Voluntary Carbon Standard
Project Description

19 November 2007

Date of VCS PD: 29 July 2011
PD Version 8

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1 Description of Project:

1.1 Project title

"Saracbendi HPP Run-of-River Hydro Project"

1.2 Type/Category of the project

The project applies CDM EB-approved methodologies and tools in their latest version. The CDM program is a VCS approved program.

The respective sectoral scope is scope 1: "Energy Industry – Renewable/Non-renewable Sources" Installed capacity of the project is 23.67 MW, thus it falls into a large scale project activity.

The project is not a grouped project.

1.3 Estimated amount of emission reductions over the crediting period including project size:

With an installed capacity of **23.67 MW**, an expected annual electricity production to be sold of up to **100.47 GWh** and an estimated baseline grid emission factor of **0.5491 tCO_2e/MWh**, the following reduction amounts are expected.

*Table 1: Emission reduction volume during crediting period**

Length of crediting period	10 years
Year	Estimate of annual emission reductions in tons of CO_2e
2011*	**36,780**
2012	**55,170**
2013	**55,170**
2014	**55,170**
2015	**55,170**
2016	**55,170**
2017	**55,170**
2018	**55,170**
2019	**55,170**
2020	**55,170**
2021***	**18,390**
Total estimated reductions [tCO_2e]	**551,700**
Annual average of estimated emission reductions [tCO_2e]	**55,170**

(*) Eventual inconsistencies linked to rounding errors.
(**) 8 months
(***) 4 months

1.4 A brief description of the project:

Saracbendi HPP is a 23.67 MW low head run-of-river power plant using a new weir structure to deviate river water of the Kızılırmak River into an intake structure with three settlement basins. From there it enters an open trapezoidal canal of 25.6 km length which runs along the left bank of the river. At the end a head pond is located with an intake to two steel penstocks of 3.90 m diameter and 159.9 m length each which lead to the powerhouse with the turbines. From there the water is released to the Kızılırmak River by an open canal.

Saracbendi HPP is expected to start electricity production on 1st January 2011. Produced electricity is being fed into the national grid. The project generates a substantial emission reduction by bringing carbon neutral electricity production to the Turkish grid. The overall emission reductions shall amount to 55,170 tCO_2e per year on average.

The hydro project shall be registered as a voluntary emission reduction project under the Voluntary Carbon Standard, thus enabling its implementation by obtaining co-financing from carbon market proceeds.

1.5 Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

The project is located downstream of Yamula River on Kızılırmak River; it lies within the boundaries of Gemerek municipality, Sivas province, in Central Anatolian Region of Turkey. The project area is 19 km northeast of Gemerek city (Sivas province), 22 km southwest of Şarkışla city (Sivas province) and 37 km north of Akkışla village (Kayseri province).

The geographical coordinates of the Weir and the Power plant are as follows:

Table 2: Geographical coordinates of the Weir and the Power plant

	Weir	**Power Plant**
Longitude	39° 19' 28.184" N	39° 8' 30.730" N
Latitude	36° 9' 40.638" E	36° 6' 43.128" E

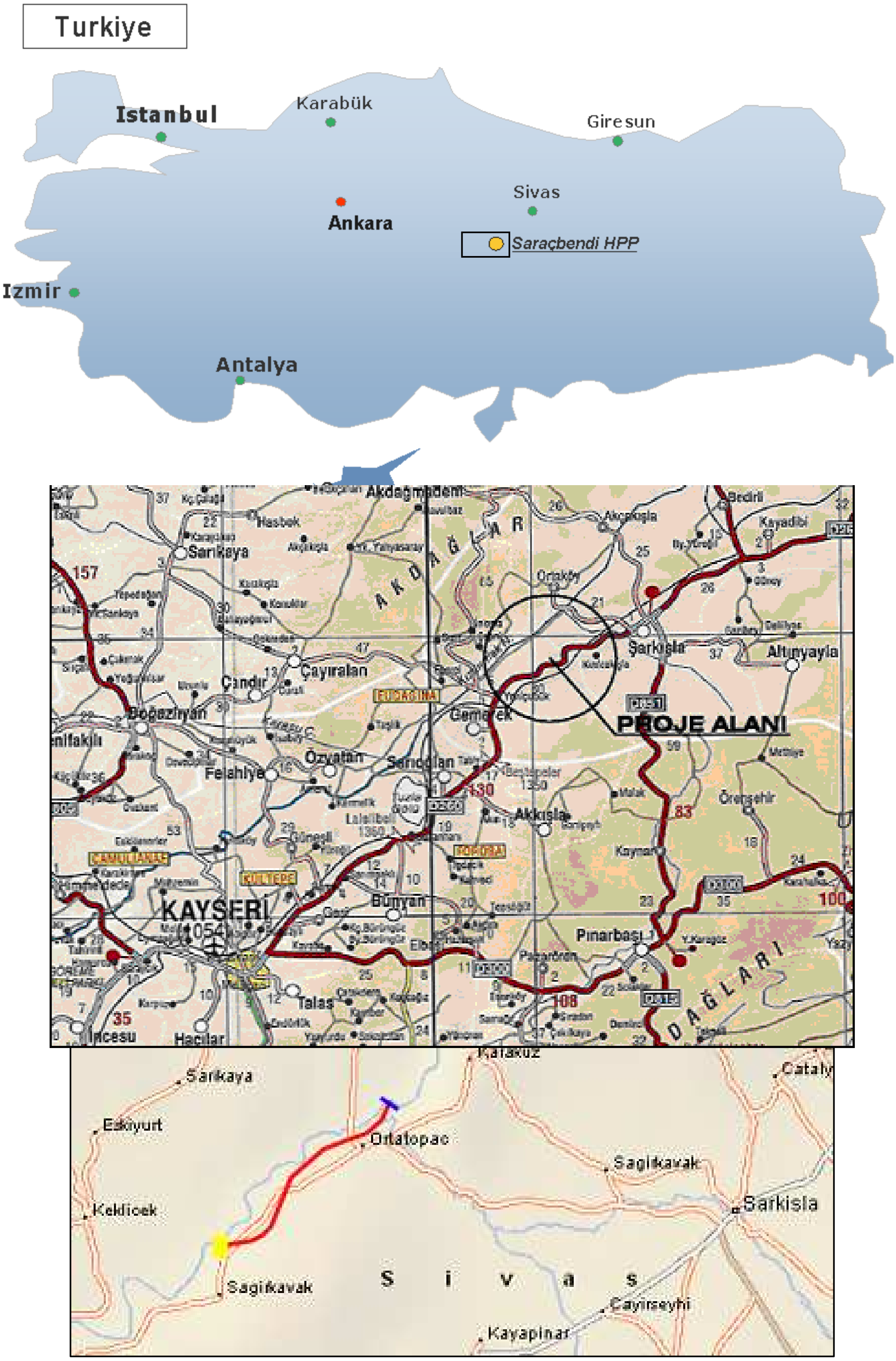

Figure 1: Location of the project

1.6 Duration of the project activity/crediting period:

The project is expected to start with the initial commercial operation of the turbines on 06th May 2011.

A renewable crediting period over 10 years shall apply and will be renewed two times. Thus, the first crediting period shall begin on start date of the commercial operation of the plant and last until 06th May 2021.

1.7 Conditions prior to project initiation:

Saracbendi HPP project site is located at Kızılırmak River in Central Anatolian Region of Turkey (see Figure 1 above).

The land was mostly field before the project activity. The project involves the constructions of a greenfield plant, i.e. installations on the left bank area of Kızılırmak River (diversion canal, weir structure, conveyance canal, head pond, penstock, powerhouse and grid connection line; see also section 1.9 below).

1.8 A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The emission reductions will be achieved by substituting electricity produced from the conventional electricity mix of the Turkish grid. The grid depends to a large degree on fossil fuels. The emission reductions will be calculated based on the Combined Margin (CM) emission factor.

1.9 Project technologies, products, services and the expected level of activity:

The 23.67 Saracbendi run-of-river HPP produces electricity for transmission into the national grid, using the kinetic energy of the water in Kızılırmak River. For this purpose an 8 m high (from river bed) weir is constructed. From there the water is sent via a new approximately 26 km long conveyance canal on the left bank of Kızılırmak River to a head pond. Two penstock channel the water to four turbines powering four electricity generators. Figures below give an overview.

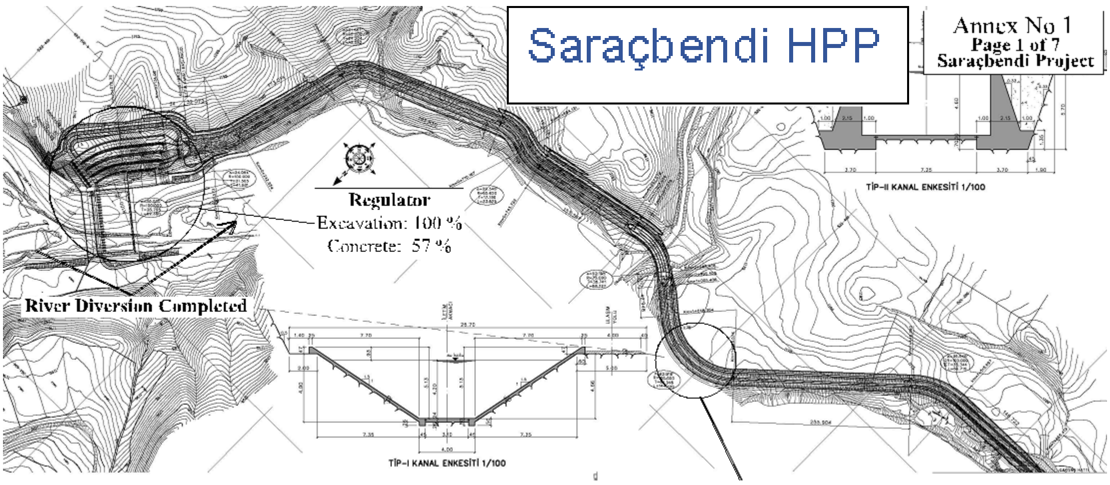

Figure 2: Technical Overview – Weir and Conveyance Canal

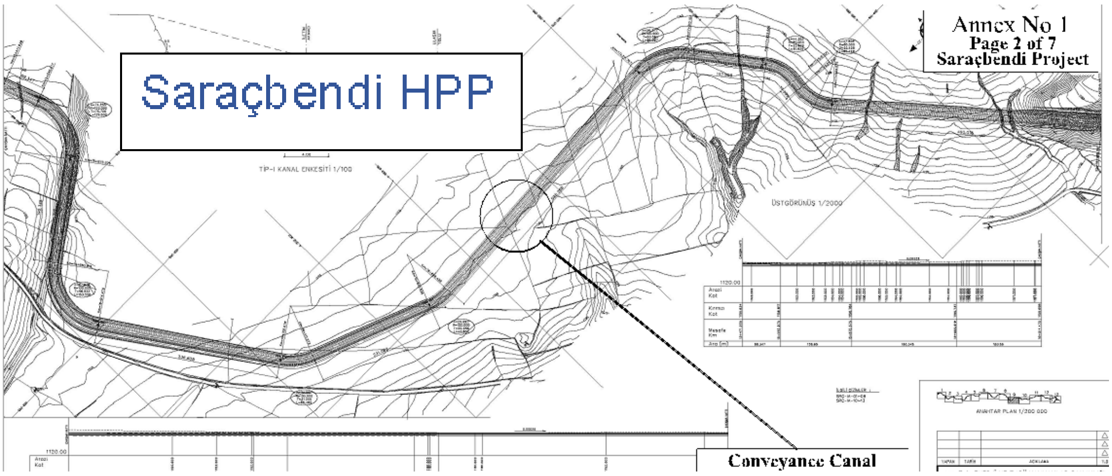

Figure 3: Technical Overview – Conveyance Canal

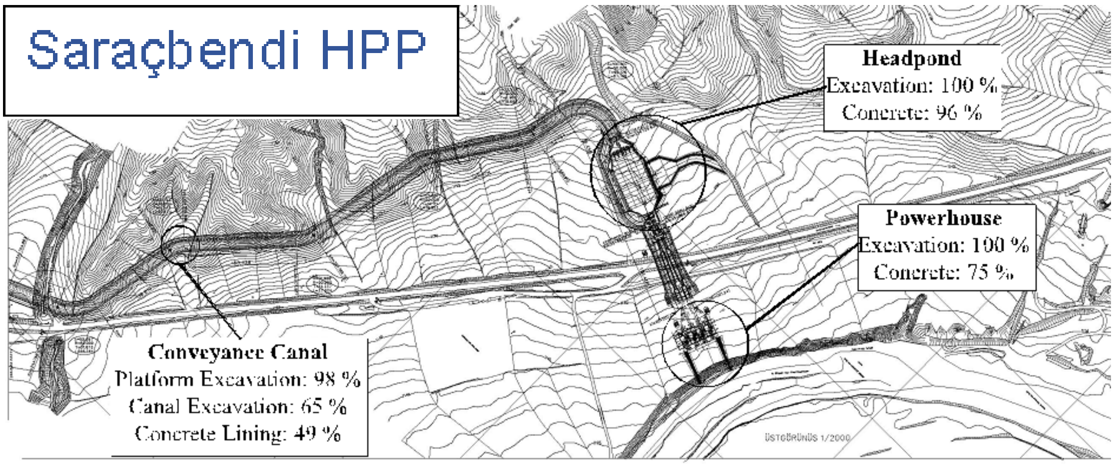

Figure 4: Technical Overview – Conveyance Canal, Head pond, Powerhouse

The Turbine type will be Francis, vertical type (for a illustration of the turbine, see Figure 6). Generated electricity will be fed into national grid via a connection to Şarkışla District Transformer Center with 34.5 kV, 477 MCM section, 30 km transmission line. The total annual electricity production of the project activity is expected to be 100.470 GWh. Detailed technical characteristics of Saracbendi HPP are given Table 3 and Figure 5 (Single Line Diagram) below.

Table 3: Technical Characteristics of Saracbendi HPP

Project Main Characteristics	Type:	Run-of-river HPP
	Total Installed Power:	23.67 MWe
	Power Generation:	100.470 GWh /year
Weir	Type:	Concrete, free overflow
	Construction dimensions:	8 m high; 84 m wide; 1.165 m elevation at crest

	Project (Max.) Discharge	50.00 m^3/s
Conveyance channel	Location	Left bank
	Type	Trapezoidal section
	Project (Max.) Discharge	84 m^3/s
	Bottom Width	4.00 m
	Top Width	18.63 m
	Channel length	25,561 m
Head pond	Location	Left bank
	Width	9.25 m
	Length	543.58 m
Penstocks	Type	Steel
	Number of Penstocks	2
	Length (aligned)	159.95 m
	Diameter	3.90 m (Steel 52)
Turbine	Turbine Type	Vertical Francis
	Number of Units	4
	Unit Power	6.152 MW
	Installed Power	23.67
Generator	Number of Generators	4
	Power	5918 MW
Transformers and transmission line	Number of Transformers	4
	Voltage	6.3/3.1.5±2x%2.5kV
	Frequency	50 Hz
	Transmision line	Connection to Şarkışla District Transformer Center 34.5 kV, 477 MCM section, 30 km transmission line.

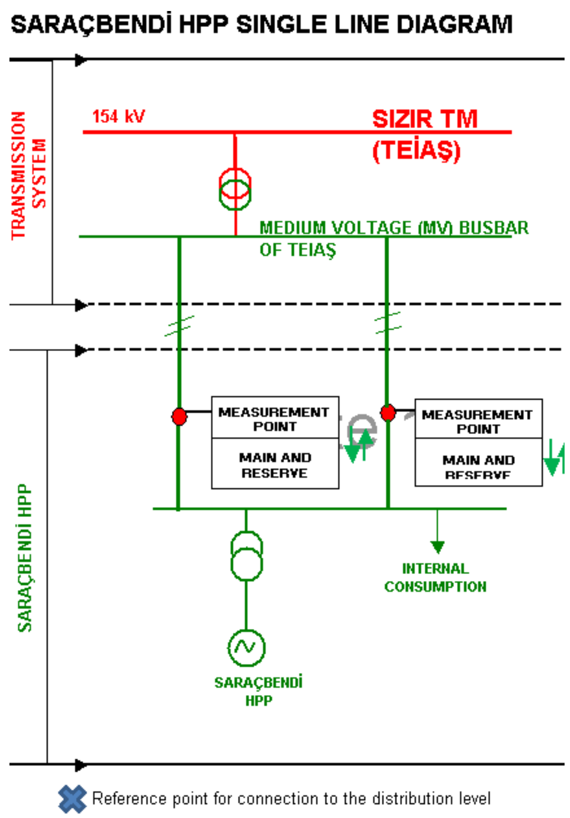

Figure 5: Single Line Diagram of Saracbendi HPP

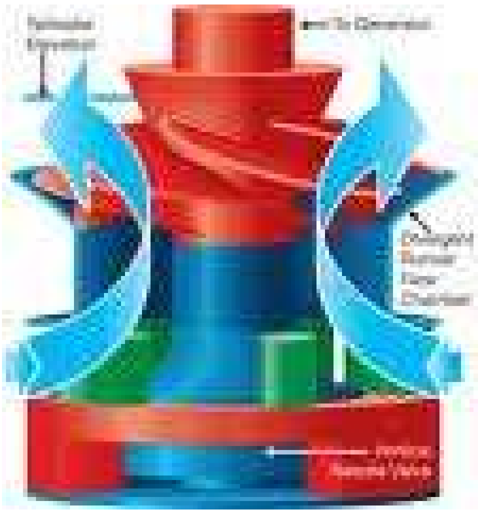

Figure 6: Illustration of Francis (vertical) Turbine

1.10 Compliance with relevant local laws and regulations related to the project:

The project is in line with all defined laws and regulations of Turkey. This is proven by the authorizations and operation permits obtained.

Laws as relevant to the project are (Law No. and Enactment Date):
(1) Electricity Market Law[1] (Nr. 4628 / 03.03.2001)
(2) Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[2] (Nr. 5346 / 10.05.2005)
(3) Energy Efficiency Law[3] (Nr. 5627/ 18.04.2007)
(4) Forest Law[4] (Nr. 6831, 31.08.1956)
(5) Environment Law[5] (Nr. 2872 / 16.12.2003) - for results of the Environmental Impact Assessment please see also section 5.

The renewable Energy generation license for Saracbendi HEPP has been issued considering Electricity Law and Law in utilization of Renewable Energy Resources for the purpose of generating electricity energy. The proposed project is also within the scope of and in compliance with Energy Efficiency Law(Article 2 of Part One). Environment Law is also satisfied in terms of sustainable development principles and EIA conducted for the proposed project activity. Finally, Forest Law which specifies that forest areas can be allocated by Ministry of Environment and Forestry to institutions or

[1] See: http://www.epdk.org.tr/documents/10157/351a7a0c-52a9-40d5-8e12-f8e61afe7247

[2] See: http://www.epdk.org.tr/documents/10157/4b360128-53aa-4174-8104-a6c10434ac9c

[3] See: http://www.eie.gov.tr/duyurular/EV/EV_kanunu/EnVerKanunu_Temmuz2008.pdf

[4] See: http://www.mevzuat.adalet.gov.tr/html/1003.html
[5] See: http://www2.cevreorman.gov.tr/yasa/k/2872.doc

individuals for energy plants if the project implementation serves common good for public.

1.11 Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Precipitation related low-water levels might lead to diminished electricity production and thus lower emission reductions. Apart from this no other risks have been identified.

1.12 Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The objective of Saracbendi HPP is the creation of carbon friendly energy generation capacity via realization of a hydro-project. The baseline to the project is defined by energy generation and respective emission intensities of the already existing Turkish grid. Thus this section is not applicable.

1.13 Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

Saracbendi HPP has not created any form of other credits. Saracbendi does not obtain any public funding.

1.14 Project rejected under other GHG programs (if applicable):

Saracbendi HPP has not applied for crediting of any other GHG program nor has it been rejected from any other GHG program.

1.15 Project proponents roles and responsibilities, including contact information of the project proponent, other project participants:

The HPP is operated and owned by **Camlıca Elektrik Üretim A.Ş. Camlıca is also VCS project proponent and** for contact please refer to the directions given below.

Table 4: Project Contact Data-Camlıca

Organization:	**Camlıca Elektrik Üretim A.Ş.**
Street/P.O.Box:	Koza Sok.
Building:	No:22 GOP
City:	Ankara
State/Region:	Ankara
Postcode/ZIP:	06700
Country:	Turkey
Personal Contact:	Mustafa Kemal GÜNGÖR
Direct FAX:	0090 0312 441 68 14
Direct tel:	0090 312 408 10 00

Personal e-mail:	akfen@akfen.com.tr; mgungor@akfen.com.tr

The project documentation at hand was defined by Camlıca in cooperation with FutureCamp Türkiye (PD consultancy). FutureCamp Türkiye is not a participant of the project.

Table 5: Contact Data of PD Consultant

Organization:	FutureCamp İklim ve Enerji Ltd.
Street/P.O.Box:	Cetin Emec Bulvarı
Building:	Beste Apartmanı 19/18 Cankaya
City:	Ankara
State/Region:	Ankara
Postcode/ZIP:	06460
Country:	Turkey
Personal Contact:	Engin Mert
Direct FAX:	0090 312 480 88 10
Direct tel:	0090 312 481 21 42
Personal e-mail:	info@futurecamp.com.tr

1.16 Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.:

Project Eligibility

Although the project cannot be staged under the JI/CDM - as Turkey is not eligible for staging such projects -, still an approved CDM methodology shall be applied. Pertaining thus to a VCS approved GHG program, the project at hand shall be eligible also under the VCS.

1.17 List of commercially sensitive information (if applicable):

/DFA/ - Documentary proof for Financial Analysis

2 VCS Methodology:

2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices:

The United Nations approved consolidated baseline methodology applicable to this project is ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", Version 12.1.0. The methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The methodology is applicable under the following conditions:

- The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit,solar power plant/unit, wave power plant/unit or tidal power plant/unit;
- In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;
- In case of hydro power plants, one of the following conditions must apply:
  - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or
  - 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; or
  - 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.

The methodology is applicable as the proposed project is a grid-connected greenfield hydropower plant project with a power density greater than 4 W/m^{2}.

ACM0002 refers to the following tools: "Tool for the demonstration and assessment of additionality", Version 05.2, and „Tool to calculate the emission factor for an electricity system, Version 02.2.0".

2.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The choice of methodology ACM0002 is justified as the proposed project activity meets the relevant applicability criteria:

- The Hydroelectric Power Plant Project involves installation of a new 23.67 grid connected renewable electricity generation plant,
- The project results in construction of a new reservoir with a power density greater than 4 W/m^2 (see also 4.3).
- The project activity is the installation of a hydro power plant with a run-of-river reservoir,
- The project activity is not capacity additions, retrofits or replacements
- 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.
- Project activities do not involve switching from fossil fuels to renewable energy sources at the site of the project activity.
- Project activity is not a biomass fired power plant.

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Greenhouse gases included in the project boundary and used in calculations of emission reductions are given in Table 6 below.

Table 6: Emission sources within the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	*Main emission source*: Fossil fuels fired for electricity generation cause CO_2 emissions. It is included in baseline calculation.
		CH_4	No	*Minor emission sources*: Even though there may be some CH_4 and N_2O emissions during electricity generation, these emissions are negligible and not included in baseline calculation to be conservative and comply with Table 1 of the methodology (page 5).
		N_2O	No	
Project Activity	Emissions from construction and operation of the plant	CO_2	No	*Minor emission sources*: As the energy density of the project activity is above 10 W/m^2 (see also 4.3), project emissions in general are equal to "0" value; on this see p.7 of the methodology.
		CH_4	No	
		N_2O	No	

2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario:

The project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is that, electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the 'Tool to calculate the emission factor for an electricity system'.

The baseline scenario is identified as defined in ACM0002 via calculation of the combined margin calculation. For this the "Tool to calculate the emission factor for an electricity system" is applied. The calculations themselves may be found in section 4.2 of this PD.

Here for description and development of the baseline (Turkish grid emission factor) to the project activity, long-term electricity demand and supply projections for Turkey are assessed. The analysis shows that the share of fossil fuel-fired power capacity in Turkey and the related grid-emission factor are both expected to remain high.

Assessment of mid-term electricity demand and supply

Demand for electricity in Turkey is growing rapidly (annual average of 5.72% over past ten years).[6] The Turkish Electricity Transmission Company (TEİAŞ) as responsible institution for grid reliability has prepared an electricity demand projection for the next ten years period (2009-2018). This demand projection, published in June 2009, predicts a continuation of the trend of demand growth.[7]

Table 7: Low/High Demand Projection Scenarios – figures (TWh)

Scenarios	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Low Scenario	194.0	202.7	213.9	228.2	243.5	259.8	277.2	295.5	315.0	335.8
High Scenario	194.0	202.7	215.9	232.1	249.5	268.2	288.4	309.7	332.6	357.2

[6] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 4, Table 1)

[7] See Link in Footnote-7 (page 12-13, Table 4 for High and Table 5 for Low Scenarios)

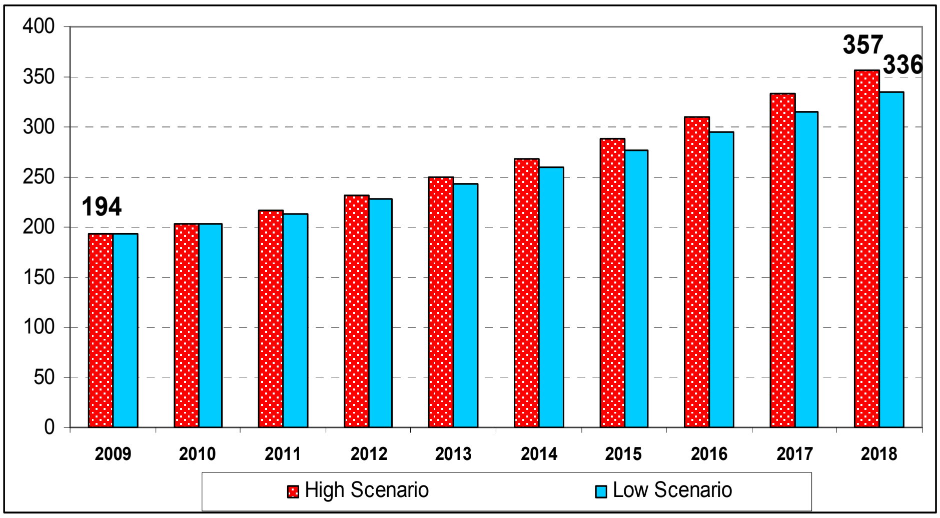

Figure 7: Low/High Demand Projection Scenarios – graphs (TWh)

In this projection, electricity supply is also forecasted, taking into account all power plants, which are operational, under construction and newly licensed. Thus the projection of electricity generation is given (table 8 below).

Table 8: Projection of Total Generation Capacity by Fuel Types[8]

Expected Generation Capacity by fuel/year	**2009** (TWh)	**2010** (TWh)	**2011** (TWh)	**2012** (TWh)	**2013** (TWh)	**2014** (TWh)	**2015** (TWh)	**2016** (TWh)	**2017** (TWh)	**2018** (TWh)	**2018** (%)
LIGNITE	52.6	52.4	52.5	52.5	52.6	52.5	52.4	52.5	52.5	52.6	*16.7%*
HARDCOAL	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	*1.0%*
IMPORTED COAL	12.1	12.7	14.4	19.9	28.2	31.7	32.0	32.6	32.2	32.3	*10.2%*
NATURAL GAS	110.3	111.9	114.6	125.9	139.0	137.9	138.6	139.2	138.4	134.5	*42.7%*
GEOTHERMAL	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	*0.2%*
FUEL OIL	13.8	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	*3.9%*
DIESEL	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	*0.4%*
OTHER	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	*0.5%*
THERMAL TOTAL	195.4	196.0	200.4	217.3	238.8	241.1	242.0	243.3	242.1	238.3	*75.7%*
BIOGAS+WASTE	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	*0.1%*
HYDRO	49.7	54.8	59.7	65.9	68.8	68.7	68.7	72.6	72.6	72.6	*23.0%*
WIND	1.6	2.4	3.2	3.7	3.7	3.7	3.7	3.7	3.7	3.7	*1.2%*
TOTAL	**246.9**	**253.5**	**263.6**	**287.3**	**311.6**	**313.9**	**314.8**	**320.0**	**318.8**	**315.0**	***100%***

According to the 10-year projection it is clear that fossil fuels will remain the main sources for electricity generation (75.3% in 2018). Natural gas will continue to dominate the market while total imported fuel will still be at 52.9%. Hydro will account for 23.0% of the mix whereas all non-hydro renewables combined (geothermal/biogas/waste/wind) will only account for 1.5% of all electricity generation. This projection is consistent with continuing fossil fuel dependent characteristics of Turkish electricity sector, which is illustrated in Figure 8 below. The share of fossil fuels in

[8] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 32, Table 22)

the mix has been continuously increasing since the 1970s, reaching 82.6% in 2008.

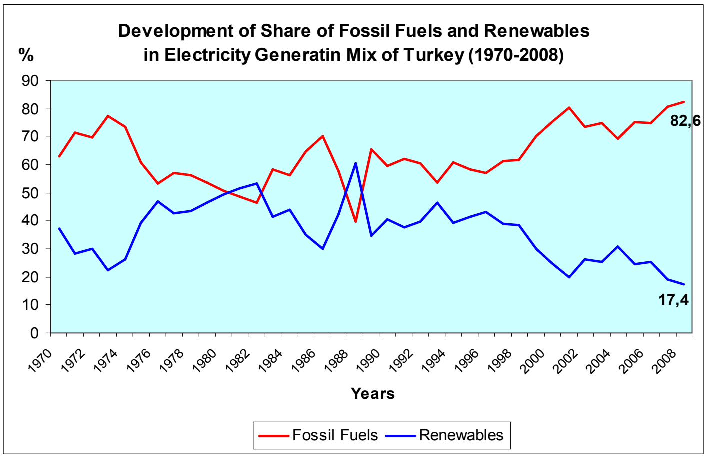

Figure 8: Fossil Fuels and Renewables in Turkish Electricity Mix (1970-2008)[9]

Conclusions on Baseline Development

The above given analysis of the baseline scenario (continuation of current situation) implies the following conclusions:

- Conclusion-1: High growth rate of energy demand during past 10 years is expected to continue over coming decade.
- Conclusion-2: Even if all plants (operational, under construction, licensed) are taken into account there is still a projected lack of supply from 2014 onwards.[10] In the face of the upcoming electricity shortage, it is clear that the most likely installation alternative would be a conventional fossil-fueled power station.
- Conclusion-3: Fossil fuels will remain dominant in the electricity generation mix, at least over the midterm period with an expected share of 75% in 2018. Renewables including hydro will hold a limited share of then 24.5%. Thus most of the new capacity will be fossil fuel based.

The combination of aforementioned trends indicates that if Saracbendi HPP would not have been built, power from a new grid-connected thermal plant would have been the most likely scenario.

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[9] See TEİAŞ, http://www.teias.gov.tr/istatistik2008/33.xls (Renewable generation is composing of 'renewable and waste', 'hydro' and 'geothermal and wind' data)

[10] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 78, Table 44)

2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality):

The additionality of the project is demonstrated and assessed according to the step-wise approach defined in the Additionality Tool in its latest version 5.2.

Step 1: Identification of technically feasible baseline scenario alternatives to the project activity

In compliance with the Additionality Tool all technically feasible options, which are realistic and credible are listed below and further discussed in the subsequent steps.

Sub-step 1a. Alternatives to the project activity

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

(b) Other renewable energy scenario(s) that could also deliver electricity with comparable quality, properties;

(c) Continuation of the current situation, i.e. Saracbendi hydro project is not built

The decision in favor or against of a project investment depends on the expected revenues and risks, like for every other private investment. Investment decisions other than Saracbendi HPP are independent from the question whether this HPP is built or not. Thus alternative (c) is realistic and credible.

The same generally applies to scenario (a). In fact it may be assumed that Saraçbendi would have undertaken the project activity without carbon income.

Scenario (b) though has to be excluded in this step, as it is not realistic. While projections of the Turkish energy market (see baseline discussion in B.4) indicate a growing need for energy investments, at the same time projections do not suggest that a renewable energy solution will be chosen. Instead figures indicate that if Saracbendi HPP is not built, the same amount of energy will most likely be supplied by fossil fuel based greenfield installations. With a predicted share of 75% in 2018, fossil-based energy generation is to remain the dominant source for electricity in the Turkish grid.

Thus the only two realistic scenarios are (a) and (c) while scenario (b) is excluded.

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

Both remaining alternatives are in compliance with all mandatory applicable legal and regulatory requirements – not building a hydro power plant as well as building one (relevant laws are identified in section 1.10). Thus, none can be excluded in this step.

Step 2: Investment analysis

The investment analysis below clearly demonstrates that scenario (c), i.e. the project activity without the revenue from the sale of VERs, is not financially/economically attractive.

Regarding documentation for proof of the early consideration of VER incomes, please refer to Section 7.

Sub-step 2a: Appropriate analysis method

After exclusion of scenario (b) in step 1b, scenario (a) is the only remaining feasible "investment scenario" (scenario (c) refers to the continuation of the status-quo/non-investment). Accordingly in order to evaluate the attractiveness of scenario (c) the benchmark analysis has to be applied.

Thus, it has been decided to use benchmark analysis for evaluation of the project investment.

Sub-step 2b: Option III: Benchmark analysis

While applying the Benchmark Analysis, Option III, the Equity IRR is selected as the financial indicator for the demonstration of the additionality of the project as permitted in the additionality tool.

Benchmark rate is calculated in line with "Tool for the demonstration and assessment of additionality" Version 05.2 which suggests to use the government bond rates, increased by a suitable risk premium. In relation to this, the benchmark rate is calculated in line with the Capital Asset Pricing Model (CAPM)[11]. The CAPM suggests below formula to calculate the discount rate (in other words benchmark rate).

$$E(R_i) = R_f + \beta_i \left(E(R_m) - R_f \right)$$

Where;

$E(R_i)$ *is the expected return on the capital asset*

R_f *is the risk-free rate of interest such as interest arising from government bonds*

β_i *(the beta coefficient) is the sensitivity of the asset returns to market returns, or*

$$\beta_i = (COV(R_i, R_m)) / (VAR(R_m))$$

$E(R_m)$ *is the expected return of the market*

$E(R_m) - R_f$ is sometimes known as the market premium or risk premium (the difference between the expected market rate of return and the risk-free rate of return).

Risk Free Rate (R_f)

[11] Please see http://en.wikipedia.org/wiki/Capital_asset_pricing_model for the definition of CAPM

The 30 year Eurobond which was issued by Treasury of Republic of Turkey was used as the proxy for the risk free rate in the country.

This market return represents an after tax return over all components of the country‟s major index. The relevant interest at the date of investment decision of the facility which is assumed as the construction start date yield for this bond was 7.52% as of 17th of April 2008.[12] ,

The Beta Coefficient (β_i)

The Beta coefficient of securities is assumed to be 1 as there is no publicly available source for Beta value of power generationg and trading companies.

Market risk premium ($E(R_m) - R_f$)

To estimate the "Market risk premium" of Turkey, the independent study of Aswath Damodaran - Stern School of Business (New York University) was used. The study offers an assessment of the market risk for different countries according to their credit ratings as the determined market risk premium for Turkey is 9.29%, calculated on the basis of the credit rating Ba3 with positive perspective given to Turkey by Moody's.[13]

All in all, the relevant discount rate is calculated as:

7.529% + 9.29% 1 = 17.11 %*

The above discount rate can easily be assumed as conservative as the above benchmark assumes that the benchmark and the project have same natures in terms of risk. However, it is obvious that the project includes more risk compared to already established companies as there are extra construction risks and inexperienced operational risks for the project. Therefore, the Beta of the project should be significantly higher than the index Beta. All in all, we can say that the CAPM derived benchmark rate is conservative.

Sub-step 2c: Calculation and comparison of the IRR

The IRR is calculated on the basis of expected cash flows (investment, operating costs and revenues from electricity sale), as used in the financial analysis for the feasibility assessment of the project. The parameters and values used for the IRR calculation are available to DOE during validation. A short overview on financial inputs is given in Table 9 below.

Table 9: Financial Inputs

Installed Power	23.67	*MWe*
Annual Electricity Generation	100.470	*GWh*
Total Project Cost	*-Confidential- (cf. 1.17)*	*EUR*
Operational Duration	39	*years*
Income Tax Rate	20%	%

[12] For Eurobond yield see : http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx (Date: 17/04/2008; Asset Name: US900123BB58, "Selling Rate")

[13] http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem07.xls

Electricity Selling Price	55	*€/MWh*
Annual Operating Cost	*-Confidential- (cf. 1.17)*	*EUR*
EUR/USD Exchange Rate	1.5937	*€/USD*
USD/TL Exchange Rate	1.3230	*USD/TL*
EUR/TL Exchange Rate	2.1085	*EUR/TL*

Operational life time of the HPP is calculated as 39 years for the Saracbendi HPP by using the 'Tool to determine the remaining lifetime of equipment''[14]. In the tool it is said that lifetime for the Hydro Turbines is 150,000 hours. In order to determine operational life time of the HPP firstly capacity factor of the HPP should be calculated because HPP will not be in operation for whole year. By dividing annual generation (100,470 MWh/year) to the installed capacity (25.49 MW), the operation time in a year will be found which is 3,941.55 h/year. Finally dividing lifetime of the equipment (150,000 hours) to the operational time per year, life time of the equipment will be found in terms of year which is 38.1. In order to be conservative operational life time of the hydro turbines will be decided as 39 years. Also the operational lifetime is in line with the technical lifetime of the electromechanical equipment.

The resulting IRRs after Tax for Base Case Scenario (55 €/MWh) for 39 year periods are stated in Table 10 below:

Table 10: Equity IRR values (after tax) for project activity

Period	IRR
39 years	7.18%

As resulting IRRs for the project activity are clearly below the 15.70% benchmark, the project activity is unlikely to be economically attractive.

Sub-step 2d: Sensitivity analysis

While the main parameter determining the income of the project is the electricity sales price, a variation of the accordant value shall demonstrate the reliability of the IRR calculation. For electricity price (EP), 55 €/MWh, which is the maximum of feed-in-tariff, is used as base case to be conservative.

*Table 11: Equity IRR results according to different parameters (after tax)**

Parameter	Power Price			Investment Cost		
Variance	-10%	0%	10%	-10%	0%	10%
IRR	5.88%	7.18%	8.48%	8.39%	7.18%	6.19%
Parameter	**Energy Yield**			**Operating Cost**		
Variance	-10%	0%	10%	-10%	0%	10%
IRR	5.88%	7.18%	8.48%	8.33%	7.18%	6.20%

[14] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

(*) For other parameters than electricity price (EP), 55 €/MWh EP is applied.

Outcome of Step 2:

The sensitivity analysis confirms that the proposed project activity is not likely to be economically attractive without the revenues from VERs as even the maximum IRR result for best-case scenario (8.48%) is below benchmark, which is 17.11%.

Thus the project is not the most economically and financially attractive alternative, without the revenue from the sale of emission reductions certificates (VERs).

Based on the analysis and information above, it is concluded that investing in the project has significant risks and it is not the most attractive option considering the alternative investment opportunities.

Step 4: Common Practice Analysis

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

Marginalization of hydro power in the market

In general, if we examine national Turkish electricity generation data, it is conspicuous that while total installed capacity of thermal power plants has shown a rapid growth (in parallel with electricity demand growth) hydroelectric power generation has increased at a much slower rate. Thus over time the ratio of hydro-generated electricity in the overall electricity generation has decreased historically from 40.2% by 1990 to 16.8% by the end of 2008.[15] . Therefore while still hydro power capacity is added to the grid, hydro power generation is only a marginal technological choice in the market.[16] This is illustrated in figure 9 below.

[15] http://www.teias.gov.tr/istatistik2008/33.xls
[16] http://www.teias.gov.tr/istatistik2008/1.xls

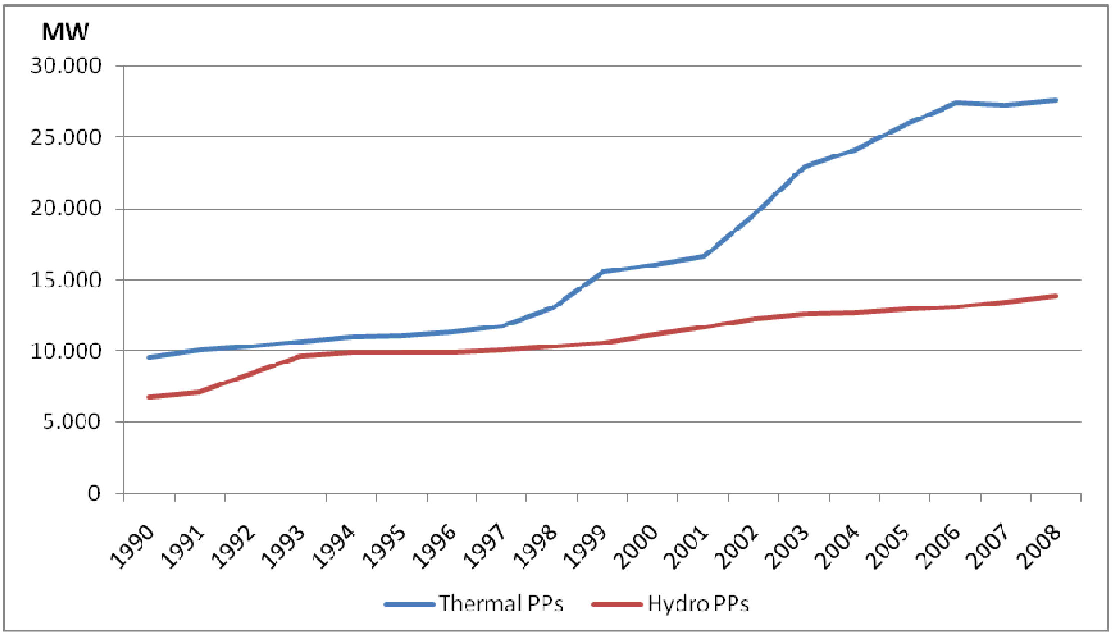

Figure 9: Annual Development of Turkey's Installed Capacity[17]

Exceptional plant operator/business model

Saracbendi HPP is operated by Camlıca Elektrik Üretim A.Ş. which is a private utility. The HPP license [18] is from Electricity Market Regulatory Authority (EMRA). All generated electricity will be sold on the market without any purchase guarantee.

For identification of similar projects in the market, the status/business model of the respective power plant operator has to be considered. Table 12 provides a breakdown of the market in 2008.

Table 12: Breakdown of Installed Capacity of Turkey by the end of 2008[19]

UTILITIES	TYPE	INSTALLED CAPACITY (MW)	TOTAL INSTALLED CAPACITY (MW)
EÜAŞ (State Power Generation Co.)	THERMAL	8,690.9	**20,146.8**
	HYDRO	11,455.9	
AFFILIATED PARTNERSHIP OF EÜAŞ	THERMAL	3,834.0	**3,834.0**
POWER PLANTS UNDER TRANSFER OF OPERATIONAL RIGHT (ToR) CONTRACT	THERMAL	620.0	**650.1**
	HYDRO	30.1	
MOBILE PLANTS	THERMAL	262.7	**262.7**
POWER PLANTS UNDER BUILT-OPERATE (BO) CONTRACT	THERMAL	6,101.8	**6,101.8**
POWER PLANTS UNDER BUILT-OPERATE-TRANSFER (BOT) CONTRACT	THERMAL	1.449.6	**2,449.0**
	WIND	17.4	

[17] http://www.teias.gov.tr/ist2007/32.xls

[18] Licence for Saracbendi HPP is available to DOE.

[19] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 16, Table 9)

	HYDRO	982.0	
GENERATION COMPANIES (IPPs)	THERMAL	3,687.3	**4,839.6**
	WIND	345.1	
	HYDRO	*807.2*	
AUTOPRODUCERS	THERMAL	2,978.5	**3,533.2**
	WIND	1.2	
	HYDRO	553.5	
TOTAL INSTALLED CAPACITY	**THERMAL**	**27,624.9**	**41,817.2**
	WIND	**363.7**	
	HYDRO	**13,828.7**	

It can be seen that in the all-over market the vast majority of electricity producers in Turkey are either state-owned companies or operating with different business models (including long-term purchase guarantees from state-owned companies):

- EÜAŞ and its affiliated companies are state owned power generation companies[20];
- Mobile Plants are selling electricity to EUAŞ;
- ToR, BO and BOTs utilities are selling electricity to TETAŞ (State Electricity Wholesale Co.) with long term purchase contracts[21].
- Autoproducers are private companies building utilities primarily for their own needs[22].

Hence all those power plants belonging to these companies cannot be considered similar to the proposed project activity. According to the business model parameter, only 1.93% of the installed capacity is potentially similar to Saracbendi HPP. The number is found by dividing hydro capacity under the topic of Generation companies by total capacity. Below the list of the potentially similar projects are given:

By the end of 2008, total of hydro plants belonging to generation companies is 807.2 MW and share of them in total installed capacity is only 1.93%. These independent power plants (IPPs) are listed in table 13 below:

Table 13: The hydro projects in operation belonging to IPPs as the end of 2008 [23]

Plant No.	Name of HPP	Plant Location	Installed Power (MW)	Average Generation (GWh/year)	Firm Generation (GWh/year)
1	BEREKET (DENİZLİ)	DENİZLİ	3.70	12	12
2	BEREKET (DALAMAN)	MUĞLA	37.50	179	179

[20] See, Website of EÜAŞ, http://www.euas.gov.tr/

[21] See, http://www.teias.gov.tr/eng/ApkProjection/CAPACITY%20PROJECTION%202008-2017.pdf (page 37)

[22] See, Licence Regulation: http://www.epdk.org.tr/english/regulations/electric/license/licensing.doc (page 3)

[23] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 93) and http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/verilenuretim.asp (for Location)

3	BEREKET (FESLEK)	AYDIN	9.50	41	25
4	BEREKET (GÖKYAR)	MUĞLA	11.60	43	23
5	BEREKET (MENTAŞ)	MUĞLA	39.90	163	140
6	AKKÖY ENERJİ (AKKÖY I HES)	GÜMÜŞHANE	101.90	408	263
7	DAREN HES (SEYRANTEPE)	TUNCELİ	49.70	182	161
8	ALP ELEKTRİK (TINAZTEPE)	ANTALYA	7.70	29	17
9	CANSU ELEKTRİK (ARTVİN)	ARTVİN	9.20	47	31
10[a)]	***ÇALDERE ELEKTRİK (DALAMAN)***	***MUĞLA***	***8.70***	***35***	***25***
11[b)]	***DEĞİRMENÜSTÜ HES***	***KAHRAMANMARAŞ***	***25.70***	***69***	***40***
12[c)]	***HAMZALI HES (TURKON MNG)***	***KIRIKKALE***	***16.70***	***117***	***66***
13	H.G.M. ENERJİ (KEKLİCEK)	MALATYA	8.70	18	11
14	HİDRO KONTROL (YUKARI MAHOZ)	ERZURUM	22.40	79	45
15	İÇ-EN ELEKTRİK (ÇALKIŞLA)	ERZİNCAN	7.70	18	11
16	KALEN ENERJİ (KALEN II)	GİRESUN	15.70	50	28
17[d)]	***MARAŞ ENERJİ (FIRNIS)***	***KAHRAMANMARAŞ***	***7.20***	***36***	***23***
18	SARMAŞIK I HES (FETAŞ FETHİYE)	ERZURUM	21.00	96	54
19	SARMAŞIK II HES (FETAŞ FETHİYE)	ERZURUM	21.60	108	61
20	YEŞİL ENERJİ (TAYFUN HES)	KAHRAMANMARAŞ	0.80	5	4
21	MURGUL BAKIR	ARTVİN	4.60	8	8
22	TEMSA ELEKTRİK (GÖZEDE)	BURSA	2.40	10	6
23	EKİN ENERJİ (BAŞARAN HES)	AYDIN	0.60	5	0
24	ENERJİ-SA (BİRKAPILI)	MERSİN	48.50	171	17
25	ENERJİ-SA (AKSU-ŞAHMALLAR)	ANTALYA	14.00	45	7
26	ENERJİ-SA (SUGÖZÜ-KIZILDÜZ)	ANTALYA	15.40	55	8
27	EŞEN-II (GÖLTAŞ)	MUĞLA	43.40	170	0
28	ELTA (DODURGA)	DENİZLİ	4.10	12	12
29	İÇTAŞ YUKARI MERCAN	ERZİNCAN	14.20	44	20
30	İSKUR (SÜLEYMANLI HES)	KAHRAMANMARAŞ	4.60	18	4
31	KURTEKS Karasu Andırın Hes	KAHRAMANMARAŞ	2.40	19	19
32	MOLU ENERJİ (BAHÇELİK HES)	KAYSERİ	4.20	30	30
33	ÖZGÜR ELEK. K.MARAŞ Tahta HES	KAHRAMANMARAŞ	12.50	54	54
34	PAMUK (Toroslar)	MERSİN	23.30	112	28
35	SU ENERJİ (ÇAYGÖREN HES)	BALIKESİR	4.60	19	4
36[e)]	***TEKTUĞ-KARGILIK***	***KAHRAMANMARAŞ***	***23.90***	***83***	***19***
37[f)]	***TEKTUĞ-KALEALTI HES***	***OSMANİYE***	***15.00***	***52***	***11***
38[g)]	***TEKTUĞ-KEBANDERESİ***	***ELAZIĞ***	***5.00***	***32***	***20***
39	YAPISAN HACILAR	MALATYA	13.30	90	54
40	YPM ALTINTEPE HES	SİVAS	4.00	18	10
41	YPM BEYPINAR HES	SİVAS	3.60	18	9
42	YPM KONAK HES	SİVAS	4.00	19	10
43	BEYKÖY	ESKİŞEHİR	16.80	87	87
44	KUZGUN	ERZURUM	20.90	36	0
45	TERCAN	ERZİNCAN	15.00	51	28
46	ATAKÖY	TOKAT	5.50	8	8
47	ÇILDIR	KARS	15.40	30	20
48	İKİZDERE	RİZE	18.60	110	100
49	MERCAN	TUNCELİ	20.40	78	48
	TOTAL		**807.10**	**3,217**	**1,858**
	TOTAL of VER Projects		**102.20**	**424**	**204**
	TOTAL of Other Projects		**704.90**	**2,793**	**1,654**

a) VER Project, registered under VCS:
https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=363
b) VER Project, registered under VCS:
https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=565
c) VER Project applicant to GS with no. GS633: https://gs1.apx.com/myModule/rpt/myrpt.asp
d) VER Project applied to VCS:
http://www.netinform.net/KE/Wegweiser/Guide2.aspx?ID=4051&Ebene1_ID=49&Ebene2_ID=1220&mode=4
e) VER Project registered under VCS:
https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=264
f) VER Project registered under
VCS:https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=111
g) VER Project registered under VCS:
https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=598

Project specific cost structure of the HPP

Furthermore regarding the technology it shall be highlighted that in contrast to other renewable technologies (such as wind, solar and biomass) for small hydro projects as run-of-river projects the cost share of mechanical equipment in the total investment is especially low (25%).[24] Hence, for a typical run-of-river hydro project, site specific costs (construction demands due to challenging topography) affect the economical feasibility of the project to a far larger degree.

Sub-step 4b: Discuss any similar options that are occurring

Turkey is divided to 26 different regions regarding to water potential and rivers. Saracbendi HPP is located in the Kızılırmak River Basin[25]. Also these river basins are big regions that contain different geographical characteristics. Kızılırmak Basin is divided into three regions which are Upper Kızılırmak Basin, Middle Kızılırmak Basin and Lower Kızılırmak Basin[26]. Saracbendi HPP is located in the upper part of the Kızılırmak Basin. Upper Basin of the Kızılırmak river is in the provinces of the Sivas and Kayseri. In order to be conservative all HPP's in these provinces are considered. As it can be seen at the table 13 there are 4 HPPs are in operation in Sivas and Kayseri provinces by the end of 2008. All of these HPPs are very small, even smaller than 5 MW.. Therefore they cannot be compared to Saracbendi HPP so; there is no similar project with proposed project.

Another approach can be that discussing the all projects in Turkey which are given in the Table 13. Seven of them (Tektuğ Kargılık HPP, Kalealtı HPP, Kebanderesi HPP, Hamzalı HPP, Değirmenüstü HPP, Caldere HPP and Maras HPP) are VER projects so they are eliminated. When similar projects are considered regarding to the installed capacities, Mercan HPP, Kuzgun HPP, Pamuk HPP, Sarmaşık I-II HPPs and Hidro Kontrol HPP which have the installed capacities in the range of 20-25 MW. However it is impossible to show the differences and similarities between those projects and Saraçbendi HPP. The technical and financial data of the projects are not accessible and known. In addition to that with 25,561 m. long channel length Saracbendi HPP is not a similar project.

[24] See, http://www.kuleuven.be/ei/Public/publications/EIWP01-02.pdf (page 4)

[25] See, http://dergiler.ankara.edu.tr/dergiler/26/920/11480.pdf (page 8)

[26] See,
http://kayseri.cevreorman.gov.tr/Kayseri/Files/havza/kizilirmak/ekler/K%C4%B1z%C4%B1l%C4%B1rmak_Havzas%C4%B1_Rapor.pdf (page 2)

Outcome of step 4:

Within the framework of the discussion above, hydroelectric power plants constructed by private companies are not considered as common practice in Turkey. Therefore the proposed type of project should not be considered as a common practice for Turkey.

3 Monitoring:

3.1 Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

As outlined in section 2.1 above the latest version of CDM EB-approved large scale "Consolidated methodology for grid-connected electricity generation from renewable sources, ACM0002, Version 12.1.0" is applied here.

This methodology was chosen as it is VCS accepted. Furthermore it is adjusted to large-scale hydropower projects like the one presented in this project description and has already been applied to several projects (also VCS projects) around the world

3.2 Monitoring, including estimation, modelling, measurement or calculation approaches:

Monitoring is carried out along ACM0002 stipulations.

Purpose of monitoring

The purpose of the monitoring is that serving the data control/logging and the consecutive calculation of baseline and project emissions and thus the calculation of achieved emission reductions. Monitored parameters are noted down in tables of section 3.3.

The below described measurement method follows Article 81 of the official regulation "Electricity Market Balancing and Settlement Regulation"[27].

Monitoring parameters and data origin

The only parameter for continuous monitoring is the quantity of net electricity generation (MWh) supplied by the project plant/unit to the grid in year y. The data is monitored via electricity meters. Two meters will be placed (one main and one reserve) at the power plant. These meters are sealed by TEIAS and intervention by project

[27] See, http://www.epdk.org.tr/documents/10157/9fdf555f-b9d3-4114-afea-032edd0f0e9f page 24

proponent is not possible. Meters are read by TEIAS staff monthly, a protocol is prepared and signed by both on site by technicians and TEIAS staff. This meter data is also the basis for the settlement notification of PMUM. Data are gathered electronically from the meters by TEIAS and stored in secured website of PMUM, which is accessible to project developer with a private password. For monitoring, the monthly settlement notification of PMUM shall be used as source of data.

Yearly electricity generation will be calculated by summing up monthly meter reading records. Data monitored will be kept in electronic form and hard copy until the end of second year after the end of crediting period.

Calculations in monitoring and monitoring frequency

Since the meters are reading electricity supplied to the system and withdrawn from the system separately, the net electricity amount supplied to the grid will be calculated by electricity supplied minus electricity withdrawn which will be taken from monthly settlement notifications.

Project related monitoring procedures begin with the start of crediting.

Data quality management

The fact that two meters are installed in a redundant manner keeps the uncertainty level of the only parameter for baseline calculation low. High data quality of this parameter is not only in the interest of the emission reduction monitoring, but paramount for the business relation between the plant operator and the electricity buyers.

According to Article 2 of the Communiqué for meters in electricity market[28]: "The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained Type and System Approval certificate from the Ministry of Trade and Industry." Therefore, Ministry of Trade and Industry (Ministry) is responsible for control and calibration of the meters. In the Feasibility Report powers of the transformers defined as 6500 KVA Since it is smaller than 10 MVA accuracy of the meter is 0.5 which is defined under the Article 11 of the Communiqué for meters in electricity market.[29]

Paragraph b of Article 9 of the "Regulation of Metering and Testing of Metering Systems"[30] (Regulation) of Ministry states that: " b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done every 10 years." Therefore periodic calibration of the meters will be done every 10 years.

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[28] See, http://www.epdk.org.tr/documents/10157/81c16fc9-7777-46d6-a1bf-15c5ac8795c7 page 1

[29] http://www.epdk.org.tr/documents/10157/81c16fc9-7777-46d6-a1bf-15c5ac8795c7 page 3

[30] See, http://www.sanayi.gov.tr/Files/Mevzuat/olcu-ve-olcu-aletleri-mua-22042010151908.pdf , page 3

According to Article 67 (page 20) of the same regulation, calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 64 of Regulation clearly states how calibration of the meters shall be performed.

According to Article 3 of System Usage Agreement [31] between **Camlıca Elektrik Üretim A.Ş.** and transmission company (TEİAŞ) stipulates other than periodic tests: If a party alleges the meters are not working appropriately tests of the meters will be done in presence of both parties. If, after controls, it is seen that the meter is not working appropriately, the measurements of reserve meters are taken into account beginning from the last measurement value when both meters are reading the same (page 3, 2-c).

As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan.

Roles and responsibilities

The responsibilities and management structure follows standard integrated Management System norms. Responsibilities for monitoring are defined in the monitoring plan section below (cf. 3.4). There a general responsibility structure for plant operation is given.

3.3 Data and parameters monitored / Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals:

Parameters for verification

Data / Parameter:	**$EG_{facility,y}$**
Data unit:	MWh/yr
Description:	Quantity of electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	The data from the Electricity Meters are the basis for the settlement notification of PMUM. Data are gathered electronically from the meters by TEIAS and stored in secured website of PMUM, which is accessible to project developer with a private password. For monitoring, the monthly settlement notification of PMUM shall be used as source of data.
Value of data applied for the purpose of calculating expected emission reductions	**100,470 MWh/year (expected)**
Description of measurement methods and procedures to be applied:	Two electricity meters will be placed (one main and one reserve) at the substation. These meters are sealed by distribution company and intervention by project proponent is not possible. The meters are reading electricity supplied to the system and withdrawn from the system separately, the net electricity amount supplied to the grid will be calculated by electricity supplied minus electricity withdrawn which will be taken from monthly settlement notifications. Two meters will backup each other. These meters will be chosen according to national regulations and approved and sealed by TEIAS at start up of the

[31] See, http://www.teias.gov.tr/sistemkullanim1.doc , page 3, 2-b)

	plant. Maintenance and calibration of the metering devices will be made by TEIAS periodically. In addition to invoices and metering devices, the electricity delivered to the grid can be cross checked through TEIAS web page (http://pmum.teias.gov.tr) using the ID and password of the project owner. All records will be kept for at least two years as requested by the applied methodology. All meters kept the data for four months in case of any breakdown.[32] If any meter is found to be out of calibration, accurate energy amounts shall be detecteted via substitute counter group since registry values of the main counter group is the same as of the substitute group in the last measurement.[33]
QA/QC procedures to be applied:	Monthly internal protocols consisting daily electricity generation records which will be prepared by power plant technicians and signed by power plant manager will be used for cross checking of this parameter.
Any comment:	

Furthermore parameters CAP_{PJ} and A_{PJ} (see list of parameters for validation below) shall be checked during cyclical verification.

Parameters for validation

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Equipment specifications that described in the equipment contracts
Value of data applied for the purpose of calculating expected emission reductions	23,670,000 W (23.67 MW)
Description of measurement methods and procedures to be applied:	Cross-checking of instrument specifications of the installed turbines/generators (MW) and the indication in the PD.
QA/QC procedures to be applied:	Yearly
Any comment:	Turbine/Generator Supply Agreement

Data / Parameter:	**A_{PJ}**
Data unit:	m^2
Description:	Area of the reservoir measured with topographic drawings in the surface of the water, after implementation of the project activity, when reservoir full
Source of data to be used:	**Technical drawings from consultants**
Value of data applied for the purpose of calculating expected emission reductions	992,982 m^2
Description of measurement methods and procedures to be applied:	Measured from one of the ways of topographical surveys / maps, satellite pictures.
QA/QC procedures to be applied:	Yearly
Any comment:	

Parameters used for calculation of Combined Margin

[32] http://www.epdk.org.tr/documents/10157/81c16fc9-7777-46d6-a1bf-15c5ac8795c7 article 6 page2

[33] http://www.teias.gov.tr/sistemkullanim1.doc page 3

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data to be used:	As per "Tool to calculate the emission factor for an electricity system"
Value of data applied for the purpose of calculating expected emission reductions	**0.5491 tCO_2/MWh**
Description of measurement methods and procedures to be applied:	As per "Tool to calculate the emission factor for an electricity system"
QA/QC procedures to be applied:	As per "Tool to calculate the emission factor for an electricity system"
Any comment:	

Data / Parameter:	**Gross electricity generation**
Data unit:	MWh
Description:	Gross Electricity supplied to the grid by relevant sources (2006-2008)
Source of data to be used:	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (1975-2008) TEİAŞ, see http://www.teias.gov.tr/istatistik2008/32(75-08).xls
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-3.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter:	**Net electricity generation**
Data unit:	MWh
Description:	Net electricity fed into the grid. Used for the calculation of the net/gross relation (Including Import and Export figures)
Source of data to be used:	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2008) TEİAŞ, see http://www.teias.gov.tr/istatistik2008/30(84-08).xls
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-4.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	This data is used to find relation between the gross and net electricity delivered to the grid by fossil fuel fired power plants. (See Table A1-4). Import and Export data is used to identify total net electricity fed into the grid in the years of 2006, 2007 and 2008 (See Table A1-5). TEİAŞ is the national electricity transmission company,

	which makes available the official data of all power plants in Turkey.

Data / Parameter:	**Sample Group for BM emission factor**
Data unit:	Name of the plants, MW capacities, fuel types, annual electricity generations and dates of commissioning.
Description:	Most recent power plants which compromise 20% of total generation
Source of data to be used:	Annual Development of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities, TEİAŞ: For plants in 2004: http://www.teias.gov.tr/istat2004/7.xls For plants in 2005: http://www.teias.gov.tr/istatistik2005/7.xls For plants in 2006: http://www.epdk.org.tr/documents/10157/d03e6570-d4c8-461c-9e78-9cfe38f71be1 (page 76 and 77 for installed power of new plants, page 67-75 for generation amounts. For capacity additions, interpolation method is used for generation amounts) For plants in 2007: http://www.epdk.org.tr/documents/10157/ddb52b2e-f6d4-45bc-8611-200de3607a (page 121 and 122 for installed power of new plants, page 111-120 for generation amounts. For capacity additions, interpolation method is used for generation amounts) For plants in 2008: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page (page 95 for plants and pages 82-94 for generation amounts. For capacity additions, interpolation method is used for generation amounts)
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-7.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey. The latest data available during PD preparation was for 2008.

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/GJ
Description:	Emission factor for fuel type i
Source of data to be used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the IPCC Guidelines on National GHG Inventories. See http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-8 and Table See Table A1-13.
Description of measurement methods and procedures to be applied:	No plant specific and national emission factor data is available in Turkey. So, IPCC default data is used. For Fuel Oil Power Plants: 'Gas/Diesel Oil' data is used for conservativeness. For Coal Power Plants: In the 205th page of official document given in the link below, it is stated that

	Çolakoğlu and İçdaş utilizes 'Taşkömürü' (Hardcoal). And at the Table-2 in page 157 of the same document, Taşkömürü is dived in two groups: Bituminous and Antharcite. Since Sub-Bituminous Coal is under Brown Coal in the same table and since Other Bituminous Coal has lower EF than Anthracite in 1.4 of IPCC Guidelines, EF for 'Other Bituminous Coal' is used. See: http://www.dpt.gov.tr/DocObjects/Icerik/4225/Enerji_Hammaddeleri_(Linyit_Taskömuru-Jeotermal)
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average energy conversion efficiency of power unit m in year y
Source of data to be used:	Annex I the "Tool to calculate the emission factor for an electricity system"
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-8.
Description of measurement methods and procedures to be applied:	For Lignite power plants, default value is taken form the Annex 1 of the tool which is 39% for subciritical For coal power plants, the highest efficiency rate for 'fluidized bed' technology which is 41.5%(as in the tool) for PFBS is applied as coal PPs in the sample group (Çolakoğlu (Capacity Increment) and Çan Gr I-II) are utilizing fluidized bed type technology. For reference see: http://www.mimag-samko.com.tr/akiskan_yatakli_kazanlar.pdf (last paragraph of page 6) For Natural Gas and Oil plants efficiencies, default value given in the tool is applied: http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$HV_{i,y}$
Data unit:	Mass or volume unit
Description:	Heating Values of fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data to be used:	Heating Values Of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/istatistik2008/46.xls
Value of data applied for the purpose of calculating expected emission reductions	There is no national NVC data in Turkey. However, TEİAŞ announces Heating values of fuels. This data is used to calculate annual NCVs for each fuel type.
Description of measurement methods and procedures to be applied:	See Table A1-9.
QA/QC procedures to be applied:	
Any comment:	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit

Description:	Fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data to be used:	Annual Development of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/ist2007/43.xls
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-10.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter:	**NCVi,y**
Data unit:	TJ/kton, TJ/million m^3
Description:	Fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data to be used:	Calculated by using HVi,y to FCi,y as Net Calorific Values of fuel types are not directly available in Turkey. Calculation of NCVs from national HVi,y and FCi,y data, Table A1-9 and Table A1-10, is preferred to default IPCC data as these are more reliable.
Value of data applied for the purpose of calculating expected emission reductions	See Table A1-11.
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	TEİAŞ is the national electricity transmission company, which makes available the official data of power plants in Turkey.

3.4 Description of the monitoring plan

As described above, the relevant data that has to be monitored is the electricity supplied to the grid (EG_y) per year, the installed capacity of the hydro power plant and the area of the reservoir.

***EG_y*:**
These data are subject to the accounting quality systems of both parties to the power purchase agreement, TEİAŞ and Camlıca Elektrik Üretim A.Ş. With this, no additional structures or processes have to be implemented to insure the availability of necessary data for monitoring.

At the end of one monitoring period, which is planned to generally last one year, the data from the monthly meter reading records will be added up to the yearly electricity generation and multiplied with the combined margin emission factor with the help of an excel spreadsheet that also contains the combined margin calculation. Thus, the complete baseline approach is always transparent and traceable. For the elaboration and quality assurance of the monitoring report, FutureCamp Türkiye is assigned for supporting related procedures.

Cap_{PJ} and A_{PJ}

These data will be stated for monitoring yearly.

For the operating stage the responsibilities and management structure has to be defined. Names, jobs and structure will be presented with the first monitoring report.

Currently the following information on staff and responsibilities at Saracbendi HPP can be given:

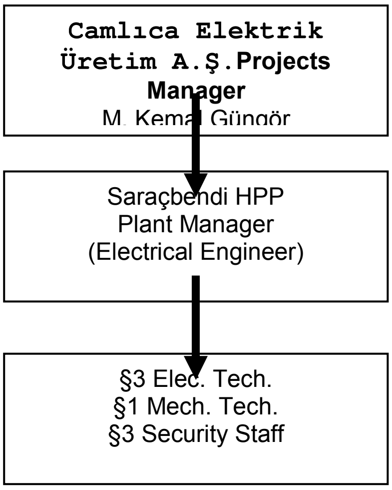

Figure 10: Organization chart

All data monitored under the monitoring plan will be kept in electronic form and hard copy for 2 years after the end of the crediting period.

The GHG information system at Saracbendi HPP is in line with VCS standards. It includes definition and description of

- monitored parameters (see especially 3.3);
- how this data is obtained, recorded and compiled (see especially 3.2, 3.3);
- how it is analysed and used for quantifying and reporting GHG emissions (see especially sections 4 and 3.4 above).
- The combined margin calculation that is relevant for definition of the baseline scenario is described and analysed in Annex 1 (“Baseline information”).

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

CDM approved methodology ACM0002 was chosen as methodological basis. This methodology defines well-established procedures and has already been successfully applied to many CDM and JI projects.

4.2 Quantifying GHG emissions and/or removals for the baseline scenario:

For identification of the baseline scenario ACM0002 refers to the "Tool to calculate the emission factor for an electricity system".

Calculation of the Combined Margin (CM)

A brief explanation of this methodology is given in Tool (page 2) as follows: *"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 "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM). The operating margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity. The build margin refers to a cohort of power units that reflect the type of power units whose construction would be affected by the proposed CDM project activity"*.

Corresponding formulas and calculations for calculation of the CM factor are shown in Annex 1 of this PD. The origin of the applied data is shown in section 3.3 above.

Baseline emissions

As per ACM0002 baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. This is calculated as per formula 6:

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

Where:

BE_y = Baseline emissions in year y (tCO_2/yr).

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

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the .Tool to calculate the emission factor for an electricity system. (tCO_2/MWh)

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

The project activity is the installation of a new grid-connected renewable power plant, thus $EG_{PJ,y} = EG_{facility,y}$ (ACM0002 page 9, equation 7).
It follows that:

$BE_y = EG_{facility,y} * EF_{grid,CM,} = 100{,}470$ MWh/year * 0.5491 tCO2/MWh = **55,170 tCO_2/year**

4.3 Quantifying GHG emissions and/or removals for the project:

Project emissions are calculated as follows:

$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$

Where:

PE_y = Project emissions in year y (tCO_2e/yr)
$PE_{FF,y}$ = project emissions from fossil fuel consumption in year y (tCO_2/yr)
$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y
$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

$PE_{FF,y}$ is zero as there will be no fossil fuel consumption to generate electricity and $PE_{GP,y}$ is zero as the project is not a geothermal project activity.

In order to calculate project emissions from water reservoir of the plant, power density should be calculated. The power density of the project activity (PD) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(5)}$$

PD= Power density of the project activity
Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity
Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For the new hydro power plants, this value is zero
A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity when reservoir is full (m2)
A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

As the project acitivity is not extension of another project, Cap_{BL} and A_{BL} are zero, then

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

As in the case of Saracbendi HPP this density is well above the $10W/m^2$ threshold (~23.84 W/m^2; reservoir size: 992,982 m^2, installed capacity: 23.67 MW), emissions (CH_4 and CO_2) from the reservoir are zero (ACM0002, page 8).According to the tool (page 7), for the projects having power density more than 10 W/m2 threshold is zero. Hence, the project emission (PE_y) is zero.

Emission reductions due to project activity have to be calculated as per formula 11 of ACM0002:

$$ER_y = BE_y - PE_y \quad \textbf{(11)}$$

Where:
ER_y = Emission reductions in year y (tCO_2/yr).
BE_y = Baseline emissions in year y (tCO_2/yr).
PE_y = Project emissions in year y (tCO_2/yr).

Then:

$$ER_y = BE_y$$

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

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project:

PE_y is 0 (see 4.3 above), the emission reduction is equivalent to the determined baseline emissions. Thus emission reductions amount to **55,170 tCO_2/year**.

5 Environmental Impact:

According to the relevant Environmental Impact Assessment Regulation for Saracbendi HPP, an Environmental Impact Assessment is not required. The official letter from Environment and Forestry Ministry confirming non-applicability of this regulation will be available to DOE during validation process.

In Turkey there are 35 Nature Preservation Area and 37 National Parks. The project is not located in any of these. Furthermore in Turkey there are 58 registered Monument of Nature and 16 registered Nature Park. None of these Monuments of Nature and Nature Parks is located in the project area.

A report from discussions with stakeholders on environmental impacts and their proper treatment will be available to the DOE at validation.

Environmental benefits

The project helps Turkey to stimulate and commercialize the use of grid connected renewable energy technologies and markets. The specific environmental benefits are:

- Reduction of GHG emissions as attributable to conventional energy production in BAU scenario;
- Creation of local employment during construction and operation of HPP;
- Reduction of other pollutants from power generation in Turkey as compared to BAU.

6 Stakeholders' comments:

The local stakeholders' comments invitation and compilation process applied was as follows:

6.1 Local Stakeholder Consultation

The local stakeholder consultation was organized in the Sarac village on 14:00 o'clock, on Friday, 16.07.2010. The stakeholder groups, which included the local participants directly impacted by the project and local authorities, were informed through oral and written announcement about the meeting. There was a comprehensive meeting in which villagers found a chance to participate. The meeting was held in meeting room of the village, while there was no coffee house in the village. That meeting room is often used by villagers for social meetings and celebrations. So it was the most popular and wide place of the village. Villagers meet each other there often. This is also a place where announcements are stated. The pictures below summarize the meeting participation.

Stakeholder meeting in Sarac village:

A comprehensive meeting which included possible stakeholders was arranged by FutureCamp Turkey to discuss the social and environmental impact of the project on local community. While choosing the stakeholders, environmental, health and socioeconomic perspectives of the project are taken into account.

To invite local people to the meeting, head of village was called and meeting was arranged in the village room. With the support head of village, the meeting was held.

The meeting started with a comprehensive presentation including information about

- project developers,
- the project activity,
- the technology and operation of the power plant,
- estimated emission reduction amount this plant realize,
- the importance of revenue from emission reduction certificates (VERs),
- the project characteristics which makes this project different from other hydro power projects in Turkey.

The entire meeting was conducted in Turkish, therefore all the documents summarizing the meeting as well as the participant list are also prepared in Turkish.

In sum more than 30 people participated to the meeting, but only 23 of them has filled participation list. Before starting to the meeting, the agenda of the meeting and non-tech PDD were distributed to all participants and requested to fill out their name and signature to the participants list.

6.2 Brief description how comments by local stakeholders have been invited and compiled:

The meeting was started by a presentation of the project including project design. During and after presentation some questions were raised. One of question was about the difference between channel type Hydro power plant and dams, the question is pointed out by presenter. Another important point was whether villagers would be able to benefit from the water that flows through the channel. Project site manager, Serdar Beykont, stated that they can benefit as it is also promised by general manager. One more question was also related with the channel. Villagers were wondering whether there will be any fence around the channel, if so, how would they pass the fence to get the irrigation water. Project site manager said that it would be possible to open small windows in fence and get the water. Lastly villagers asked whether the project developer would realise any water to river bed. Site manager pointed out that in every season there would be water in river bed and this would be monitored by DS (State Hydraulic Water Works). Project developer also promised to the villagers to repairs roads within the village which was a positive impact of the project.

There were also positive comments from resident of the village and they collectively thanked to the designer and investors of the project.

Finally, stakeholders were asked for further questions, opinions and recommendations about the project. All questions and answers were recorded in the protocol.

6.3 Report on how due account was taken of any comments received:

The overall feedback to the organised consultation, and what follows to the project, was very positive, where participants emphasized the importance of environmental sustainability and the overall benefit for all the participants. There have not been raised any critical comments nor objections for the project implementation. Due to no negative effects but benefits (e.g. possible employment for local people) for the people, there was no rejection to the proposed hydro power project.

All the comments were written down during the meeting, where afterwards the participants signed the prepared documents.

As there have not been raised any significant concerns related to the potential impacts of the project, no changes to the project design were necessary.

6.4 Sustainable Development effects

The project supports Turkey in stimulating and commercializing the use of grid connected renewable energy technologies and markets. The specific economical, social and technological benefits are:

- Reducing Turkeys expanding energy deficit;
- Diversification of Turkish electricity generation mix and reduction of import dependency;
- Creation of local employment and income during construction and operation of HPP (directly as well as indirectly via contracts with local providers for supply of construction material);
- Foster infrastructural investments with connected development benefits to the local rural community in the remote project area;

7 Schedule:

The following schedule shall apply:

According to Turkish regulations, to get necessary permits for further project implementation, a granting generation licence from Authority is required. Hence, issuance of licence cannot be considered as 'Project Start Date' but a prerequisite to proceed for further project development activities. Starting date of construction activities is set to be investment decision date since, with these activities the project investor committed to the overall investment.

Table 14: Implementation Schedule

Date (DD-MM-YYYY)	Activity
08-04-2005; 21-02-2008 (revised)	Issuance of the License
25-08-2007	Requests for Proposals from Consultants for VER Development
17-04-2008	Start of First Construction Activities
28-05-2008	Contract with Hangzhou Yatai Hydro
01-09-2008	Initial Agreement with a VER Consultant
25-05-2009	Financial Closure with Bank
01-09-2009	Contract with EPM Elektrik Proje Montaj İnşaat Ltd. Şti. (electrical equipment)
13-04-2010	Signature with FutureCamp Türkiye for VER Development
06-05-2011	Start of operation

The implementation schedule above clearly shows that before starting of the project activity, Camlıca Elektrik Üretim A.Ş. started to analyse revenues from VER credit sales, decided to get consultancy for VER development and signed contract with a carbon consultant. However, due to problems with the initial carbon development consultant and the financial crisis this agreement is terminated. But since carbon reduction revenue is essential for implementation of this project. Camlıca Elektrik later closed an agreement with FutureCamp Türkiye for carbon development.

Aforementioned schedule shows us that Camlıca Elektrik started its consideration of VER income from the beginning of the project implementation. VER revenue has a decisive impact on the decision to proceed in the project development.

The project activity begins with the commissioning of the hydro plant on 1st May 2011. As starting date of the project/begin of the crediting period, the same date is indicated.

Validation of the project shall take place as soon as possible. An annual monitoring and reporting is envisaged.

The Project has an electricity generation license valid from May 5th, 2007 for a period of 48 years 6 months. The crediting period for GHG emission reductions is 10 years, and it is planned to be extended 2 more periods to a total crediting period of 30 years. Therefore it expected that the Project will continue reducing GHG emissions even after the crediting period.

The monitoring is planned to be carried out annually. Each year, an accredited DOE will verify the GHG emission reductions, which have been monitored according to the monitoring plan. The project owner will submit the relevant information and documentation for verification to this 3rd party annually.

8 Ownership:

8.1 Proof of Title:

Saracbendi HPP is a project by Camlıca Elektrik Üretim A.Ş.

Respective documentation regarding the ownership will be available at validation.

8.2 Projects that reduce GHG emissions from activities that participate in an emissions trading program (if applicable):

Not applicable: The project activity is neither included in an emissions trading program nor does it take place in a jurisdiction or sector in which binding limits are established on GHG emissions.

Annex 1: BASELINE INFORMATION

PART A: Calculation of the Combined Margin (CM)

Stepwise approach of 'Tool to calculate the emission factor for an electricity system'is used to find this combined margin (emission coefficient) as described below:

Step 1: Identify the relevant electric power system

There are 21 regional distribution regions in Turkey but no regional transmission system is defined. In Article 20 of License Regulation it is stated that '*TEİAŞ shall be in charge of all transmission activities to be performed over the existing transmission facilities and those to be constructed as well as the activities pertaining to the operation of* ***national transmission system*** *via the National Load Dispatch Center and the regional load dispatch centers connected to this center and the operation of Market Financial Reconciliation Center*[34]'. As it can be understood from this phrase, only one transmission system which is national transmission system is defined and only TEİAŞ is in the charge of all transmission system related activities. Moreover, a communication with representative of TEİAŞ which indicates that: "There are not significant transmission constraints in the national grid system which is preventing dispatch of already connected power plants" is submitted to the DOE. Therefore, the national grid is used as electric power system for project activity. The national grid of Turkey is connected to the electricity systems of neighboring countries. Complying with the rules of the tool, the emission factor for imports from neighboring countries is considered 0 (zero) tCO_2/MWh for determining the OM.

There is no information about interconnected transmission capacity investments, as TEİAŞ, who operates the grid, also didn't take into account imports-exports for electricity capacity projections.[35] Because of that, for BM calculation transmission capacity is not considered.

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

According to Tool project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

Option II: Both grid power plants and off-grid power plants are included

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[34] See, See, http://www.epdk.org.tr/english/regulations/electric/license/licensing.doc (page 21)

[35] See, http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu2008_2017.pdf (page 39)

For this project **Option I** is chosen.

Step 3: Select an operating margin (OM) method

The Turkish electricity mix does not comprise nuclear energy. Also there is no obvious indication that coal is used as must run resources. Therefore, the only low cost resources in Turkey, which are considered as must-run, are Hydro, Renewables and Waste, Geothermal and Wind (according to statistics of TEİAŞ).

Table A1-1: Share of Low Cost Resource (LCR) Production 2004-2008 (Production in GWh)[36]

	2004	2005	2006	2007	2008
Gross production	150,698.3	161,956.2	176,299.8	191,558.1	198,418.0
TOTAL LCR Production	46,338.6	39,836.3	44,618.7	36,575.6	34,498.6
Hydro	46,083.7	39,560.5	44,244.2	35,850.8	33,269.8
Renewables and Waste	104.0	122.4	154.0	213.7	219.9
Geothermal and Wind	150.9	153.4	220.5	511.1	1,008.9
Share of LCRs	*30.75%*	*24.60%*	*25.31%*	*19.09%*	*17.39%*
Av. of last five years			**23.43%**		

As average share of low cost resources for the last five years is far below 50% (23.43%), the Simple OM method is applicable to calculate the operating margin emission factor ($EF_{grid,OM,y}$)

For the Simple OM method, the emissions factor can be calculated using either of the two following data vintages:

- Ex ante option: 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, or
- Ex post option: The year, in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

The ex ante option is selected for Simple OM method, with the most recent data for the baseline calculation stemming from the years 2006 to 2008.

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

The Simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants. The calculation of the simple OM emission factor can be based on

- data on net electricity generation a CO2 emission factor of each power unit (Option A), or
- data 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).

[36] See, http://www.teias.gov.tr/istatistik2008/32(75-08).xls

Option B is chosen to calculate the Simple OM, as there is no power plant specific data available, renewable power generation are considered as low-cost power sources and amount of electricity supplied to the grid by these sources is known.

Where Option B is used, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants, and based on the fuel type(s) and total fuel consumption of the project electricity system, as per formula 1 of the tool:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} x NCV_{i,y} x EF_{CO2,i,y}}{EG_y} \quad (1)$$

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 (of fossil fuel type i in year y (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
y	=	three most recent years for which data is available at the time of submission of the PDD to the DOE for validation

For the calculation of the OM the consumption amount and heating values of the fuels for each sources used for the years 2006, 2007 and 2008, is taken from the TEİAŞ annual statistics, which holds data on annual fuel consumption by fuel types as well as electricity generation amounts by sources and electricity imports. All the data needed for the calculation, including the emission factors and net calorific values (NCVs), are provided in part B of this Annex. Total CO_2 emission due to electricity generation in Turkey for the years of 2006, 2007 and 2008 are given in Table A1-2.

Table A1-2: CO2 emissions from electricity production 2006-2008 (ktCO2)[37]

	2006	2007	2008
CO_2-Emmissions	82,562	97,649	103,352

[37] For detail calculation see Annex 2

Table A1-3 below presents the gross electricity production data by all the relevant energy sources. Low-cost/must run resources like hydro, wind, geothermal and biomass do not emit fossil CO_2 and thus are not taken into account in calculations.

Table A1-3: Gross electricity production by fossil energy sources 2006-2008 (GWh)

Energy Source	**2006**	**2007**	**2008**
Natural Gas	80,691.2	95,024.8	98,685.3
Lignite	32,432.9	38,294.7	41,858.1
Coal	14,216.6	15,136.2	15,857.5
Fuel Oil	4,232.4	6,469.6	7,208.6
Motor Oil	57.7	13.3	266.3
Naphtha	50.2	0.0	43.6
LPG	0.1	43.9	0.0
Total fossil fuels	**131,681.1**	**154,982.5**	**163,919.4**

Table A1-3 shows gross data, but EG_y in the above described formula means electricity delivered to the grid, i.e. net generation. Therefore following Table A1-4 shall help to derive net data by calculating the net/gross proportion on the basis of overall gross and net production numbers.

Table A1-4: Net/gross electricity production 2006-2008 (GWh)[38]

	2006	**2007**	**2008**
Gross Production	176,299.80	191,558.13	198,418.00
Net Production	169,543.10	183,339.70	189,761.90
Relation	**96.17%**	**95.71%**	**95.64%**

Multiplying these overall gross/net relation percentages with the fossil fuels generation amount does in fact mean an approximation. However this is a conservative approximation as the consumption of plant auxiliaries of fossil power plants is higher than for the plants that are not included in the baseline calculation. In the end this would lead to a lower net electricity generation and therefore to a higher OM emission factor and higher emission reductions.

Table A1-5 shows the resulting net data for fossil fuel generation and adds electricity imports.

Table A1-5: Electricity supplied to the grid, relevant for OM (GWh)

	2006	**2007**	**2008**
Net El. Prod. by fossil fuels	126,634.4	148,333.3	156,768.3
Electricity Import	573.2	864.3	789.4
Electricity supplied to grid by relevant sources	**127,207.6**	**149,197.6**	**157,557.7**

Electricity import is added to the domestic supply in order to fulfill the Baseline Methodology requirements. Imports from connected

[38] For Net Production See, http://www.teias.gov.tr/istatistik2008/30(84-08).xls (column L)

electricity systems located in other countries are weighted with an emission factor of 0 (zero) tCO_2/MWh.

The last step is to calculate $EF_{grid,OMsimple,y}$:

Table A1-6: Calculation of Weighted $EF_{grid,OMsimple,y}$ (ktCO2/GWh)

	2006	2007	2008
CO_2-Emmissions ($ktCO_2$)	82,562	97,649	103,352
Net Electricity Supplied to Grid by relevant sources (GWh)	127,207.6	149,197.6	157,557.7
$EF_{grid,OMsimple,y}$ ($ktCO_2/GWh$)	0.6490	0.6545	0.6560
3-year Generation Weighted Average $EF_{grid,OMsimple,y}$ ($ktCO_2/GWh$)	**0.6534**		

Step 5: Identify the group of power units to be included in the build margin

Build Margin calculations are performed with the sample group of power units *m* consisting 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

Option (b) is used to identify the sample group, as this option comprises the larger annual generation in Turkey. In 2008, gross electricity generation amount was 198,418 GWh and 20% of this is 39,683.6 GWh.

The last plant of the sample group is built in 2004 and until the end of the 2008 (which is the latest year for official statistics published for plants put in operation) there were 12 VER projects. Because of the last plant of the sample group was built 4 years ago (not more than 10 years ago), VER plants are excluded from sample group.

While identifying the sample group dismantled, revised, retrofits are not included. Only new capacity additions (power plants / units) are taken into account.

Sample group for BM emission factor is given below table. The derivation of the values presented in Table A1-7 is contained in a separate excel file which is available for validation.

Table A1-7: Sample group generation for BM emission factor calculation (GWh)

Energy Source	2004	2005	2006	2007	2008	Total
Natural Gas	8,810.4	7,068.4	3,119.1	2,552.1	2,400.0	**23,950.5**
Lignite	0.0	4,420.0	7,020.0	0.0	0.0	**11,440.0**
Coal	337.5	1,125.0	0.0	0.0	0.0	**1,462.5**
Fuel Oil	789.2	99.1	0.0	800.0	103.2	**1,791.4**
Hydro	241.8	1,028.8	482.6	1,217.0	1,629.0	**4,599.2**

Renewables	0.0	87.4	453.1	11.0	167.8	**719.3**
TOTAL	10,178.9	13,828.7	11,074.7	4,580.1	4,300.0	**43,962.3**

Again, the project proponents can chose between two options according to the calculation tool: calculate the BM ex-ante based on the latest available data or update the BM each year ex post. Option 1, the ex-ante approach, is again chosen.

Step 6:. Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as per formula 13 of the tool:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} x EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (13)$$

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

Because of only fuel types and electricity generation data are available for the sample group, *Option B2* of Simple OM method is used to calculate emission factor. The formula corresponds to formula 3 of the tool:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} x 3.6}{\eta_{m,y}} \quad (3)$$

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 CO_2 emission factor of fuel type i used in power unit m in year y (tCO_2/GJ)

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (%)

y = Three most recent years for which data is available at the time of submission of the PDD to the DOE for validation

BM emission factor calculation and resulted BM factor is given in the Table A1-8. For BM factor calculation, since no official emission factors for different fuel types are available, lower confidence default values of IPCC Guidelines are applied. Explanation of emission factor selection for each energy sources and references are given in section 3.3 of the PDD.

Table A1-8: BM emission factor calculation as per tool equations 13/3.

Energy Source	Sample Group Total Generation (GWh)	Effective CO_2 emission factor (tCO_2/TJ)	Average Efficiency ($\eta_{m,y}$)	CO_2 Emission ($ktCO_2$)
Natural Gas	23,950.0	54.3	60.00%	7,802.9
Lignite	11,440.0	90.9	39%	9,599.0
Coal	1,462.5	89.5	41.50%	1,135.5
Fuel Oil	1,791.4	72.6	46.00%	1,017.8
Hydro	4,599.2	0.0	0.00%	0.0
Renewables	719.3	0.0	0.00%	0.0
Total	***43,962.3***			***19,555.2***
$EF_{grid,BM,y}$ (tCO_2/MWh)	**0.4448**			

Step 7: Calculate the combined margin emission factor

The combined margin emission factor is calculated as per tool formula 14:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \quad \textbf{(14)}$$

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 (%)

According to the Tool for wind power generation project activities: w_{OM} = 0.5 and w_{BM} = 0.5. Then:

$EF_{grid,CM,y}$	**= 0.6534 tCO_2/MWh * 0.5 + 0.4448 tCO_2/MWh * 0.5** **= 0.5491 tCO_2/MWh**

PART B: Calculation of Total CO_2 from OM Power Plants:

Table A1-9: HVi,y (Heating Values for Fossil Fuels for Electricity Generation (TCal)

Energy Sources	2005	2006	2007
Hard Coal+Imported Coal	29,504	32,115	33,310
Lignite	83,932	100,320	108,227
Fuel Oil	16,769	21,434	20,607
Diesel Oil	627	517	1,328
Lpg	0	0	0
Naphta	141	118	113
Natural Gas	150,588	179,149	189,057

Table A1-10: FCi,y (Fuel Consumptions for Fossil Fuels for Electricity Generation (million m3 for Natural Gas and ton for others)

Energy Sources	2005	2006	2007
Hard Coal+Imported Coal	5,617,863	6,029,143	6,270,008
Lignite	50,583,810	61,223,821	66,374,120
Fuel Oil	1,746,370	2,250,686	2,173,371
Diesel Oil	61,501	50,233	131,206
LPG	33	0	0
Naphta	13,453	11,441	10,606
Natural Gas	17,034,548	20,457,793	21,607,635

1 Tcal= 4.1868 TJ

Table A1-11: $NCV_{i,y}$ (Average Net Calorific Values for Fossil Fuels for Electricity Generation; TJ/million m3 for Natural Gas and TJ/kton for others) and EF_i (Emission Factor of Fossil Fuels)

Energy Sources	NCVi 2005	NCVi 2006	NCVi 2007	EF_i
Hard Coal+Imported Coal	21.99	22.30	22.24	89.50
Lignite	6.95	6.86	6.83	90.90
Fuel Oil	40.20	39.87	39.70	72.60
Diesel Oil	42.68	43.09	42.38	72.60
LPG	0.00	0.00	0.00	61.60
Naphta	43.88	43.18	44.61	69.30
Natural Gas	37.01	36.66	36.63	54.30

*Table A1-12: **CO_2 Emission** by each Fossil Fuels Types ($ktCO_2e$)*

Energy Sources	2005	2006	2007
Hard Coal+Imported Coal	11,056	12,034	12,482
Lignite	31,943	38,180	41,189
Fuel Oil	5,097	6,515	6,264
Diesel Oil	191	157	404
Lpg	0	0	0
Naphta	41	34	33
Natural Gas	34,235	40,728	42,981
TOTAL	82,562	97,649	103,352

PART C: Identification of Sample Group

Table A1-13: Sample Group PPs for BM Emission Factor Calculation

Name of Power Plant	Capacity (MW)	Average Genera-tion (GWh)	Fuel Type	Date of Operation
ANKARA D.G.(BAYMİNA) GR-I-II-III	798.0	6,500.0	N. Gas	08.01.2004
ENTEK GR-IV	31.1	255.7	N.GAS+NAPHTA	12.02.2004
ATATEKS 2 GM	5.6	45.0	N. Gas	20.02.2004
TANRIVERDİ 4 GM	4.7	38.7	N. Gas	24.03.2004
ÇOLAKOĞLUB(CAPACITY INCREMENT)	45.0	337.5	IMPORTED COAL	05.05.2004
TEKBOY TEKSTİL 1 GM	2.2	16.0	N. Gas	18.05.2004
GÜL ENERJİ GR-II	12.5	96.5	Fuel Oil	03.06.2004
KOMBASSAN KAĞIT GIDA VE TEKS	5.5	38.1	N. Gas	09.06.2004
AYEN OSTİM ENERJİ ÜRETİM	31.1	264.1	N. Gas	11.06.2004
BİS ENERJİ 2 GT	73.0	602.7	N. Gas	16.06.2004
ENERJİ-SA ADANA 1 BT	49.8	322.9	NAPHTA	23.06.2004
ŞAHİNLER ENERJİ 1 GM	3.2	22.2	N. Gas	29.06.2004
BESLER GR-2, BT (5,2+7,5)	12.7	97.7	N. Gas	07.07.2004
ÇELİK ENERJİ ÜR.ŞTİ. 2 GM	2.4	18.6	N. Gas	09.07.2004
KOMBASSAN KAĞ. MATBAA GIDA	5.5	35.7	N. Gas	24.09.2004
AYEN OSTİM ENERJİ ÜRETİM (BT)	9.9	84.0	N. Gas	01.10.2004
HABAŞ ALİAĞA GRUP I-II	89.2	713.9	N. Gas	08.10.2004
STANDART PROFİL 3 GM	6.7	49.2	N. Gas	22.10.2004
KARKEY-II 3+3 DGM	54.3	369.7	Fuel Oil	12.11.2004
ALTINMARKA GIDA GR I-II-III	3.6	28.8	N. Gas	17.12.2004
ERE (BİR KAPILI HES) GRUP-I	48.5	170.6	Hydro (Run of River)	11.03.2004
ELTA ELK (DODURGA) GR-I-II-III-IV	4.1	12.3	Hydro (Run of River)	26.04.2004
İSKUR TEKSTİL (SÜLEYMANLI) GR I-II	4.6	17.9	Hydro (Run of River)	28.04.2004
BEREKET EN. (Feslek Hes) Gr-1-2	9.5	41.0	Hydro (Run of River)	05.08.2004
ÇAN GR I	160.0	1,040.0	LIGNITE	15.02.2005
ÇAN GR II	160.0	1,040.0	LIGNITE	15.03.2005
ELBİSTAN-B GR I	360.0	2,340.0	LIGNITE	15.02.2005

AKBAŞLAR GR-II (Isolated)	8.8	73.0	N.GAS	24.06.2005
AKÇA ENERJİ GR-III	8.7	65.4	N.GAS+NAPHTHA	14.12.2005
AYKA TEKSTİL GR-I	5.5	40.0	N. Gas	24.09.2005
BAYDEMİRLER GR IV-V-VI	6.2	51.4	N. Gas	04.02.2005
BOSEN GR-III	50.0	350.0	N. Gas	30.12.2005
ÇUMRA ŞEKER	16.0	40.0	N.GAS+LIGNITE	01.01.2005
ETİ MAD.(BAN.ASİT)GR-I	11.5	85.0	RENEW.+WASTES	15.07.2005
EVYAP GR I-II	5.1	30.0	N. Gas	27.08.2005
GRANİSER GRANİT GR-I	5.5	42.0	N. Gas	14.11.2005
HABAŞ ALİAĞA GR III	47.7	381.6	N. Gas	02.06.2005
HABAŞ ALİAĞA GR IV	47.7	381.6	N. Gas	21.09.2005
HABAŞ ALİAĞA GR-V	24.6	196.8	N. Gas	24.11.2005
HAYAT KAĞIT GR-I	7.5	56.0	N. Gas	27.05.2005
İÇDAŞ ÇELİK GR-I	135.0	1,080.0	IMPORTED COAL	30.11.2005
KAHRAMANMARAŞ KAĞIT GR-I	6.0	45.0	IMPORTED COAL	08.12.2005
KORUMA KLOR GR I-II-III	9.6	77.0	N. Gas	03.12.2005
KÜÇÜKÇALIK TEKSTİL GR I-II-III-IV	8.0	64.0	N. Gas	27.11.2005
MERCEDES BENZ TURK GR I-II-III-IV	8.3	68.0	N. Gas	04.02.2005
MODERN ENERJİ GR-III	8.4	62.9	N. Gas	14.06.2005
MODERN ENERJİ GR-II	6.7	50.4	N.GAS+LPG	14.06.2005
MOSB GR I-II-III-IV-V-VI-VII	84.8	434.0	N. Gas	01.03 - 01.08.2005
ORS RULMAN	12.4	99.4	N. Gas	25.08.2005
PAK GIDA (Kemalpaşa) GR-I	5.7	45.0	N. Gas	07.12.2005
TEZCAN GALVANİZ GR I-II	3.7	29.0	N. Gas	27.05.2005
YONGAPAN(KAST.ENTG) GR-II	5.2	32.7	N. Gas	25.05.2005
ZEYNEP GİYİM SAN. GR-I	1.2	9.0	N. Gas	07.07.2005
AK ENERJİ(K.paşa) GR- III	40.0	256.9	N. Gas	09.11.2005
AK ENERJİ(K.paşa) GR I-II	87.2	560.1	N. Gas	30.04.2005
ALTEK ALARKO GR I-II	60.1	420.0	N. Gas	14.10.2005
BİS ENERJİ GR VII	43.7	360.8	N. Gas	18.03.2005
CAN ENERJİ GR-I	3.9	28.0	N. Gas	25.08.2005
ÇEBİ ENERJİ BT	21.0	164.9	N. Gas	27.08.2005
ÇEBİ ENERJİ GT	43.4	340.1	N. Gas	23.08.2005
ENTEK ELK.A.Ş.KOÇ ÜNİ.GR I-II	2.3	19.0	N. Gas	07.02.2005
KAREGE GR IV-V	18.1	141.9	N. Gas	07.04.2005
KARKEY(SİLOPİ-4) GR-IV	6.2	47.2	Fuel Oil	30.06.2005
KARKEY(SİLOPİ-4) GR-V	6.8	51.9	Fuel Oil	23.12.2005
METEM ENERJİ(Hacışıramat) GR I-II	7.8	58.0	N. Gas	29.01.2005
METEM ENERJİ(Peliklik) GR I-II-III	11.7	89.0	N. Gas	29.01.2005
NOREN ENERJİ GR-I	8.7	70.0	N. Gas	24.08.2005
NUH ENERJİ-2 GR I	47.0	319.7	N. Gas	24.05.2005
ZORLU ENERJİ KAYSERİ GR-I-II-III	149.9	1,144.1	N. Gas	22.07.2005
ZORLU ENERJİ KAYSERİ GR-IV	38.6	294.9	N. Gas	26.10.2005
ZORLU ENERJİ YALOVA GR I-II	15.9	122.0	N. Gas	26.11.2005
TEKTUĞ(Kargılık) GR I-II	23.9	83.0	Hydro (Run of River)	25.04.2005
İÇTAŞ ENERJİ(Yukarı Mercan) GR I-II	14.2	44.0	Hydro (Run of River)	02.05.2005
MURATLI GR I-II	115.0	444.0	Hydro (with Dam)	03.06.2005
BEREKET EN.(DALAMAN) GR XIII-XIV-XV	7.5	35.8	Hydro (Run of River)	16.07.2005
YAMULA GRUP I-II	100.0	422.0	Hydro (with Dam)	31.07.2005
SUNJÜT(RES) GR I-II	1.2	2.4	Wind	23.04.2005
EKOTEN TEKSTİL GR-I	1.9	14	N. Gas	16.02.2006
ERAK GİYİM GR-I	1.4	10.0	N. Gas	22.02.2006

ALARKO ALTEK GR-III	21.9	173.0	Steam	23.02.2006
AYDIN ÖRME GR-I	7.5	60.0	N. Gas	25.02.2006
NUH ENERJİ-2 GR-II	26.1	180.1	Steam	02.03.2006
MARMARA ELEKTRİK (Çorlu) GR-I	8.7	63.0	N. Gas	13.04.2006
MARMARA PAMUK(Çorlu) GR-I	8.7	63.0	N. Gas	13.04.2006
ENTEK (Köseköy) GR-IV	47.6	378.2	N. Gas	14.04.2006
ELSE TEKSTİL (Çorlu) GRI-II	3.2	25.0	N. Gas	15.04.2006
SÖNMEZ ELEKTRİK (Çorlu) GRI-II	17.5	126.0	N. Gas	03.05.2006
MENDERES ELEKTRİK GR-I	8.0	56.0	Geothermal	10.05.2006
KASTAMONU ENTEGRE (Balıkesir) GR-I	7.5	54.0	N. Gas	24.05.2006
BOZ ENERJİ GR-I	8.7	70.0	N. Gas	09.06.2006
ADANA ATIK SU ARITMA TESİSİ	0.8	6.0	Biogas	09.06.2006
AMYLUM NİŞASTA (ADANA)	14.3	34.0	N. Gas	09.06.2006
ŞIKMAKAS (Çorlu) GR-I	1.6	13.0	N. Gas	22.06.2006
ELBİSTAN B GR-III	360.0	2,340.0.	Lignite	23.06.2006
ANTALYA ENERJİ GR I-II-III-IV	34.9	245.0	N. Gas	29.06.2006
HAYAT TEM. VE SAĞLIK GR I-II	15.0	108.0	N. Gas	30.06.2006
EKOLOJİK EN. (Kemerburgaz) GR-I	1.0	6.0	Waste Heat	31.07.2006
EROĞLU GİYİM (Çorlu) GR-I	1.2	9.0	N. Gas	01.08.2006
CAM İŞ ELEKTRİK (Mersin) GR-I	126.1	1,008.0.	N. Gas	13.09.2006
ELBİSTAN B GR-II	360.0	2,340.0.	Lignite	17.09.2006
YILDIZ ENT. AĞAÇ (Kocaeli) GR-I	6.2	40.0	N. Gas	21.09.2006
ÇERKEZKÖY ENERJİ GR-I	49.2	390.0	N. Gas	06.10.2006
ENTEK (Köseköy) GR-V	37.0	293.9	N. Gas	03.11.2006
ITC-KA EN. MAMAK TOP.M. GR I-II-III	4.2	30.0	Waste Heat	03.11.2006
ELBİSTAN B GR-IV	360.0	2,340.0.	Lignite	13.11.2006
ÇIRAĞAN SARAYI GR-I	1.3	11.0	N. Gas	01.12.2006
ERTÜRK ELEKTRİK Tepe RES GR-I	0.9	2.0	Wind	22.12.2006
AKMAYA (Lüleburgaz) GR-I	6.9	50.0	N. Gas	23.12.2006
BURGAZ (Lüleburgaz) GR-I	6.9	54.0	N. Gas	23.12.2006
ŞANLIURFA GR I-II	51.8	124.0	Hydro (Run of River)	01.03.2006
BEREKET ENERJİ GÖKYAR HES 3 Grup	11.6	43.3	Hydro (Run of River)	05.05.2006
MOLU EN. Zamantı Bahçelik GR I-II	4.2	16.7	Hydro (Run of River)	31.05.2006
SU ENERJİ (Balıkesir) GR I-II	4.6	20.7	Hydro (Run of River)	27.06.2006
BEREKET EN. (Mentaş Reg) GR I-II	26.6	108.7	Hydro (Run of River)	31.07.2006
EKİN (Başaran Hes) (Nazilli)	0.6	4.5	Hydro (Run of River)	11.08.2006
ERE (Sugözü rg. Kızıldüz hes) GR I-II	15.4	31.6	Hydro (Run of River)	08.09.2006
ERE (AKSU REG. Ve ŞAHMALLAR HES) GR I-II	14.0	26.7	Hydro (Run of River)	16.11.2006
TEKTUĞ (Kalealtı) GR I-II	15.0	52.0	Hydro (Run of River)	30.11.2006
BEREKET EN. (Mentaş Reg) GR III	13.3	54.4	Hydro (Run of River)	13.12.2006
HABAŞ (ALİAĞA-ADDITION)	9.1	35.3	N. Gas	02.05.2007
MODERN ENERJİ	5.2	38.0	N. Gas	2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kadıköy Hast.)	0.5	4.0	N. Gas	19.06.2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kozyatağı Hast.)	0.6	5.0	N. Gas	23.10.2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Nilüfer/BURSA)	1.3	11.0	N. Gas	28.08.2007
AKATEKS Tekstil Sanayi ve Ticaret A.Ş.	1.8	14.0	N. Gas	30.07.2007
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)	2.1	17.0	N. Gas	03.12.2007
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)	2.1	17.0	N. Gas	03.12.2007
FRİTOLAY GIDA SAN.VE TİC. AŞ.	0.5	4.0	N. Gas	23.01.2007
KIVANÇ TEKSTİL SAN.ve TİC.A.Ş.	3.9	33.0	N. Gas	20.03.2007

KİL-SAN KİL SAN.VE TİC. A.Ş	3.2	25.0	N. Gas	19.02.2007
SÜPERBOY BOYA SAN.ve Tic.Ltd.Şti.	1.0	8.0	N. Gas	05.12.2007
SWİSS OTEL (Anadolu Japan Turizm A.Ş (İstanbul)	1.6	11.0	N. Gas	01.08.2007
TAV Esenboğa Yatırım Yapım ve İşetme AŞ.	3.9	33.0	N. Gas	19.09.2007
KARTONSAN	5.0	40.0	Liqued Fuel + N.Gas	2007
ESKİŞEHİR END. ENERJİ	3.5	26.8	Liqued Fuel + N.Gas	2007
İGSAŞ	2.2	15.2	Liqued Fuel + N.Gas	2007
ITC-KA Enerji Üretim Aş.(Mamak)(Addition)	1.4	11.0	Waste Heat	22.05.2007
BİS Enerji Üretim AŞ.(Bursa)(Addition)	43.0	354.8	N. Gas	30.05.2007
Aliağa Çakmaktepe Enerji A.Ş.(Aliağa/İZMİR)	34.8	278.0	N. Gas	13.09.2007
BİS Enerji Üretim AŞ.(Bursa)(Addition)	48.0	396.1	N. Gas	30.08.2007
BOSEN ENERJİ ELEKTRİK AŞ.	142.8	1,071.0.	N. Gas	18.01.2007
SAYENERJİ ELEKTRİK ÜRETİM AŞ. (Kayseri/OSB)	5.9	47.0	N. Gas	03.07.2007
T ENERJİ ÜRETİM AŞ.(İSTANBUL)	1.6	13.0	N. Gas	04.04.2007
ZORLU EN.Kayseri (1 GT Addition)	7.2	55.0	N. Gas	17.01.2007
SİİRT	25.6	190.0	Fuel Oil	2007
Mardin Kızıltepe	34.1	250.0	Fuel Oil	2007
KAREN	24.3	180.0	Fuel Oil	2007
İDİL 2 (PS3 A- 2)	24.4	180.0	Fuel Oil	2007
BORÇKA HES	300.6	1,039.0.	Hydro (With Dam)	27.02.2007
TEKTUĞ(Keban River)	5.0	32.0	Hydro (run of river)	08.05.2007
YPM Ener.Yat.AŞ.(Altıntepe Hydro)	4.0	18.0	Hydro (run of river)	06.06.2007
YPM Ener.Yat.AŞ.(Beypınar Hydro)	3.6	18.0	Hydro (run of river)	06.06.2007
YPM Ener.Yat.AŞ.(Konak Hydro)	4.0	19.0	Hydro (run of river)	19.07.2007
KARASU HES-Andırın	2.4	19.0	Hydro (run of river)	28.11.2007
İSKUR TEKSTİL (SÜLEYMANLI HES)	4.6	18.0	Hydro (run of river)	30.12.2007
ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)	6.3	27.0	Hydro (run of river)	03.05.2007
ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)(Addition)	6.3	27.0	Hydro (run of river)	24.05.2007
MB ŞEKER NİŞASTA SAN.A.Ş. (Sultanhanı)	8.8	60.0	Natural Gas	2008
AKSA ENERJİ (Antalya)	183.8	1,290.0	Natural Gas	2008
AKSA ENERJİ (Manisa)	52.4	370.0	Natural Gas	2008
ANTALYA ENERJİ (Addition)	17.5	122.3	Natural Gas	2008
ATAÇ İNŞAAT SAN. A.S.B. (ANTALYA)	5.4	37.0	Natural Gas	2008
BAHÇIVAN GIDA (LÜLEBURGAZ)	1.2	8.0	Natural Gas	2008
CAN ENERJİ (Çorlu - Tekirdağ) (Addition)	52.4	304.2	Natural Gas	2008
FOUR SEASONS OTEL (ATİK PASHA TUR. A.Ş.)	1.2	7.0	Natural Gas	2008
FRİTOLAY GIDA SAN.VE TİC. AŞ. (Addition)	0.1	4.0	Natural Gas	2008
ITC-KA Enerji Üretim Aş.(Mamak)(Addition)	14.1	95.8	Waste	2008
KARKEY (SİLOPİ-5) (154 kV) (Addition)	14.8	103.2	Fuel Oil	2008
MELİKE TEKSTİL (GAZİANTEP)	1.6	11.0	Natural Gas	2008
MİSİS APRE TEKSTİL BOYA EN. SAN.	2.0	14.0	Natural Gas	2008
MODERN ENERJİ (LÜLEBURGAZ)	13.4	94.1	Natural Gas	2008
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	2.8	22.0	Waste	2008
POLAT TURZ. (POLAT RENAISSANCE İST. OT.)	1.6	11.0	Natural Gas	2008
SARAYKÖY JEOTERMAL (Denizli)	6.9	50.0	Geothermal	2008
SÖNMEZ Elektrik (Addition)	8.7	67.3	Natural Gas	2008
AKKÖY ENERJİ (AKKÖY I HES)	101.9	408.0	Hydro (with Dam)	2008
ALP ELEKTRİK (TINAZTEPE) ANTALYA	7.7	29.0	Hydro (run of river)	2008
CANSU ELEKTRİK (MURGUL/ARTVİN)	9.2	47.0	Hydro (run of river)	2008
ÇALDERE ELEKT. (ÇALDERE HES) Dalaman – MUĞLA	8.7	35.0	Hydro (run of river)	2008

DAREN HES ELKT. (SEYRANTEPE BARAJI VE HES)	49.7	182.0	Hydro (With Dam)	2008
DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	25.7	69.0	Hydro (With Dam)	2008
GÖZEDE HES (TEMSA ELEKTRİK) BURSA	2.4	10.0	Hydro (run of river)	2008
H.G.M ENERJİ (KEKLİCEK HES) (Yeşilyurt)	8.7	18.0	Hydro (run of river)	2008
HAMZALI HES (TURKON MNG ELEKTRİK)	16.7	117.0	Hydro (run of river)	2008
HİDRO KNT. (YUKARI MANAHOZ REG. VE HES)	22.4	79.0	Hydro (run of river)	2008
İÇ-EN ELK. (ÇALKIŞLA REGÜLATÖRÜ VE HES)	7.7	18.0	Hydro (run of river)	2008
KALEN ENERJİ (KALEN II REGÜLAT. VE HES)	15.7	50.0	Hydro (run of river)	2008
MARAŞ ENERJİ (FIRNIS REGÜLATÖRÜ VE HES)	7.2	36.0	Hydro (run of river)	2008
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21.0	96.0	Hydro (run of river)	2008
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21.6	108.0	Hydro (run of river)	2008
TORUL	105.6	322.0	Hydro (With Dam)	2008
YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	0.8	5.0	Hydro (run of river)	2008
TOTAL	**6,718.6**	**43,962.3**		