	49
ERİKLİ-AKOCAK REG.(AK EN.)	82,5	257	146
EŞEN-II (GÖLTAŞ)	43,4	170	80
ELTA (DODURGA)	4,1	12	12
ERVA KABACA HES	8,5	33	15
FEKE 2 (AKKUR EN.)	69,3	223	126
FIRTINA ELEK.(SÜMER HES)	21,6	70	39
FİLYOS YALNIZCA HES	14,4	67	33
GÖK HES	10,0	43	24
GÜDÜL I (YAŞAM EN.)	2,4	14	8
GÜZELÇAY-I HES(İLK EN.)	8,1	43	24
HAMZALI HES (TURKON MNG ELEK.)	16,7	117	66
H.G.M.ENER.(KEKLİCEK HES)	8,7	18	11
HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1,2	5	3
HİDRO KONTROL YUKARI MANAHOZ	22,4	79	45
HİDRO KONTROL (SELİMOĞLU HES)	8,8	35	20
İÇ-EN ELEK. ÇALKIŞLA	7,7	18	11
İÇTAŞ YUKARI MERCAN	14,2	44	20
İŞKUR (SÜLEYMANLI HES)	4,6	18	4
KAHRAMAN REG.(KATIRCIOĞLU ELEK.)	1,4	6	3
KAHTA I HES(ERDEMYILDIZ ELEK.)	7,1	35	20
KALE HES	34,1	116	66
KALEN ENER. (KALEN I-II)	31,3	104	47
KALKANDERE-YOKUŞLU HES(AKIM EN.)	14,5	63	36
KARADENİZ ELEK.(UZUNDERE I HES)	62,2	165	93
KAREL (PAMUKOVA)	9,3	55	55
KAR-EN KARADENİZ ELEK.(ARALIK HES)	12,4	56	32
KARŞIYAKA HES (AKUA EN.)	1,6	8	5
KAYABÜKÜ HES (ELİTE ELEK.)	14,6	49	28
KAYEN ALFA EN.KALETEPE HES (tortum)	10,2	37	17
KİRPİLİK HES (ÖZGÜR ELEK.)	6,2	22	13
KOZAN HES (SER-ER EN.)	4,0	9	5

KULP IV HES (YILDIZLAR EN.)	12,3	41	23
KURTEKS (Karasu Andırın HES)	2,4	19	19
TGT EN. LAMAS III-IV	35,7	150	71
MARAŞ ENERJİ (FIRNIS)	7,2	36	23
MOLU ENERJİ (BAHÇELİK HES)	4,2	30	30
MURGUL BAKIR	24,2	50	39
NARİNKALE HES (EBD EN.)	3,1	10	6
NİSAN EN.(BAŞAK HES)	6,9	22	12
NURYOL EN.(DEFNE HES)	7,2	22	13
ÖZGÜR ELEKTR.K.Maraş Tahta HES	12,5	54	54
ÖZGÜR ELEKTR.AZMAK I	11,8	43	24
ÖZGÜR ELEKTR.AZMAK II	6,3	20	11
ÖZTAY GÜNAYŞE	8,3	29	14
ÖZYAKUT GÜNEŞLİ HES	1,8	8	4
PAMUK (Toroslar)	23,3	112	28
PAŞA HES(ÖZGÜR EL.)	8,7	34	19
PETA EN. (MURSAL II HES)	4,5	19	11
REŞADİYE I HES(TURKON MNG EL.	15,7	126	71
REŞADİYE II HES(TURKON MNG EL.	26,1	210	119
SABUNSUYU II HES (ANG EN.)	7,4	21	12
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,0	96	54
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,6	108	61
SARITEPE HES DİNAMİK SİSTEMLER	4,9	20	9
SELEN EL.(KEPEZKAYA HES)	28,0	124	70
SU ENERJİ (ÇAYGÖREN HES)	4,6	19	4
ŞİRİKÇİOĞLU KOZAK	4,4	15	7
TAŞOVA YENİDEREKÖY	2,0	10	6
TEMSA ELEKTRİK (GÖZEDE HES)	2,4	10	6
TEKTUĞ-KARGILIK	23,9	83	19
TEKTUĞ-ANDIRIN	40,5	106	60
TEKTUĞ-KALEALTI HES	15,0	52	11
TEKTUĞ-KEBENDERESİ	5,0	32	20
TEKTUĞ-ERKENEK	12,5	50	30
TURKON MNG REŞADİYE III	22,3	175	88
UMUT III HES(NİSAN EL.)	12,0	26	15
UZUNÇAYIR	82,0	322	182
YEDİGÖZE HES	155,3	474	268
YEŞİL ENERJİ (TAYFUN HES)	0,8	5	4
YEŞİLBAŞ	14,0	56	26
YAPISAN HACILAR DARENDE	13,3	90	54
YAPISAN KARICA DARICA	97,0	328	154
YAVUZ HES (MASAT EN.)	22,5	83	47

YPM ALTINTEPE SUŞEHRİ HES	4,0	18	10
YPM BEYPINAR HES	3,6	18	9
YPM KONAK HES (SUŞEHRİ/SİVAS)	4,0	19	10
YPM GÖLOVA	1,1	3	2
YPM SEVİNDİK	5,7	36	18
YURT EN. TOCAK I	4,8	13	6
TÜM EN. PINAR	30,1	138	65
ULUBAT KUVVET TÜN.(AK EN.)	97,0	372	210
BEYKÖY ZORLU	16,8	87	87
KUZGUN ZORLU	20,9	36	0
TERCAN ZORLU	15,0	51	28
ATAKÖY ZORLU	5,5	8	8
ÇILDIR ZORLU	15,4	30	20
İKİZDERE ZORLU	18,6	110	100
MERCAN ZORLU	20,4	78	48

ANNEX II: OM CALCULATIONS

Table 14: Fossil Fuel Consumed in Thermal Power Plants in Turkey (ton /gas 10^3 m^3)[60]

Fuel Type	2008	2009	2010
Hard Coal+Imported Coal+Asphaltite	6,270,008	6,621,177	7,419,703
Lignite	66,374,120	63,620,518	56,689,392
Fuel Oil	2,173,371	1,594,321	891,782
Diesel Oil	131,206	180,857	20,354
LPG	0	111	0
Naphta	10,606	8,077	13,140
Natural Gas	21,607,635	20,978,040	21,783,414

Net Calorific Values (NCV) data in Turkey is not publicly available. However, TEIAS announces Heating values of fuels which can be used to calculate the annual NCVs for each fuel type through dividing by the Fuel Consumption.

Table 15: Heating Values of Fuels Consumed in Thermal Power Plants in Turkey (Tcal)[61]

Fuel Type	2008	2009	2010
Hard Coal+Imported Coal+Asphaltite	33,310	35,130	39,546
Lignite	108,227	97,652	96,551
Fuel Oil	20,607	15,160	8,569
Diesel Oil	1,328	1,830	209
LPG	0	1	0
Naphta	113	84	105
Natural Gas		186,266	194,487

[60] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, "*Fuels Consumed in Thermal Power Plants in Turkey (2006-2010).*" Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Fuels Consumed In Thermal P.Ps In Turkey By The Electricity Utilities (2006-2010)." Accessed on 12 April 2012.

[61] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, "*Heating Values of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities."* http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: " Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electricity Utilities ((2006-2010)." Accessed on 12 April 2012.

Table 16: Heating Values of Fuels Consumed in Thermal Power Plants in Turkey (GJ)[62]

Fuel Type	2008	2009	2010
Hard Coal+Imported Coal+Asphaltite	139,462	147,082	165,571
Lignite	453,125	408,849	404,240
Fuel Oil	86,277	63,472	35,877
Diesel Oil	5,560	7,662	875
LPG	0	4	0
Naphta	473	352	440
Natural Gas	791,544	779,858	814,278

Table 17: NCV of Fuels Consumed in 2008, 2009 and 2010 (GJ/Kg)

Fuel Type	2008	2009	2010
Hard Coal+Imported Coal+Asphaltite	0.02224	0.02221	0.02232
Lignite	0.00683	0.00643	0.00713
Fuel Oil	0.03970	0.03981	0.04023
Diesel Oil	0.04238	0.04236	0.04299
LPG		0.03604	
Naphta	0.04460	0.04358	0.03349
Natural Gas	0.03663	0,03717	0,03738

Table 18: Summary Table: FC, Heat Values, NCV and EF_{CO2} Values for 2008

Fuel Type	FC (tonnes)	Heat Value (GJ)	NCV (GJ/Kg)	EFCO2 (Kg/GJ)	CO2 Emission (Tonnes)
Hard Coal+Imported Coal + Asphaltite	6,270,008	139,462	0.02224	92.8	12,942,102
Lignite	66,374,120	453,125	0.00683	90.9	41,189,045
Fuel Oil	2,173,371	86,277	0.03970	75.5	6,513,943
Diesel Oil	131,206	5,560	0.04238	72.6	403,661
LPG	0	0		61.6	0
Naphta	10,606	473	0.04460	69.3	32,786
Natural Gas	21,607,635	791,544	0.03663	54.3	42,980,831

[62] Conversion factor of 4.1868 Joules/Cal is used

CO_2 Emission (Tonnes) for year 2008	**104,062,368**

Table 19: Summary Table: FC, Heat Values, NCV and EF_{CO2} Values for 2009

Fuel Type	FC (tonnes)	Heat Value (GJ)	NCV (GJ/Kg)	EFCO2 (Kg/GJ)	CO2 Emission (Tonnes)
Hard Coal+Imported Coal + Asphaltite	6,621,177	147,082	0.02221	92.8	13,649,236
Lignite	63,620,518	408,849	0.00643	90.9	37,164,410
Fuel Oil	1,594,321	63,472	0.03981	75.5	4,792,128
Diesel Oil	180,857	7,662	0.04236	72.6	556,250
LPG	111	4	0.03604	61.6	258
Naphta	8,077	352	0.04358	69.3	24,372
Natural Gas	20,978,040	186,266	0,03717	54.3	42,346,316
CO_2 Emission (Tonnes) for year 2009					**98,532,969**

Table 20: Summary Table: FC, Heat Values, NCV and EF_{CO2} Values for 2010

Fuel Type	FC (tonnes)	Heat Value (GJ)	NCV (GJ/Kg)	EFCO2 (Kg/GJ)	CO2 Emission (Tonnes)
Hard Coal+Imported Coal + Asphaltite	7,419,703	165,571	0.02232	92.8	15,365,007
Lignite	56,689,392	404,240	0.00713	90.9	36,745,391
Fuel Oil	891,782	35,877	0.04023	75.5	2,680,472
Diesel Oil	20,354	875	0.04299	72.6	62,601
LPG	0	0		61.6	0
Naphta	13,140	440	0.03349	69.3	39,650
Natural Gas	21,783,414	194,487	0,03738	54.3	43,972,046
CO_2 Emission (Tonnes) for year 2010					**98,865,167**

The calculation of net electricity production is demonstrated below. As the efficiency factor from gross to net electricity for thermal resources is not known, the overall relation between gross and net electricity production is assumed to be the same for thermal production. Following table shows the overall gross/net relation where the estimated net electricity production from thermal resources were calculated by using the same relation.

Table 21: Net Electricity Production from Thermal Power Plants (GWh) [63]

[63] Gross electricity generation and net electricity generation data are from the following reference:
TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey. "*Annual Development of Electricity Generation- Consumption and Losses in Turkey (1984-2010).*" Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm.

	2008	2009	2010
Gross Electricity Production [GWh] (a)	198,418	194,813	211,207.7
Net Electricity Production [GWh] (b)	189,762	186,619	203,046.1
Net/Gross (c= a/b)	0.956	0.958	0.961
Gross Electricity Production from thermal sources [GWh] (d)	163,919	156,583	155,370
Net Electricity Production from thermal sources [GWh] (c*d)	156,768	149,998	149,366

Table 22: Electricity imported to the Grid from Other Countries[64] (GWh)

Countries	2008	2009	2010
Georgia	215.5	182.1	303.2
Iran	450.0	504.5	684.6
Nahcievan	94.0	125.3	156.0
Greece	29.9	-	-
TOTAL	**789.4**	**812.0**	**1,143.8**

Table 23: EGy - Net Electricity Supply to the Grid by Thermal Plants and Imports[65]

[GWh]	2008	2009	2010
Gross Generation	198,418	194,813	211,207.7
Net Generation	189,762	186,619	203,046.1

Click on the following link:
Annual Development of Electricity Generation- Consumption and Losses in Turkey (1984-2010). Accessed on 28 Nov 2012.

Data for electricity generation from thermal resources is from the following reference:

TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey."*Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)".*Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)." Accessed on 28 Nov 2012.

[64] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, *"Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)".*Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)." Accessed on 28 Nov 2012.

[65] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, *"Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)".*Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Annual Development of Turkey's Gross Electricity Generation-Imports-Exports and Demand (1975-2010)." Accessed on 28 Nov 2012.

Net/Gross	0.956	0.958	0.961
Gross Electricity Production from Thermal Sources	163,919	156,583	155,370
Net Electricity Production from Thermal Sources	156,768	149,998	149,366
Imports	789	812	1,144
Net Generated + Imports	157,558	150,810	150,510

The last part of Step 4 is calculating the ratio of emissions and generation:

Table 24: $EF_{grid,OMsimple,y}$ Values, 2008 - 2010 (tCO_2/MWh)

	2008	**2009**	**2010**
$EF_{Grid,y}$ [tCO_2/MWh]	0.659590	0.651952	0.654954
OM Emission Factor	**0.655 tCO_2 / MWh**		

ANNEX III: BM CALCULATIONS

Table 25: Generation of Recent Capacity Additions

	GWh
System Generation in 2010 (GWh)s[66]	211,207.727
System Generation 2010 excluding CDM Project activities	208619.757
Minimum Threshold (20%)	41723.9514
Total of selected power plants [2009 + 2010] [GWh]	41930.37
Annual Generation of Capacity Additions in 2010[67]	29,337.44
Annual Generation of Capacity Additions in 2009[68]	12592.93

The final list of the power plants in the Sample Set is available in the following table.

Table 26: Recent Capacity Additions (2009-2010)[69]

POWER PLANT	INSTALLED CAPACITY (MW)	PROJECT ENERGY GENERATION (GWh)	PLANT TYPE	COMMISSIONING DATE
INTERNATIONAL HOSPITAL İSTANBUL AŞ.	0.77	6.0	Natural Gas	31.12.2010
KALKANDERE REG. VE YOKUŞLU HES	14.54	63.0	Hydro	30.12.2010
TURGUTTEPE RES (SABAŞ ELEKTRİK ÜR.)	22.00	64.0	Wind	30.12.2010
KAHRAMAN REG. VE HES (KATIRCIOĞLU)	1.42	6.0	Hydro	30.09.2010
NARİNKALE REG. VE HES (EBD ENERJİ)	3.10	10.0	Hydro	30.09.2010
ERİKLİ-AKOCAK REG. ve AKOCAK HES	82.50	257.0	Hydro	30.06.2010
ÇAMLIKAYA REG. VE HES	5.65	19.0	Hydro	30.06.2010
BORASKO ENERJİ (BANDIRMA RES)	12.00	47.8	Wind	30.06.2010
ITC-KA ENERJİ (SİNCAN)	1.42	11.1	Renew+Wastes	30.04.2010

[66] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, "*Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (1975-2010)*." Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (1975-2010)." Accessed on 28 Nov 2012.

[67] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, "*Generation Units Put into Operation in 2010."* Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/%C4%B0statistik%202010.htm. Click on the following link: "Generation Units Put into Operation in 2010". Accessed on 28 Nov 2012.

[68] TEIAS Web Site, Electricity Generation and Transmission Statistics of Turkey, *Generation Units Put into Operation in 2009.*Available at http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2009/index.htm. Accessed on 28 Nov 2012.

[69] 2010 year data is derived from the TEIAS, "10 Year Energy Generation Capacity Projection Report", 2011 (In Turkish). pp.102-106. Available at http://www.teias.gov.tr/KapasiteProjeksiyonu.aspx. Click on the "2011" link. 2009 year data is derived from the excel table obtained from the TEIAS (2009 Yılı Kurulu Güç Yeni Giren Santrallar.xls).

KAR-EN KARADENİZ EL.A.Ş. ARALIK HES	12.41	56.0	Hydro	30.04.2010
RASA ENERJİ (VAN) (İlave)	10.12	64.9	Natural Gas	29.12.2010
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600.00	4006.0	Imported Coal	29.12.2010
KIRKA BORAKS(Kırka) (Eti Maden İşl.) (İlave)	10.00	65.9	Natural Gas	29.09.2010
ALAKIR HES (YURT ENERJİ ÜRETİM)	2.06	6.0	Hydro	29.01.2010
SABUNSUYU II HES (ANG ENERJİ ELK.)	7.35	21.0	Hydro	28.10.2010
KARŞIYAKA HES (AKUA ENERJİ ÜRET.)	1.59	8.0	Hydro	28.08.2010
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101.95	801.0	Natural Gas	31.07.2010
AKIM ENERJİ (CEVİZLİK REG. VE HES)	91.40	330.0	Hydro	28.05.2010
ALİZE ENERJİ (KELTEPE RES)	1.80	6.4	Wind	28.04.2010
CAN TEKSTİL (Çorlu/TEKİRDAĞ)	7.83	60.2	Natural Gas	28.01.2010
ALTINMARKA	4.60	37.0	Natural Gas	28.01.2010
BAYBURT HES (BAYBURT ENERJİ ÜRET.)	14.63	51.0	Hydro	28.01.2010
UZUNÇAYIR HES (Tunceli) (İlave)	54.60	214.6	Hydro	28.01.2010
ULUABAT KUVVET TÜNELİ VE HES	97.00	372.0	Hydro	27.10.2010
KARADENİZ EL.ÜRET. (UZUNDERE-1 HES)	62.20	165.0	Hydro	27.05.2010
FRİTOLAY GIDA SAN.VE TİC A.Ş. (İlave)	0.33	2.5	Renew+Wastes	26.11.2010
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	69.84	557.9	Natural Gas	26.11.2010
REŞADİYE 1 HES (TURKON MNG ELEKT.)	15.68	126.0	Hydro	26.11.2010
EGEMEN 1 ve 1B HES (ENERSİS ELEKTRİK)	19.90	72.0	Hydro	26.11.2010
SÖNMEZ ENERJİ ÜRETİM (UŞAK)	33.24	256.3	Natural Gas	26.08.2010
NURYOL ENERJİ (DEFNE REG. VE HES)	7.23	22.0	Hydro	26.03.2010
MENDERES GEOTERMAL DORA-2	9.50	73.0	Geothermal	26.03.2010
GLOBAL ENERJİ (PELİTLİK)	3.54	27.1	Natural Gas	26.02.2010
KONYA ŞEKER SAN. VE TİC. A.Ş.	6.00	Yok	Lignite	26.02.2010
ASMAKİNSAN (BANDIRMA 3 RES)	24.00	85.0	Wind	26.02.2010
MARMARA PAMUKLU MENSUCAT (İlave)	26.19	203.5	Natural Gas	25.11.2010
GÜDÜL I REG. VE HES (YAŞAM ENERJİ)	2.36	14.0	Hydro	25.08.2010
FEKE 2 BARAJI VE HES (AKKUR ENERJİ)	69.34	223.0	Hydro	24.12.2010
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	4.25	32.9	Renew+Wastes	24.02.2010
RB KARESİ İTHALAT İHRACAT TEKSTİL	8.60	65.0	Natural Gas	23.07.2010
HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1.20	5.0	Hydro	23.02.2010
SARES RES (GARET ENERJİ ÜRETİM)	15.00	60.0	Wind	22.12.2010
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101.95	801.0	Natural Gas	22.05.2010
YILDIZ ENTEGRE AĞAÇ (Kocaeli)	12.37	79.8	Natural Gas	22.04.2010
BAKRAS EN. ELKT.ÜR. A.Ş. ŞENBÜK RES	15.00	47.0	Wind	22.04.2010
ETİ SODA ÜRE.PAZ.NAK.VE ELK.ÜRE.SAN.	24.00	144.0	Lignite	22.01.2010
KOZAN HES (SER-ER ENERJİ)	4.00	9.0	Hydro	21.09.2010
KAYABÜKÜ REG. VE HES (ELİTE ELEKT.)	14.58	49.0	Hydro	21.07.2010
UĞUR ENERJİ ÜRETİM TİC. VE SAN. A.Ş.	48.20	405.1	Natural Gas	21.06.2010
FRİTOLAY GIDA SAN.VE TİC A.Ş.	0.07	0.5	Renew+Wastes	21.04.2010
CİNDERE HES (İlave)	9.07	28.5	Hydro	21.01.2010
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	25.20	103.0	Hydro	20.08.2010
AKSA ENERJİ (ANTALYA)	25.00	192.5	Natural Gas	20.03.2010
ALİZE ENERJİ (SARIKAYA RES) (Şarköy)	28.800	96.00	Wind	19.10.2009
CAN ENERJİ ELEKTRİK ÜR. A.Ş.(Tekirdağ)	29.10	203.0	Natural Gas	19.08.2010
KURTOĞLU BAKIR KURŞUN SAN. A.Ş.	1.59	12.0	Natural Gas	19.08.2010
AKDENİZ ELEKTRİK (MERSİN RES)	33.00	100.0	Wind	19.03.2010

PETA MÜHENDİSLİK EN. (MURSAL II HES)	4.50	19.0	Hydro	19.02.2010
ASA ENERJİ (KALE REG.ve HES)	9.57	32.0	Hydro	19.02.2010
ALTEK ALARKO ELEKTRİK SANTRALLARI	21.89	151.4	Natural Gas	18.12.2010
MAZI-3 RES ELEKTRİK (MAZI-3 RES)	7.50	26.5	Wind	18.06.2010
AKBAŞLAR (İlave)	1.54	12.1	Natural Gas	18.02.2010
REŞADİYE 2 HES (TURKON MNG ELEKT.)	26.14	210.0	Hydro	17.09.2010
BİNATOM ELEKTRİK ÜRETİM A.Ş.	2.00	13.0	Natural Gas	17.08.2010
FLOKSER TEKSTİL (Çerkezköy/TEKİRDAĞ)	5.17	42.0	Natural Gas	17.07.2010
POLYPLEX EUROPA POLYESTER FİLM	7.81	61.0	Natural Gas	16.12.2010
BORASKO ENERJİ (BANDIRMA RES)	21.000	85.30	Wind	16.10.2009
KALE REG. VE HES (KALE ENERJİ ÜR.)	34.14	116.0	Hydro	16.06.2010
FIRTINA ELEKTRİK ÜR. A.Ş. (SÜMER HES)	21.60	70.0	Hydro	16.04.2010
TÜPRAŞ RAFİNERİ (İZMİT) (İlave)	40.00	258.8	Natural Gas	15.12.2010
EREN ENERJİ ELEKTRİK ÜRETİM A.Ş.	160.00	1068.0	Imported Coal	15.07.2010
ZİYARET RES (ZİYARET RES ELEKTRİK)	35.00	140.0	Wind	15.07.2010
GÜZELÇAY-I ve II HES (İLK ELEKTRİK ENERJİ)	8.10	43.0	Hydro	15.06.2010
KAHTA I HES (ERDEMYILDIZ ELEK. ÜRT.)	7.12	35.0	Hydro	14.10.2010
YAVUZ REG. VE HES (MASAT ENERJİ)	22.50	83.0	Hydro	14.07.2010
ROTOR ELEKTRİK (OSMANİYE RES)	55.00	207.8	Wind	14.01.2010
UMUT III REG. VE HES (NİSAN ELEKTR.)	12.00	26.0	Hydro	13.12.2010
SOMA RES (BİLGİN RÜZGAR SAN. EN.ÜR.)	90.00	307.0	Wind	13.08.2010
KULP IV HES (YILDIZLAR EN.ELK.ÜR.AŞ.)	12.30	41.0	Hydro	13.01.2010
TUZLA JEOTERMAL	7.50	55.0	Geothermal	13.01.2010
DENİZ ELEKTRİK (SEBENOBA RES)	10.00	36.7	Wind	12.03.2010
MURGUL BAKIR (Ç.Kaya) (İlave)	19.60	40.5	Hydro	11.11.2010
KESKİNOĞLU TAVUKÇULUK VE DAM. İŞL.	3.50	25.0	Natural Gas	11.08.2010
KİRPİLİK REG. VE HES (ÖZGÜR ELEKTRİK)	6.24	22.0	Hydro	11.07.2010
PAŞA REG. VE HES (ÖZGÜR ELEKTRİK)	8.68	34.0	Hydro	11.06.2010
DOĞUBAY ELEKTRİK (SARIMEHMET HES)	3.10	10.0	Hydro	11.03.2010
BULAM REG. VE HES (MEM ENERJİ ELK.)	7.03	33.0	Hydro	10.08.2010
ALTEK ALARKO ELEKTRİK SANTRALLARI	60.10	415.6	Natural Gas	10.07.2010
SOMA ENERJİ ÜRETİM (SOMA RES)	34.20	114.0	Wind	10.03.2010
KUYUCAK RES (ALİZE ENERJİ ÜR.) (İlave)	25.60	110.0	Wind	09.12.2010
NİSAN E.MEKANİK EN. (BAŞAK REG. HES)	6.85	22.0	Hydro	09.04.2010
BOREAS ENERJİ (BOREAS I ENEZ RES)	15.00	49.0	Wind	09.04.2010
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	90.00	355.0	Wind	09.04.2010
DAMLAPINAR HES (CENAY ELEKTRİK ÜR.)	16.42	92.0	Hydro	08.07.2010
DİM HES (DİLER ELEKTRİK ÜRETİM)	38.25	123.0	Hydro	08.07.2010
SÖNMEZ ENERJİ ÜRETİM (UŞAK) (İlave)	2.56	17.9	Natural Gas	07.12.2010
ENERJİ-SA (BANDIRMA)	930.80	7540.0	Natural Gas	07.10.2010
UĞUR ENERJİ ÜR. TİC.VE SAN. A.Ş. (İlave)	12.00	100.9	Natural Gas	07.10.2010
ERENKÖY REG. VE HES (TÜRKERLER)	21.46	87.0	Hydro	07.10.2010
BEYTEK EL. ÜR. A.Ş. (ÇATALOLUK HES)	9.54	31.0	Hydro	07.04.2010
SELİMOĞLU REG. VE HES	8.80	35.0	Hydro	07.01.2010
SELEN ELEKTRİK (KEPEZKAYA HES)	28.00	124.0	Hydro	06.09.2010
GÖK REG. ve HES (GÖK ENERJİ EL. SAN.)	10.01	43.0	Hydro	06.08.2010
ROTOR ELEKTRİK (GÖKÇEDAĞ RES)	22.50	85.0	Wind	05.06.2010
ATAER ENERJİ ELEKTRİK ÜRETİM A.Ş.	49.00	277.9	Natural Gas	05.05.2010

BURÇ BENDİ VE HES (AKKUR ENERJİ)	27.33	113.0	Hydro	04.11.2010
ERENLER REG. ve HES (BME BİR.MÜT.EN.)	45.00	85.0	Hydro	04.06.2010
TEKTUĞ ELEKTRİK (ANDIRIN HES)	40.50	106.0	Hydro	03.09.2010
ÜTOPYA ELEKTRİK (DÜZOVA RES) (İlave)	15.00	45.0	Wind	03.09.2010
DİNAR HES (ELDA ELEKTRİK ÜRETİM)	4.44	15.0	Hydro	03.07.2010
CEYHAN HES (OŞKAN HES) (ENOVA EN.)	23.89	98.0	Hydro	03.06.2010
BİRİM HİDR. ÜRETİM AŞ. (ERFELEK HES)	6.50	19.0	Hydro	03.04.2010
RASA ENERJİ (VAN)	26.19	166.5	Natural Gas	03.03.2010
YEDİGÖZE HES (YEDİGÖZE ELEKTRİK)	155.33	474.0	Hydro	02.12.2010
ITC ADANA BİOKÜTLE SANT.	9.90	80.0	Renew+Wastes	02.09.2010
BELEN ELEKTRİK (BELEN RES) (İlave)	6.00	19.0	Wind	02.09.2010
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600.00	4006.0	Imported Coal	01.11.2010
AKSA ENERJİ (ANTALYA)	25.00	192.5	Natural Gas	01.07.2010
ÇAKIT HES (ÇAKIT ENERJİ A.Ş.)	20.18	96.0	Hydro	01.06.2010
ÖZGÜR ELEKTRİK (AZMAK I REG.VE HES)	11.80	43.0	Hydro	01.04.2010
CEV ENERJİ ÜRETİM (GAZİANTEP ÇÖP BİOGAZI)	1.13	8.6	Renew+Wastes	01.02.2010
BİL ENERJİ (DG+M)(Balgat)	36.587	229.00	Natural Gas	12/31/2009
E.ŞEHİR END. ENERJİ (DG+M)(Eskişehir-2)	59.025	452.00	Natural Gas	12/31/2009
EGE BİRLEŞİK ENERJİ (LPG+DG+M)(Aliağa)	12.825	107.00	Natural Gas	12/31/2009
HABAŞ ALİAĞA	224.460	1796.00	Natural Gas	12/31/2009
HABAŞ(BİLECİK)(Paşalar)	18.000	144.00	Fuel Oil	12/31/2009
HABAŞ(İZMİR)(Habaş)	36.000	288.00	Fuel Oil	12/31/2009
HAYAT KAĞIT	7.531	56.00	Natural Gas	12/31/2009
KAREL ENERJİ (Pamukova)	9.300	55.00	Hydro	12/31/2009
KEN KİPAŞ ELEKTRİK ÜRETİM (KAREN)	41.800	180.00	Natural Gas	12/31/2009
MODERN ENERJİ (B.Karıştıran)	96.780	680.00	Natural Gas	12/31/2009
PETKİM ALİAĞA(Aliağa)	222.040	1554.00	Fuel Oil	12/31/2009
SİLOPİ ELEKTRİK ÜRETİM A.Ş.(ESENBOĞA)	44.784	315.00	Fuel Oil	12/31/2009
SÜPER FİLM (G.antep)	25.320	203.00	Fuel Oil	12/31/2009
TİRE-KUTSAN(Tire)	8.000	37.00	Fuel Oil	12/31/2009
ÖZGÜR ELEKTRİK (AZMAK II REG.VE HES)	24.407	91.00	Hydro	12/25/2009
TÜPRAŞ O.A.RAFİNERİ(Kırıkkale)(Düzeltme)	10.000	70.00	Fuel Oil	12/25/2009
DATÇA RES (Datça)	0.800	2.27	Wind	12/24/2009
SARITEPE HES (GENEL DİNAMİK SİS.EL.)	2.450	10.00	Hydro	12/24/2009
KORES KOCADAĞ RES (Urla/İZMİR)	15.000	56.00	Wind	12/23/2009
YAPISAN (KARICA REG. ve DARICA I HES)	48.500	164.00	Hydro	12/23/2009
AKSA ENERJİ (MANİSA) (İlave)	10.500	83.10	Natural Gas	12/18/2009
FALEZ ELEKTRİK ÜRETİMİ A.Ş.	11.748	88.00	Natural Gas	12/16/2009
ÇELİKLER TAAH. İNŞ. (RİXOX GRAND)	2.000	58.00	Natural Gas	12/15/2009
TAV İSTANBUL TERMİNAL İŞLETME. A.Ş.	3.260	27.60	Natural Gas	12/12/2009
SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	10.800	36	Wind	12/8/2009
ROTOR ELEKTRİK (OSMANİYE RES)	22.500	85.3	Wind	12/4/2009
YEŞİLBAŞ ENERJİ (YEŞİLBAŞ HES)	14.001	56.00	Hydro	12/4/2009
UZUNÇAYIR HES (Tunceli)	27.330	105.00	Hydro	12/2/2009
SARITEPE HES (GENEL DİNAMİK SİS.EL.)	2.450	10.00	Hydro	11/19/2009
ÖZYAKUT ELEK. ÜR.A.Ş. (GÜNEŞLİ HES)	0.600	2.70	Hydro	11/13/2009
REŞADİYE 3 HES (TURKON MNG ELEKT.)	22.300	175.00	Hydro	11/11/2009
SELKASAN KAĞIT PAKETLEME MALZ. İM.	9.900	73.00	Natural Gas	11/11/2009

TEKTUĞ (Erkenek) (İlave)	6.514	26.00	Hydro	11/10/2009
TÜM ENERJİ (PINAR REG. VE HES)	30.090	138.00	Hydro	11/6/2009
ERVA ENERJİ (KABACA REG. VE HES)	4.240	16.30	Hydro	10/29/2009
SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	16.200	54	Wind	10/28/2009
BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15.000	42.5	Wind	10/23/2009
CAM İŞ ELEKTRİK (Mersin) (İlave)	126.100	1008.00	Natural Gas	10/19/2009
AK GIDA SAN. VE TİC. A.Ş. (Pamukova)	7.500	61.00	Natural Gas	10/17/2009
MAURİ MAYA SAN. A.Ş.	0.330	2.50	Renew+Wastes	10/16/2009
DALSAN ALÇI SAN. VE TİC. A.Ş.	1.165	9.00	Natural Gas	10/14/2009
İÇDAŞ ÇELİK (İlave)	135.000	961.70	Imported Coal	10/13/2009
YAPISAN (KARICA REG. ve DARICA I HES)	48.500	164.00	Hydro	10/10/2009
BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15.000	42.5	Wind	10/2/2009
ELESTAŞ ELEKTRİK (YAZI HES)	1.109	6.00	Hydro	10/2/2009
ERVA ENERJİ (KABACA REG. VE HES)	4.240	16.30	Hydro	9/23/2009
BORASKO ENERJİ (BANDIRMA RES)	24.000	93.7	Wind	9/18/2009
DELTA ENERJİ ÜRETİM VE TİC.A.Ş. (İlave)	13.000	101.20	Natural Gas	9/17/2009
FİLYOS ENERJİ (YALNIZCA REG. VE HES)	14.430	67.00	Hydro	9/16/2009
MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	10.000	35.1	Wind	9/16/2009
BAKİ ELEKTRİK ŞAMLI RÜZGAR	33.000	161.30	Wind	9/11/2009
ROTOR ELEKTRİK (OSMANİYE RES)	17.500	66.35	Wind	9/11/2009
MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	12.500	43.9	Wind	9/9/2009
ELESTAŞ ELEKTRİK (YAYLABEL HES)	5.100	20.00	Hydro	9/7/2009
SAYALAR RÜZGAR (Doğal Enerji)	3.600	11.36	Wind	9/6/2009
AK ENERJİ (AYYILDIZ RES)	15.000	51.00	Wind	9/5/2009
SOMA ENERJİ ÜRETİM (SOMA RES)	18.000	60	Wind	9/5/2009
PETKİM ALİAĞA(Aliağa) (Düzeltme-İlave)	52.040	364.00	Fuel Oil	8/28/2009
DENİZLİ ELEKTRİK (EGE I HES)	0.920	4.00	Hydro	8/27/2009
ENTEK KÖSEKÖY(İztek) (Düzeltme)	0.760	6.40	Natural Gas	8/27/2009
AKÇAY HES ELEKTRİK ÜR. (AKÇAY HES)	28.780	95.00	Hydro	8/14/2009
ORTADOĞU ENERJİ (ODA YERİ) (İlave)	5.660	44.90	Renew+Wastes	8/14/2009
ANADOLU ELEKTRİK (ÇAKIRLAR HES)	16.158	60.00	Hydro	8/13/2009
ÖZTAY ENERJİ (GÜNAYŞE REG.VE HES)	8.300	29.00	Hydro	8/13/2009
ÜTOPYA ELEKTRİK (DÜZOVA RES)	15.000	46.00	Wind	8/11/2009
ROTOR ELEKTRİK (OSMANİYE RES)	17.500	66.35	Wind	8/7/2009
ENTEK KÖSEKÖY(İztek) (Düzeltme)	36.295	288.90	Natural Gas	8/6/2009
GLOBAL ENERJİ (PELİTLİK)	8.553	65.70	Natural Gas	7/31/2009
RASA ENERJİ (VAN)	78.570	500.00	Natural Gas	7/31/2009
OBRUK HES	212.400	473.00	Hydro	7/29/2009
	TOTAL	**41930.37**		

Table 27: Electricity Generation of Selected Recent Capacity Additions by Fuel Type

	Electricity Generation (GWh)		
Capacity Additions by Fuel Type	**2009**[70]	**2010**[71]	**Total**
Coal	1961.70	9080.00	10041.7
Lignite	0	144.00	144.00
Fuel Oil	2975.00	0	2975.00
Diesel Oil	0	0	0
LPG	0	0	0
Naphta	0	0	0
Natural Gas	5869.9	13112.8	18982.7
Renewables and wastes	49.40	135.6	185.0
Hydro	1783.30	4650.6	6433.90
Geothermal & Wind	953.63	2214.44	3168.07
TOTAL			41930.37

Electricity generation of selected set of sample m is 41930.37 GWh which is larger than the 41723.9514 as determined in Table 25.

Table 28: CO2 Emission Factor ($EF_{EL,m,y}$) of Capacity Additions by Fuel Type (tCO_2/MWh)

Fuel Type	$EF_{EL,m,y}$ (tCO2/MWh)
Coal	8601.87
Lignite	120.83
Fuel Oil	2047.10
Diesel Oil	0.00
LPG	0.00
Naphta	0.00
Natural Gas	6184.56
Renewables and wastes	0.00
Hydro	0.00

[70] TEIAS, "10 Year Energy Generation Capacity Projection Report", 2010 (In Turkish). pp.85-100. Available at http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf

[71] TEIAS, "10 Year Energy Generation Capacity Projection Report", 2011 (In Turkish). pp.88-106. Available at http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202011.pdf

Geothermal & Wind	0.00
TOTAL	**16954.37**

$EF_{grid,BM,y}$ =16954.37/ 401937.37

$EF_{grid,BM,y}$ = 0.404345 ktCO_2/GWh (or 40.43 tCO_2/MWh)

ANNEX IV: DAGBASI HEPP- EIA EXEMPTION LETTER

T.C.
Çevre ve Orman
Bakanlığı

Kalitest
ISO 9001:2008

T.C.
MERSİN VALİLİĞİ
İL ÇEVRE VE ORMAN MÜDÜRLÜĞÜ

Karar Tarihi : 12/01/2011
Karar No : 228.07/...60...-0493

ÇEVRESEL ETKİ DEĞERLENDİRME BELGESİ

17 Temmuz 2008 tarih ve 26939 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin EK-II Listesinde yer alan **Dağbaşı Regülatörü ve HES (Kırma-Eleme Tesisi** (2 adet) **ve Beton Santrali** (2adet) **dahil)** projesi ile ilgili olarak inceleme-değerlendirme yapılmış ve Proje Tanıtım Dosyasında çevresel etkilere karşı alınması öngörülen önlemler yeterli görülmüştür.Ayrıca ÇED Raporu hazırlanmasına gerek bulunmadığı tespit edilmiş olup, söz konusu projeye ÇED Yönetmeliğinin 17. maddesi gereğince Valiliğimizce ***"Çevresel Etki Değerlendirmesi Gerekli Değildir"*** kararı verilmiştir.

M. Suphi OLCAY
Vali a.
Vali Yardımcısı

Proje Sahibi : Alperen Elektrik Üretim Ltd. Şti
Projenin Yeri : Mersin İli, Anamur İlçesi Sugözü Köyü Civarı, Su Gözü Deresi Üzeri.
(* Proje Koordinatları belgenin arka yüzündedir.)

According to the Annex II of the Regulation on Environmental Impact Assessment that is issued on 17 July 2008 and published in Official Gazette numbered 26939, EIA is not required for Dagbasi HEPP.

The document has been issued on 12 January 2011 by the Directorate of Environment and Forestry in Mersin.