

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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SECTION A. General description of small-scale project activity
A.1. Title of the small-scale project activity:
Grid-connected electricity generation from renewable sources:
Cakirlar 17.00 MW Run-off-River Hydro Power Plant

(in the following: Cakirlar HEPP)

Document version: 01

Date of completion: May 4th, 2010

A.2. Description of the small-scale project activity:

ANADOLU ELEKTRİK ÜRETİM ve TİCARET A.Ş.(ANADOLU, hereafter) is in the phase of installing a runoff-river hydropower plant near Murgul creek in Artvin, The project aims the installation of a 17.0 MW runoff-river hydropower electricity plant (HEPP) near Egrisu, Soval, Kopurten and Suluduz brooks in Artvin, Turkey. The purpose of the project is to generate electricity and to feed it into the public grid. Cakirlar HEPP shall be registered as a Gold Standard Voluntary Emission Reduction (GS-VER) project in order to facilitate the project implementation by means of financial inflows coming from the credits sale Due to its significant contribution in diminishing carbon emissions and protecting the climate as well as due to some significant additionality issues discussed further below, this project is anticipated to fulfil the requirements of the Gold Standard rigorously. The project has not been rejected by another GHG program before. In addition, the project highly supports the sustainable economic development in the region.

The project will help Turkey to stimulate and commercialise the use of grid connected renewable energy technologies and markets. It will demonstrate the viability of small run-off river hydro power plants which will support improved energy security, improved air quality, alternative sustainable energy futures, improved local livelihoods and sustainable renewable energy industry development. The specific goals of the project are:

- reducing greenhouse gas emissions in Turkey compared to business-as-usual scenario,
- helping to stimulate the growth of small run-off river hydro power industry in Turkey,
- creating local employment during the construction and the operation phase of the plant,
- reduce other pollutants resulting from fossil fuel dependent power generation industry in Turkey, compared to business-as-usual scenario,
- helping to reduce Turkey's increasing energy deficit and
- diversifying the electricity generation mix and reducing import dependency.

The project contributes to sustainable development in Turkey in following ways:

- Hydropower presents various environmental benefits compared to other primary energy sources: hydro energy does not result in emissions of pollutants into the atmosphere nor does it emit residuals that can have negative impact on soil, water etc. As a renewable energy source hydro energy can be used without putting the supply of primary energy sources in danger for future generations. The proposed project will also contribute to reduction in emissions other than GHG, such as sulphur dioxide, nitrogen oxides and particulates.

- Cakirlar HEPP will result in extra employment – the realisation of the project will result in increased jobs in the local area, especially during the construction phase. Construction materials for the foundations, cables and access roads have been preferentially be sourced locally.

ANADOLU, as the project developer, from the very beginning was committed to providing sustainability through environmental protection as well as social development and community support. Based on the information collected during various unofficial and unstructured stakeholder participation meetings conducted by the project owner in the region and the Sustainable Development Matrix (for details see section D) were prepared. The results of the in-depth assessment of environmental and social impacts confirm the positive influence of the project on all domains of environment and social support.

Implementation of the project will consist of construction of the following main items:

- Four weirs, where water from the river is diverted into conveyance pipes;
- Total length of the conveyance pipes is 8,888 m.
- Power house with Pelton type turbines;

In the power house, two vertical shaft Pelton turbines will be installed, each 8.519 MW (total capacity 17.0 MW). The efficiency of the turbines is 90.5% when 4 jets are in operation. There are two generators attached to the facility. Generators have power factor of 0.8309 d/d, a frequency of 50 Hz and an output of 7.6 MVA.

The construction of the project started in and it is expected to be finished until July 2009. When the plant is commenced, the entire net electricity production is expected to be some 59,928 GWh per year.

A.3. Project participants:

| Name of Party involved ((host) indicates a host Party) | Private and/or public entity(ies) project participants (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|--|--|---|
| Turkey (host) | ANADOLU ELEKTRİK ÜRETİM ve TİCARET A.Ş.(| No |

Republic of Turkey: Host country. Turkey has ratified the Kyoto Protocol on February 5, 2009. Yet, in practice, Turkey will not commit to a cap on its greenhouse gas emissions and will not be a host for Clean Development Mechanism (CDM) or Joint Implementation (JI) projects until the end of 2012, because of its particular situation (Please see the final report of COP-7, Marrakesh)¹. Turkish National Focal Point to the UNFCCC is the Ministry of Environment and Forestry². Regional Environmental Center Country

¹ http://ec.europa.eu/environment/climat/pdf/marrakech_report.pdf

² UNFCCC, list of the National Focal Points (<http://maindb.unfccc.int/public/nfp.pl?mode=wim>)

Office Turkey (REC Turkey) acts as the National Focal Point for UNFCCC Article 6 – Education, Training and Public Awareness.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

The **Republic of Turkey** is the host country. Turkey has ratified the Kyoto Protocol. According to the UNFCCC website, the Ministry of Environment and Forestry is in charge of administration of the climate project issues³. The Turkish Country Office of the REC initiative has taken over certain functions of a National Focal Point for UNFCCC Article 6⁴.

A.4.1.2. Region/State/Province etc.:

Eastern Blacksea Region, province of Artvin, town of Murgul

A.4.1.3. City/Town/Community etc.:

The plant stretches across the following communities/towns: Giresun city, Murgul town, and Kabaca village.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

Cakirlar HEPP is located in the Black Sea Region of Turkey. The project is in Eastern Black Sea basin, within the province of Artvin. The project is on the Murgul creek. The geographical location of the project on Turkey map is 41° 08' 21'' - 41° 09' 23'' North, and 41° 31' 05'' - 41° 33' 54'' East.

³ See UNFCCC website, List of National Focal Points <http://maindb.unfccc.int/public/nfp.pl?mode=wim> (accessed on 25 February 2009)

⁴ See REC Turkey website, http://www.rec.org.tr/sayfa_en.asp?id=31 (accessed on 25 February 2009)

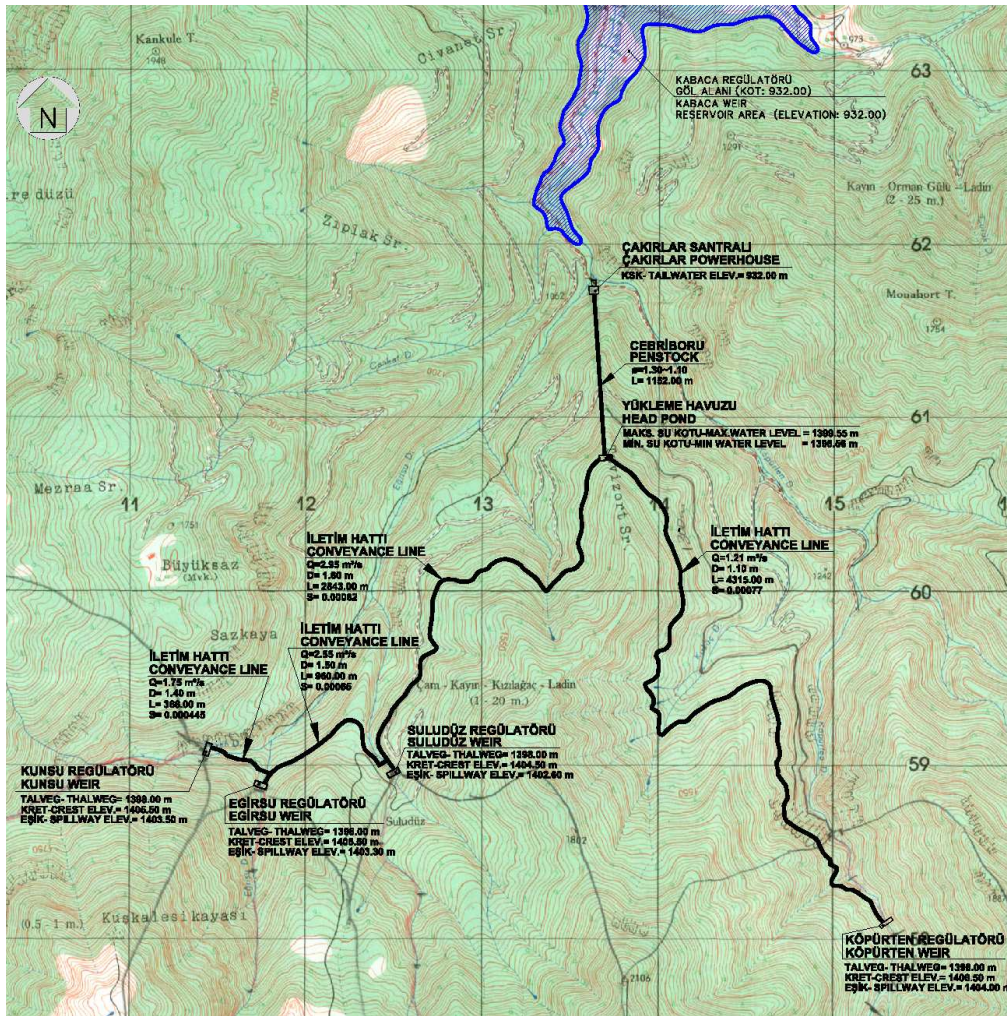


Figure 1: Site Layout of Cakirlar HEPP

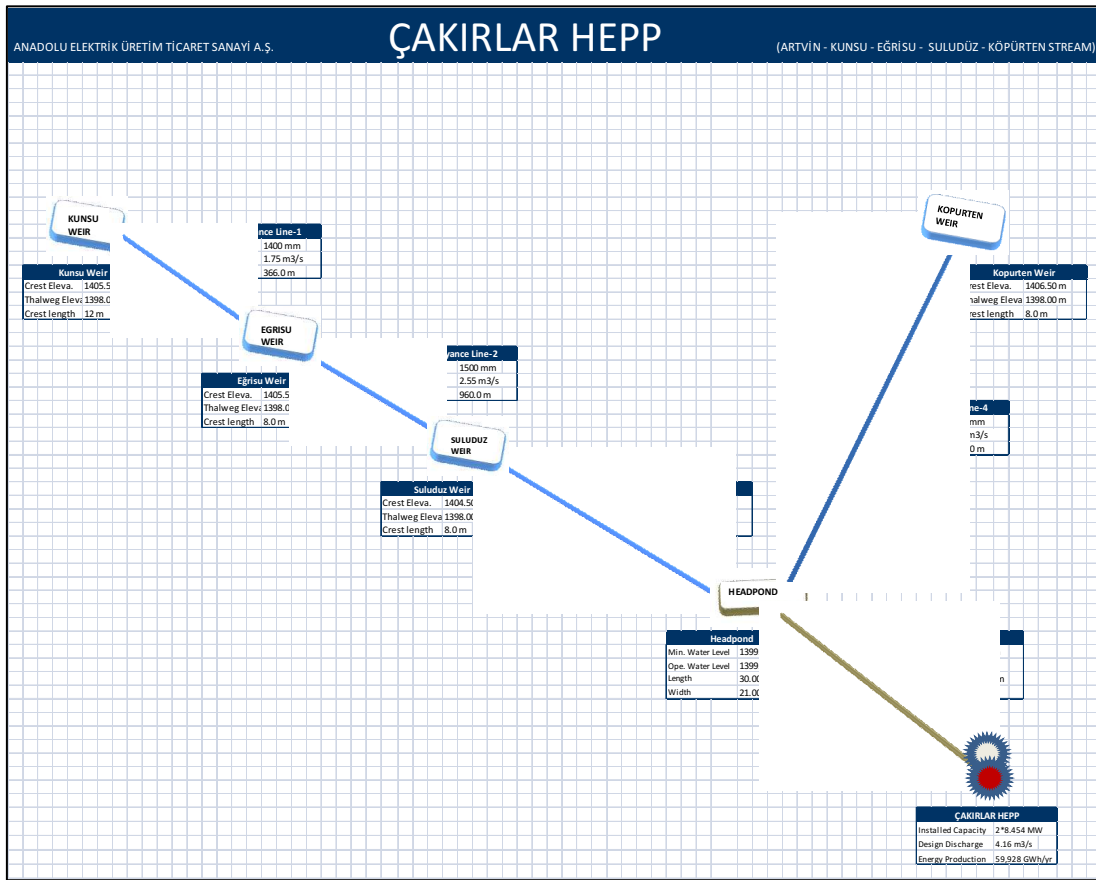


Figure 2: Site Scheme of Çakırlar HEPP



Figure 3: Cakirlar HEPP on Turkey Map

A.4.2. Category of small-scale project activity::

Cakirlar HEPP falls in the "Renewable Energy Supply Category", according to the Gold Standard Toolkit.⁵

Cakirlar HEPP project entails the construction and operation of a 17.00 MW hydroelectric power plant, the construction of weirs, conveyance pipes and powerhouse. The project consists of hydro power plant with two turbines of 8.519 MW. The first-hand turbines which will be used in the project will be supplied from Vatech Bouvier Hydro SAS, France. The turbines will be Pelton type with vertical axis. The net electricity production (delivered to the grid after losses and consumption in the plant) from the plant is estimated to be 59,928 GWh per annum. The quantity of electricity required for operation of plant is about 640 MWh annually which is at a negligible level.

The technology used in the plant is a state-of-the-art technology with extensive automatization. There is no new technology which is expected to replace the plant's technology in the short run. The project does not need extensive initial training and maintenance efforts in order to work as presumed during the project period. Necessary trainings to the plant staff will be delivered by the supplier in line with the agreement between the project owner and the supplier.

The economic life of an HEPP in Turkey is assumed as 50 years⁶. However, it is recommended to renew the equipment in every 20 years⁷.

⁵ http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/GSv2.1/GSv2.1_Toolkit_Clean.pdf

A.4.3. Estimated amount of emission reductions over the chosen crediting period:

The crediting period starts with the commissioning of the plant, exactly with the first day of documented electricity supply to the grid. The expected yearly net electricity generation is listed in the table below. As the project activity is to start in June 1st, 2010 the estimated emission reductions from the first and last year of the crediting period sum up to the amount of the estimated yearly reductions.

| Years | Annual estimation of emission reductions in tonnes of CO₂e |
|---|--|
| 2009 | 15,332 |
| 2010 | 36,796 |
| 2011 | 36,796 |
| 2012 | 36,796 |
| 2013 | 36,796 |
| 2014 | 36,796 |
| 2015 | 36,796 |
| 2016 | 21,464 |
| Total emission reductions (tonnes of CO₂e) | 441,552⁸ |
| Total number of crediting years | 7 |
| Annual average over the crediting period of estimated reductions (tonnes of CO₂e) | 36,796 |

The above annual estimated emission reduction are calculated inline with the formula as suggested in ACM0002 / Version 10 :

$$ERy = BEy - PEy - Ley$$

Where:

ERy = Emission reductions in year *y* (t CO₂e/yr)

BEy = Baseline emissions in year *y* (t CO₂e /yr)

PEy = Project emissions in year *y* (t CO₂/yr)

LEy = Leakage emissions in year *y* (t CO₂/yr)

⁶ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> page 4.25)

⁷ <http://ekutup.dpt.gov.tr/enerji/oik585.pdf> page 4.26

⁸ Emission reductions are calculated in Excel spreadsheet, where values are considered with 9 decimal places. In the PDD at hand the presented values are rounded up, therefore the total number of emission reductions does not equal the sum of the yearly emission reductions.

For the calculation of BE_y please refer to B.4. Step 6. However, since the project does not have a reservoir, Project Emissions (PE_y) and Leakage Emissions (LE_y) are assumed to be 0.

A.4.4. Public funding of the small-scale project activity:

There has been no public funding used for the financing of the project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project is not a debundled component of a large scale project activity



SECTION B. Application of a baseline and monitoring methodology**B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:**

For determination of the baseline, the official methodology ACM0002 / Version 10, “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”⁹, approved by the CDM Executive Board, is applied, using conservative options and data as presented in the following section. Also, to prove additionality and to calculate the grid emission factor, the official methodologies: “Tool for the demonstration and assessment of additionality, Version 05.2”¹⁰ and “Tool to calculate the emission factor for an electricity system, Version 01”¹¹ are used.

B.2. Justification of the choice of the project activity:

The choice of methodology *ACM002 / Version 10*, is justified as the proposed project activity meets relevant applicability criteria:

- Cakirlar 17.00 MW Runoff-River HEPP project is the installation of a grid connected renewable power generation project which adds electricity capacity to the grid from hydro power sources and which supplies electricity to a system that is supplied by at least one fossil fuel fired generating unit.
- The project involves construction of new units in a brand new plant, in other words the project does neither involve the addition of renewable energy generation units at an existing renewable power generation facility nor does it foresee to retrofit or modify an expired facility of renewable energy generation.
- The project activity is not 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/m².
- The project activity does not result 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/m².
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;
- 5 years of historical data are available;
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity,
- The project is not a hydro power plant that results in a new reservoir or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m².

B.3. Description of the project boundary:

⁹ <http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDA0V5K382HW0JR14GS7XYQUMCP>

¹⁰ <http://cdm.unfccc.int/EB/016/eb16repan1.pdf>

¹¹ http://cdm.unfccc.int/Reference/tools/ls/meth_tool07_v01_1.pdf

Potential leakage emissions in the context of power sector projects are emissions that arise from the project activities such as power plant construction, fuel handling and land inundation. According to ACM0002 / Version 10, such emissions are considered to be negligible and do not need to be taken into account.

Turkish Electricity Sector¹²

Demand Side:

Gross electricity demand (Gross Generation + Imports – Exports) in Turkey rose at a rate of 8.0% per annum for the last three decades since 1975, that reflects one of the basic indicators of an emerging economy. Gross electricity demand in Turkey reached 198,085 GWh in 2008, which makes Turkey one of the ten largest markets for electricity among European countries. Even the devastating earthquake that hit Turkey in 1999, and the economic crisis in 2001, could not reverse this robust growth record. In 1999, consumption grew by 4.5% despite the decline in GDP by 5%. In 2001, Turkey's electricity consumption dropped only 1.1% whereas GDP shrank by 7.5%. Parallel to the gross demand, the net consumption figure reflects an average of 7.9% increase since 1975, reaching to 161,948 GWh in 2008. Although there has been significant improvements in the recent years, Turkey's per capita electricity consumption figure is 2,053 kWh (as of 2006), which is one of the lowest among European countries.¹³ According to International Energy Agency (IEA) statistics, OECD average per capita electricity consumption is 8,381 kWh in 2006, which is an indicator of the growth potential in Turkey.¹⁴ This figure has been 3,258 kWh among CEE countries.¹⁵ Per capita consumption is expected to increase to 5,050 kWh by 2020 according to the MENR base case demand growth scenario, and with a projected annual population growth rate of 1.5%.

Supply Side:

Installed capacity and electricity generation in Turkey increased in line with consumption growth in recent decades. In 2008, electricity generation reached 198,418 GWh while imports stood at 789 GWh – 0.40% of total supply. Turkey became an importer in the mid-1970s, however, the share of imports in total supply never exceeded 3.6% for the last 20 years. The imports reached its peak as a portion of total supply in 1984 with 8%. By the end of 2008 the installed capacity of Turkey reached 41,817 MW, representing a CAGR of 8.0% since 1975. The rate of the increase in the capacity was well above 10% from 1970 to 1980. 48.2% of the installed capacity of 41,817 MW in 2008, was held by the State Generation Company EUAS, 9.2% by Affiliated Partnerhips of EUAS, 0.6% Mobile Power Plants and the remaining 42.0% owned by autoproducers, Production companies, TOOR and ADÜAŞ. There is an increasing trend in favor of IPPs, switching away from the State Generation Company in the recent years. When we compare the breakdown of the installed capacity in 2000, we see that EUAS's contribution to the installed capacity was 80% whereas the IPPs' share was only 9%. This is a concrete indication of the trend of the generation in favor of independent producers. The contribution of thermal power has always been the dominant source in both the generation and the installed capacity. In 2008, thermal power plants accounted for the 66.0% of the installed capacity whereas the hydro power plants' contribution was 33.1%. This is one of the lowest figures since 1970. On the other hand geothermal and wind powered capacity is still negligible with 0,9%. The existing electricity

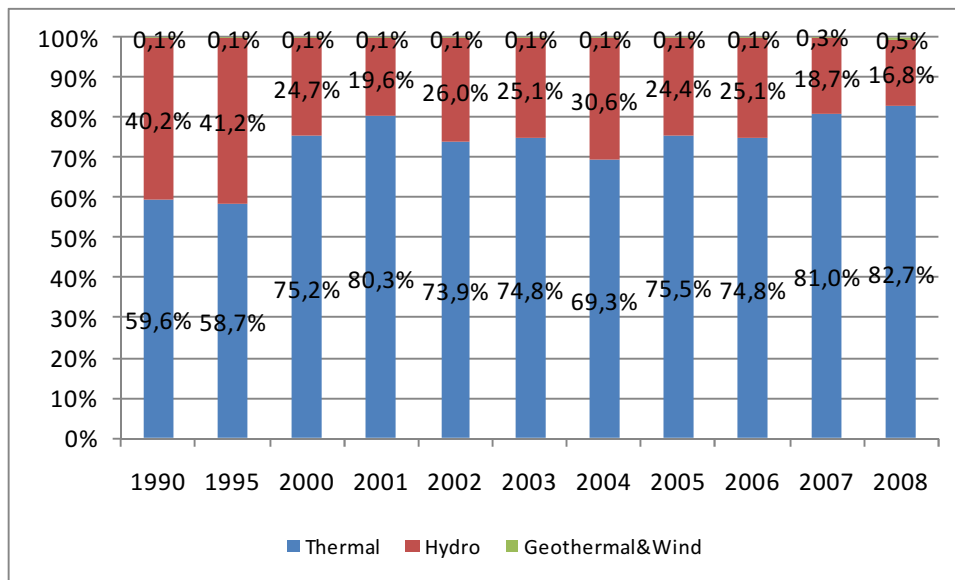
¹² <http://www.teias.gov.tr/ist2007/index.htm>

¹³ http://www.iea.org/Textbase/country/maps/EUROPE/ele_pop.htm

¹⁴ http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=28

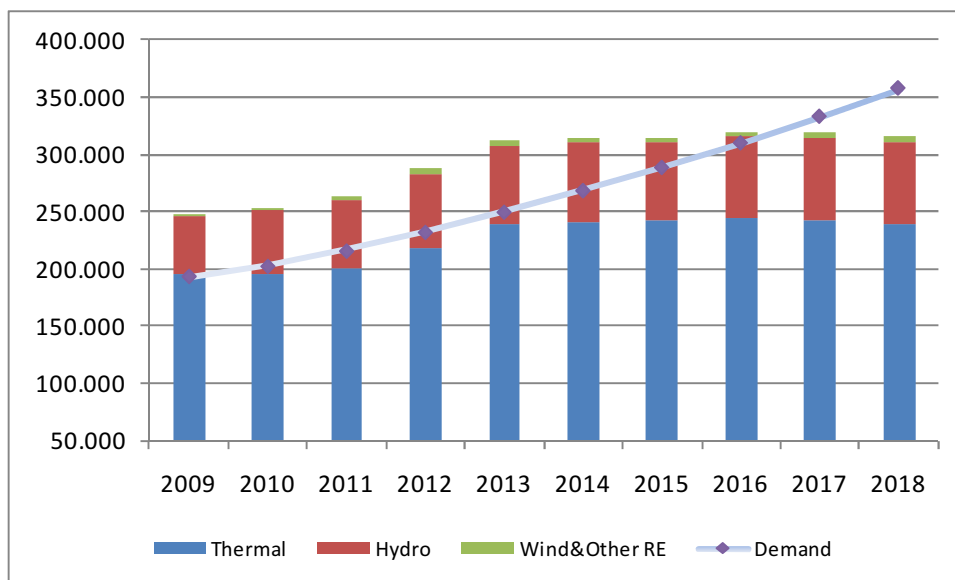
¹⁵ http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=33

grid in Turkey is an interconnected single entity which to a larger extent fed by fossil fuel fired power plants. (Graph 2.1)



Graph 1: Electricity Production Fuel Type ¹⁶

The Graph below displays the forecast in increasing demand along the years between 2008 and 2017. The supply projection is based on the planned projects for energy production but it is very probable that, under increasing pressure of increasing demand, the government will shift to thermal power plants as they present higher financial feasibility with relatively short construction periods.



Graph 2: Electricity Supply and Demand Projections for Turkey¹⁷

¹⁶ Source: [http://www.teias.gov.tr/istatistik2008/32\(75-08\).xls](http://www.teias.gov.tr/istatistik2008/32(75-08).xls)

Turkish Renewable Energy Sector

Although Turkey is not a party to Kyoto Protocol (Minister of Forestry recently announced that Turkey will be a party to Kyoto Protocol under certain conditions), having signed the United Nations Framework Convention on Climate Change it is committed to managing greenhouse gas emissions. The goal is to maintain emissions at the level of 1990 (3,15 per capita). Therefore, Turkish government keeps focusing on renewables.

Turkey enacted its first specific renewable energy law in 2005, but there are also provisions regarding renewable energy in the Electricity Market Law (EML), which authorises the Energy Market Regulatory Authority ("**EMRA**") to take measures to promote renewable energy use and in secondary legislation:

- The Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy¹⁸ ("**Law**") was adopted on 18 May 2005. This article provides as overview of the general provisions of the Law, as well as other supporting legislation regarding renewable energy resources. However, the legislation on bio-fuel will not be taken into account.¹⁹
- Renewable energy resources ("**RER**") is not a brand-new topic, as the Electricity Market Law²⁰ ("**EML**"), which was enacted in March 2001 and the Electricity Market License Regulation²¹ ("**Regulation**") demonstrate. According to the EML, EMRA is authorized to take the necessary measures to encourage the utilization of RER.
- According to the European Council Decision of 23 January 2006 on the principles, priorities and conditions contained in the Accession Partnership with Turkey²², one of the short-term priorities identified for Turkey relates to "[s]tart alignment on the *acquis* on energy efficiency and renewable energy sources and develop administrative capacity in these sectors". Therefore, the new Law contains new incentives for RER development.

Objective and Scope of the Law

It is important to note that there is no region specific regulation and law in Turkey as it is not a federal state. The purpose of the Renewable Law is "to expand the use of renewable energy resources for generating electricity and to benefit from these resources in a secure, economic and qualified manner; and to increase the diversification of energy resources, reduce greenhouse gas emissions, assess waste products, protect the environment and develop the related manufacturing sector to realize these objectives."

¹⁷ Source: <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf>

¹⁸ Law No. 5346, published in the Official Gazette dated 18 May 2005 and numbered 25819.

¹⁹ See Petroleum Market Law No. 5015, published in the Official Gazette dated 20 December 2003 and numbered 25322; Petroleum Market License Regulation, published in the Official Gazette on 17 June 2004 and numbered 25495; Regulation on Technical Criteria for Petroleum Market, published in the Official Gazette on 10 September 2004 and numbered 25579.

²⁰ Law No. 4628, published in the Official Gazette dated 3 March 2001 and numbered 24335

²¹ Published in the Official Gazette dated 4 August 2002 and numbered 24836; see moreover Electricity Market Grid Regulation, published in the Official Gazette dated 22 June 2003 and numbered 25001; Regulation on Balancing and Settlement, published in the Official Gazette dated 21 December 2004 and numbered 25677; Communiqué Regarding the Principles and Procedures of Financial Settlement, published in the Official Gazette dated 4 November 2003 and numbered 25279.

²² OJ 2006 L 22/34.

The Renewable Law covers wind, solar, geothermal, biomass, biogas, wave, stream, tidal, river and arc type hydroelectric generation facilities and hydroelectric generation facilities either canal or run of river type or with a reservoir area of less than 15 km².

Incentives provided by the Renewable Law and Electricity Market Licensing Regulation

Renewable Energy Law

(a) Development plans which might have a negative effect on the use and efficiency of RER areas can no longer be created on public land.

(b) Each legal entity holding a retail sale licence must purchase a specified amount of electrical energy from RER certified generators which have been in generation for less than 10 years. This amount is based on a comparison between the amount of energy sold by that retail sale licence holder, in the previous calendar year, and the total electrical energy offered for sale by all retail sale licence holders in Turkey.

The price of electrical energy bought in accordance with this provision is determined by EMRA and is the average Turkish wholesale price announced in the previous year. This amount is 9.67 Ykr/Kwh in 2007 (approximately 5 Euro cents). The retail price must be between 5.0 and 5.5 Euro cents but a generator can sell its electrical energy for a higher price if there is market demand.

In practice all generators are currently selling their electrical energy to the Market Financial Reconciliation Center, which currently offers the highest price in Turkey due to a recent supply gap.

(c) Real persons and legal entities establishing an isolated electricity generation plant and grid supported electricity generation plant; using hydraulic resources with a maximum installed capacity of 1,000 kW that is to be used solely to satisfy their own needs, are not required to pay service charges for these projects. This is provided that the final design, planning, master planning, preliminary surveying and first auditing were prepared by either the DSI (State Hydraulic Works) or the EIE (Electrical Power Resources Survey and Development Administration).

(d) The sale price, rent, rights of access and usage permissions of state owned land are subject to an 85% reduction where the property is used for the purpose of generating electrical energy from RER which fall within the scope of the Renewable Law. ORKOY (General Directorate of Forest and Village Relations) and forestation special allowance revenue are not charged for forested land.

(e) Within the framework of the Renewable Law: (i) investment in energy generation facilities; (ii) procurement of domestically manufactured electromechanical systems; (iii) investment in research, development and manufacturing in the scope of electricity generation systems using solar cells and concentrated collectors; and (iv) investment in research and development facilities for the generation of electrical energy or fuels by utilizing biomass resources, can benefit from incentives determined by the Council of Ministers. Nevertheless, despite good intention of the government to promote electricity generation from renewable energy sources, it is not possible to say that the incentives provided so far are sufficient or the existing incentives are applied properly. Considerable barriers for renewable energy projects still exist, as discussed in Section 2.5; Barrier Analysis.

Licensing Regulation

Legal entities applying for Licences for the construction of facilities based on domestic natural resources and RER only pay 1% of the total licensing fee and do not pay annual Licence fees for the first 8 years following completion of the facility.

Legal entities engaged in generation activities at facilities based on RER can purchase electricity from private sector wholesale companies on the condition that they do not exceed the annual average generation amounts indicated in their Licences for that calendar year.

TEIAS and/or legal entities holding distribution Licences must give priority for connection of generation facilities to the system based on whether they use domestic natural resources and RER.

Licence guarantee

Since November 2007 EMRA has been requesting bid bonds and performance bonds for Licence applications. Bid bonds with an amount of 10,000 YTL per mw are requested at the application stage and, if EMRA approves the application, a performance bond, with an amount to be calculated in accordance with the capacity to be installed, is also requested.

Renewable Energy Resource (RER) Certificates

If and when requested by any legal entity holding a generation Licence, a RER certificate must be granted by EMRA for the purpose of identifying and monitoring the resource type used in electrical energy generation or for the purpose of accessing the incentives applicable under the Renewable Law.

The principles and procedures relating to RER certification are governed by secondary legislation issued by EMRA in 2005. There are two types of RER certificates which govern the:

- (a) type of resource utilized to generate electrical energy; and
- (b) incentives that the owner is entitled to under the Renewable Law.

No GHG sources in terms of sinks and reservoirs could be identified for this project.

B.4. Description of baseline and its development:

The Cakirlar HEPP project entails the construction and operation of a 17.00 MW hydroelectric power plant. The project consists of hydro power plant with turbines of 8.519 MW each.

| | Source | Gas | Included? | Justification |
|-------------------------|--|------------------|-----------|---|
| Baseline | Generation mix of electricity grid in Turkey | CO ₂ | Yes | CO ₂ emission from fossil fuel fired power plant that are displaced due to project activity was taken into account. |
| | | N ₂ O | No | Minor emission source as suggested by ACM0002, Version 10. |
| Project Activity | Construction and operation of HEPP | CO ₂ | No | As net electricity approach is adopted, emissions that occur during construction and during the operation are negligible and non-existent respectively. |
| | | N ₂ O | No | Minor emission source as suggested by ACM0002, Version 10. |
| | | CH ₄ | Yes | Main emission source as suggested in ACM0002, Version 10. However, the emissions during the construction is at a negligible level and also, since the project does not have a reservoir, no CH ₄ emission is expected. |

Table 1: The justification for project boundary

The method to describe and calculate the baseline has clearly been specified by the Baseline Methodology. CDM Executive Board has already provided a consolidated tool for appraising and demonstrating the additionality feature of the projects.

Since the project is an installation of a new grid-connected renewable power plant, the baseline scenario is formulated in ACM0002 / Version 10: *“Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the Combined Margin (CM) calculations described below”*.

The project is not a modification/retrofit of an existing grid-connected renewable power plant/unit. Therefore the other alternative baseline scenario mentioned in ACM0002 / Version 10 is not chosen.

According to the “Baseline Methodology Procedure” in “Tool to calculate the emission factor for an electricity system” following steps should be followed..

All the information pertaining to the grid and estimating baseline emissions are publicly available, and was available at the website of TEIAS (Turkish Electricity Transmission Company Inc. - www.teias.gov.tr).

STEP 1: Identify the relevant electricity system

The project electricity system is defined as “the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints” in the “Tool to calculate the emission factor for an electricity system, Version 02” page 3. Similarly, “a connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint” in the same document.”

In the project’s case “the project electricity system” and “the connected system” are same. As also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.), the Turkish transmission system is interconnected. There is not an independent regional grid system neither in Artvin nor in Black Sea Region.

In addition to this, since there is no DNA in the host country to delineate the project electricity system, the suggested criteria in “Tool to calculate the emission factor for an electricity system, Version 02” was used. According to this, 1-The capacity usage figure for the transmission line should be checked. 2-Spot market prices of different systems in the country should be compared.

Since there is no capacity usage figure for transmission line published, the criteria “The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.” could not be proved.

On the other hand, there is no spot electricity market available in the country as suggested in the other criteria “In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.” Therefore, this criterion is not applicable as well.

As suggested in “Tool to calculate the emission factor for an electricity system, Version 02”, “if these criteria do not result in a clear grid boundary, use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national).” However, there are no layered dispatch systems in the host country. As a result the national grid was used as the project electricity system. Hence, the estimation of OM (Operating Margin) and BM (Built Margin) are based on the definition of the Turkish electricity network as one single interconnected system.

STEP 2: Choose whether to include Off-grid power plants in the project electricity system

According to “Tool to calculate the emission factor for an electricity system, Version 02”, the OM and BM values can be calculated based on the following two options:

- Option I: Only grid power plants are included in the calculation
- Option II: Both grid power plants and off-grid power plants are included in the calculation.

Option I is selected in the calculation of Built Margin and Operating Margin for the proposed project activity. The reason why the tool suggests the Option II is, “in some countries off-grid power generation is significant and can partially be dispatched by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.”

As Turkey's grid is more appropriate for calculating the OM and BM values according to Option I, this option is selected.

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

According to “Tool to calculate the emission factor for an electricity system, Version 02”, four alternative methods to calculate OM can be chosen. In choosing the right method for the calculation of OM, “Simple adjusted OM”, “Dispatch data analysis OM” and “Average OM” methods are eliminated since all these methods require power plant specific information of power plants which are connected to the grid. However, no power plant specific information is available. Similarly, option A and option B of “Simple OM” methods were also eliminated as again there is no power plant specific data is publicly available.

All in all, option C of “Simple OM” method was adopted as “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” is the only available data in the host country.

Simple OM option C method is eligible when low cost and/or must run resources constitute, as an average of the five most recent years, less than 50 percent of the total generation for the grid. Nevertheless, the only relevant low operating cost and must run resource in Turkey is hydropower because the share of all other renewable resources is close to nil and therefore can be assumed negligible. The share of all non-hydro renewable resources in the entire electricity generation is 0,5 percent for the years between 2003 and 2008. There is no example of coal being used as must-run and nuclear energy is not practiced in Turkey.

As depicted in Table 3²³ the share of low-cost/must run resources were never higher than 50 percent in the last five years.

| | 2004 | 2005 | 2006 | 2007 | 2008 |
|--|---------|---------|---------|---------|---------|
| Turkey's Gross Electricity Production (GWh) | 150.698 | 161.956 | 176.300 | 191.558 | 198.418 |
| Electricity Production From Hydro (GWh) | 46.084 | 39.561 | 44.244 | 35.851 | 33.270 |
| Share (%) | 30,6% | 24,4% | 25,1% | 18,7% | 16,8% |

Table 3: Share of hydroelectric production in Turkey, 2003 – 2008²⁴

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

The Simple Operating Margin Emission Factor ($EF_{OM, y}$) is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must run power plants/units as determined by the Baseline Methodology.

According to “Tool to calculate the emission factor for an electricity system, Version 02”, the formula given below is applied for computing the $EF_{grid, OMsimple, y}$.

Option B – Calculation based on total fuel consumption and electricity generation of the system:

²³ All data presented in the baseline calculations are provided from official sources as mentioned in related footnotes. Therefore, uncertainties of data sets were not estimated.

²⁴ [http://www.teias.gov.tr/istatistik2008/32\(75-08\).xls](http://www.teias.gov.tr/istatistik2008/32(75-08).xls)

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y}$$

Where:

- $EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (tCO2/MWh)
 $FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
 $NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
 $EFCO_2,i,y$ = CO2 emission factor of fossil fuel type i in year y (tCO2/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 = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In order to calculate the emission amounts from each fuel type, emission factors from IPCC website were used.²⁵ Three sets of emission factors were identified as minimum, medium and maximum values. To be conservative side, the minimum values are used in the OM calculations.

| | kg CO2/GJ | | | Default Carbon Oxidation Factor |
|-------------|-----------|-------|-------|---------------------------------|
| | min | mid | max | |
| hard coal | 92,8 | 96,1 | 100,0 | 1,0 |
| lignite | 90,9 | 101,0 | 115,0 | 1,0 |
| fuel oil | 75,5 | 77,4 | 78,8 | 1,0 |
| diesel oil | 72,6 | 74,1 | 74,8 | 1,0 |
| natural gas | 54,3 | 56,1 | 58,3 | 1,0 |
| lpg | 61,6 | 63,1 | 65,6 | 1,0 |
| naphtha | 69,3 | 73,3 | 76,3 | 1,0 |

Table 4: Emission factors from IPCC

Turkey's GHG Emissions Inventories for year 2006 and 2007 are announced by Turkish Statistical Institute (TUIK). However, to be on the conservative side, CO2 emissions figures from electricity production are not taken from these announced figures, as the calculation method is not known and these

²⁵ http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef_s1.php

figures are a bit higher than the calculated figures.^{26, 27, 28} As a result, for years 2006, 2007 and 2008, the CO₂ emissions are calculated with the IPCC minimum values:

| | 2006 | 2007 | 2008 |
|---|------------|------------|-------------|
| CO₂ Emission from Electricity Production (tons) | 83.173.585 | 98.352.660 | 104.062.368 |

Table 5: CO₂ Emission of Turkey from Electricity Production

The calculation of net electricity production is demonstrated below.²⁹ As the efficiency factor from gross to net electricity for thermal resources is not known, the overall relation between gross and net electricity production is assumed to be the same for thermal production. Table 6 shows the overall gross/net relation where the estimated net electricity production from thermal resources were calculated by using the same relation.

| | 2006 | 2007 | 2008 |
|--|---------|---------|---------|
| Gross Electricity Production (a) | 176.300 | 191.558 | 198.418 |
| Net Electricity Production (b) | 169.543 | 183.340 | 189.762 |
| Net/Gross (c= a/b) | 0,962 | 0,957 | 0,956 |
| Gross Electricity Production from thermal sources (d) | 131.835 | 155.196 | 164.139 |
| Net Electricity Production from thermal sources (c*d) | 126.783 | 148.538 | 156.979 |

Table 6: Net Electricity Production of Turkey from Thermal Sources

Obviously, using the same relation for both overall electricity production and thermal production is an approximation based on a rough assumption. Yet, obviously, such assumption results in a very conservative estimation because the efficiency of thermal plants is much lower than other plants as the operational consumption in those plants are relatively higher and this would only lead to a lower net electricity generation with higher OM emission factor and higher emission reductions.

With respect to the Baseline Methodology, electricity import amount is added to the domestic supply where the imports from connected grids located in other countries are weighted with an emission factor of zero tCO₂/MWh.

The last part of Step 1 is calculating the ratio of emissions and generation as follows:

| | 2006 | 2007 | 2008 |
|---------------------------------|-------|-------|-------|
| OM (MWh/tCO₂) | 0,657 | 0,663 | 0,664 |

Table 7: OM Emission Factor for 2006 – 2008

²⁶ <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=1996>

²⁷ <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=4078>

²⁸ http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=488

²⁹ [http://www.teias.gov.tr/istatistik2008/30\(84-08\).xls](http://www.teias.gov.tr/istatistik2008/30(84-08).xls)

According to the methodology, two data vintages are allowed for the calculation of the OM emission factor, ex-ante and ex-post:

- Ex-ante: A 3-year average, based on the most recent statistics available at the time of PDD submission
- Ex-post: The year in which project generation occurs, if the OM emission factor is updated based on ex-post monitoring

In this case, the ex-ante approach is preferred because the data is available and it is a conservative approach due to the forecast that the weight of fossil fuel use in the generation of electricity in Turkey will increase.

As the weighted average of the figures between 2006 and 2008 is computed, the OM emission factor is 0,661 tCO₂ / MWh.

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

Computing the BM is based on the sample of plants, in either of the two proposed ways:

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

Among these two options, the sample group that comprises the larger annual generation should be used.

The data for the recently built power plants is available for their capacity, type of utility in terms of IPP, auto-producer, BOT, fuel type and date of commissioning. According to the data:

- The total annual production of the five plants that have been built most recently is 1,842.3 GWh. Such capacity represents approximately 0.93 percent of the overall electricity generation capacity in Turkey which is in the amount of 198.4 TWh. Obviously, this is far below the 20 percent threshold proposed by the methodology.
- Instead, the Build Margin could also be computed by using the most recent capacity additions that comprise the 20 percent of the total system generation. This corresponds to 39.7 TWh which is 20 percent of the overall generation of 198.4 TWh.

The table in Appendix 4 displays the details of generation from those plants in specific.

STEP 6: Calculate the build margin emission factor

According to the Baseline Methodology, the Build Margin (BM) Emission Factor EF_{BM} is calculated as the generation-weighted average emission factor of a sample of power plants m for a specific year, as follows:

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

Where:

| | |
|------------------|---|
| $EF_{grid,BM,y}$ | Build margin CO ₂ emission factor in year y (tCO_2 / MWh); |
| $EG_{m,y}$ | Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh) |
| $EF_{EL,m,y}$ | CO ₂ emission factor of power unit m in year y (tCO_2/MWh) |
| m | Power units included in the build margin |
| y | Most recent historical year for which power generation data is available |

There is no available CO₂ emission data for the power units included in the BM calculation. The available data for on plant basis is the name, type, installed capacity and annual electricity production figures of these facilities. However, there is no available data for the electricity production figures of some small facilities, most probably because these projects are included in the “Other Projects”. Therefore, annual electricity productions of these facilities were calculated with the following formula unless the exact production figures are reached. The data used in the BM calculation is provided from the Turkey’s Capacity Projection Reports published in years: 2009³⁰, 2008³¹, 2007³², 2006³³ and 2005³⁴.

$EG_{m,y} = \text{Full Load Working Hours} \times \text{Installed Capacity}$

In addition to this the efficiency rates for the fuel consumption of these facilities should be added to the calculation (as the thermal plants do not consume 100% of the fuel which they are fed with). Therefore an efficiency figure which represents how efficiently the thermal power plant consumes the fuel was estimated for each facility group in line with the data provided by TEIAS.. Within the context of the calculation in this document, higher the efficiency figure means lower the CO₂ emission (as the electricity calculation assumes that the electricity production is a function of the designed installed capacity not the efficiency. However, in theory the installed capacity of a plant increases with the higher efficiency).

The Build Margin estimation is based on the emission factors calculated for each energy source.

³⁰ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf>

³¹ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf>

³² <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf>

³³ <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf>

³⁴ <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202005.pdf>

Fuel Specific Emission Factors

Carbon content factors for each fuel type (tC/TJ) refer to the factors stated in “2006 IPCC Guidelines for National Greenhouse Gas Inventories” and the fuel specific CO₂ emission factors were estimated from the same factors. To be on the conservative side, minimum emission factors were used in the calculation.

Electric Efficiency Rates

The electric efficiency rates for different fuel types across ownership structures of the facilities (state owned vs privately owned vs mobile facilities) were calculated through actual energy consumption figures of these facility types in the last 3 years. All additional facilities were assumed to be equal to its specific group’s average efficiency.

Equivalent Electricity Generation

The equivalent electricity generation for each fuel type j out of the most recent 20 percent plants is calculated as follow:

Average Running Hours (Hours): For each specific fuel type, average running hours of similar facilities in Turkey for the year 2008, 2007, 2006 and 2005. Relevant figures were calculated based on the installed capacity and electricity production figures. On the other hand EUAS announces the electricity production figures of its facilities in each year. For these facilities actual figures were used.

Installed Capacity (MW): Total installed capacities of facilities run by similar fuel types for the period between January 8th, 2004 and December 31st, 2008.

Electricity Production (GWh): The announced electricity production figures of the facilities which were commissioned in the period between January 8th, 2004 and December 31st, 2008. And, multiplication of running hours and installed capacity for each fuel type, unless the energy production figures are not reached.

The computations display a weighted Build Margin emission factor of 0.566.

STEP 7: Calculate the combined margin emissions factor

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor. The ACM0002 / Version 10 guideline recommends equal weight values for hydropower projects as seen in the formula below:

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

Where:

| | | |
|---------------------------|---|--|
| $EF_{\text{grid, BM, y}}$ | = | Build margin CO ₂ emission factor in year y (tCO ₂ /MWh) |
| $EF_{\text{grid, OM, y}}$ | = | 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 (%) |

The default values recommended by Methodological tool: “Tool to calculate the emission factor for an electricity system, Version 02” for w_{OM} and w_{BM} for activities other than wind and solar power generation projects are 0.5 and 0.5, respectively.

$$EF_{grid, CM, y} = 0.661 \times 0.5 + 0.566 \times 0.5$$

Therefore resulting $EF_{grid, CM, y}$ is 0.614 tCO₂/MWh

Project emissions

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

Where:

PE_y = Project emissions in year y (tCO₂e/yr)

$PE_{FF, y}$ = Project emissions from fossil fuel consumption in year y (tCO₂/yr)

$PE_{GP, y}$ = Project emissions from the operation of geothermal power plants due to the release of Non-condensable gases in year y (tCO₂e/yr)

$PE_{HP, y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO₂e/yr)

$PE_{FF, y}$ and $PE_{GP, y}$ are both irrelevant with the project activity and therefore assumed “0”, as the proposed project activity is a new grid-connected run-off-river hydro power plant.

On the other hand, ACM0002 Version 10 suggests that project proponents shall account for CH₄ and CO₂ emissions for the reservoir. Since there is no reservoir in the project, PE_y is assumed as 0.

Also, according to ACM0002 / Version 10 if the power density (PD) of the hydro power plant is above 10 W / m², PE_y is 0. As a result, since there is no reservoir in the project, LE_y is also assumed to be 0 as suggested in ACM 0002 / Version 10.

Accordingly the baseline emissions BE_y are calculated as following:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid, CM, y}$$

Where:

BE_y Baseline emissions (tCO₂e)

EG_y Annual electricity supplied by the project to the grid (MWh)

$EG_{baseline}$ Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.

$EF_{grid, CM, y}$ Baseline emission factor (tCO₂e/MWh)

Y Refers to a given year

$EG_y = 59,928 \text{ MWh/year}$

$EG_{\text{baseline}} = 0$ (The figure is zero for the project as the project is new)

Therefore, the expected baseline emission for the full year production of the project is:

$BE_y = (0.614 - 0) \times 59,928 = 36,796 \text{ tCO}_2\text{e}$

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM small-scale project activity :

Referred by the Baseline Methodology, the “Tool for the Demonstration and Assessment of Additionality (Version 5.2)” outlines a step by step approach for the assessment of additionality or in other words the emission reductions that would have occurred in the absence of the project.

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

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

In the absence of the proposed project activity, plausible and credible project activities to the proposed project activity are as follows:

- Alternative 1 : Construction of a thermal power plant with the same annual power output
- Alternative 2 : The proposed project activity not undertaken as a VER project activity
- Alternative 3 : Construction of some other renewable energy plant with the same annual power output
- Alternative 4 : The same service of power supply is provided from the grid (Kiran HEPP is not built)

Although the coal and natural gas reserves in Turkey is very limited, there are many thermal power plants that have been being commissioned in recent years and Turkey’s grid mainly consists of thermal power plants. As they have become common practice in the energy sector due to off-take agreements provided by the government, these projects face easier circumstances in terms of financing and realisation. In addition, these projects use imported coal, so they can be realized regardless of their geographic proximity to coal supply. Therefore, construction of a thermal plant with the same annual electricity output is a realistic alternative.

The Black Sea region is not very rich of wind and the high forest density combined with very steep terrain does not allow for wind power plants. It can be seen in the REPA (Wind Energy Potential Map) of Giresun, the areas which have enough potential for economically feasible wind farm investments are not very evident in the region.³⁵ As for the geothermal energy, this renewable energy source exists in west side of the country.³⁶ Therefore, at the project area, there is no geothermal source either. As a result, Alternative 3 for the region is eliminated.

³⁵ <http://www.eie.gov.tr/duyurular/YEK/YEKrepa/GIRESUN-REPA.pdf>

³⁶ <http://web.deu.edu.tr/jenarum/index.php/turkyede-jeotermal>

As mentioned above, the Turkish Electricity Sector is heavily dependent on fossil fuel plants. With the new bill that passed in 2001³⁷, the public funding in energy investments have stopped. The new bill allows incentives for private sector participation in energy investments. In addition to rehabilitation of existing plants, new capacities to be added to meet the increasing demand require mass amount of investments. Because the public funding of energy investments is no more legitimate, the new projects need to be accomplished by private sector. Yet, ANADOLU cannot influence the future fuel mix in the energy market, but can only decide to invest on the project because ANADOLU has no influence on the domestic energy policy of the decision makers.

Under these circumstances, the realistic alternatives are 1, 2 and 4. Analyzing these three alternatives, it is seen that all scenarios are consistent with the baseline definition of ACM0002 / Version 10 where it defines the baseline scenario as the amount of electricity that would be delivered to the grid by the project activity, generated by the operation of existing grid-connected power plants and by the addition new generation sources, as reflected by the combined margin.

Sub-step 1b: Enforcement of applicable laws and regulations

The following applicable mandatory laws and regulations have been identified for the proposed project activity:

1. Electricity Market Law³⁸
2. Law on Utilisation of Renewable Energy Resources for the Purpose of Generating Electrical Energy³⁹
3. Energy Efficiency Law⁴⁰
4. Forest Law⁴¹
5. Environment Law⁴²
6. Regulation on procedures and principles of signing the agreement of utilisation of water resources for the purpose of electricity production in the electricity market⁴³
7. Regulation on Environmental Impact Assessment⁴⁴

All energy projects are in compliance with the mandatory laws and regulations listed above except 2nd and 7th one. “Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy” is only applicable for renewable energy projects. Also, “Regulation on procedures and principles of signing the agreement of utilization of water resources for the purpose of electricity production in the electricity market” is only applicable for hydropower projects.

Step 2: Investment Analysis

³⁷ Electricity Market Law” No: 4628 issued in 2001

³⁸ Law number 4628, enactment date 03/03/2001, <http://www.epdk.gov.tr/english/regulations/electricity.htm>

³⁹ Law number 5346, enactment date 18/05/2005, <http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf>

⁴⁰ Law number 5627, enactment date 02/05/2007, http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc

⁴¹ Law number 6831, enactment date 31/08/1956. This will be made available to the DOE on request.

⁴² Law number 2872. Published in Official Gazette No. 18132 on 11/08/’83. This will be made available to the DOE on request.

⁴³ National Gazette number 25150, 06/06/2003

⁴⁴ National Gazette number 26939, 17/07/2008

Sub-step 2a: Determine appropriate analysis method

The „*Tool for the Demonstration and Assessment of Additionality*’, version 05, from EB39, lists three possible analysis methods:

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

Since the proposed project generates financial and economic benefits via the sales of electricity other than carbon revenues, Option I cannot be used.

Option II is only applicable to projects where alternatives should be similar investment projects in terms of generation capacity. Between Option II and Option III, benchmark financial analysis (Option III) is chosen, wherein Equity IRR has been utilized as opposed to Project IRR, as permitted in the additionality tool.

As a result Option III: Benchmark Analysis is selected as the analysis method and the Equity IRR is selected as the financial indicator for the demonstration of the additionality of the project.

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

The equity IRR is selected as the financial indicator for the Benchmark Analysis. Various professionals who work at financial institutions which deal with the assessment of energy projects on daily basis were contacted. As they were briefed about the purpose of questioning, they were kindly asked to testify for general expectation of their institutions to approve the loan release for renewable energy projects. The survey had to be based on personal testimony rather than intrinsic evidence as most of the professionals in the field are strictly prohibited by their institutions from quoting such guidelines in writing.

Almost all bankers who have been asked for an opinion for the minimum IRR that is required for the approval of a similar project expressed some after tax IRR that is in the bandwidth of 16 to 18 percent.

In addition to this a relevant benchmark rate is also calculated in line with the suggestion in “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)⁴⁵. The CAPM suggests below formula to calculate the discount rate (in other words benchmark rate).

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

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

⁴⁵ Please see http://en.wikipedia.org/wiki/Capital_asset_pricing_model for the definition of CAPM

- β_i (the beta coefficient) is the sensitivity of the asset returns to market returns, or
also
$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)}$$
- $E(R_m)$ 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)

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 feasibility study of the facility completion date yield for this bond was 7.084% as of 30th of March 2007.⁴⁶

The Beta Coefficient (β_i)

The Beta coefficient of securities with values close to 1 determines the company securities as being of average risk. There are four power generating and trading companies under trade in the Istanbul Stock Exchange (ISE). The average Beta for these four companies can be calculated based the index created from these four stocks which is called as "Electricity Index" of ISE. The β_i for the Electricity Index is calculated as 0.922 by Bloomberg which is one of the prominent data suppliers in financial markets.

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.⁴⁷

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

$$7.084\% + 9.29\% * 0.922 = 15.65 \%$$

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, the Beta of the index includes lower risk compared to the project, as the index includes already established companies (which are up and running). 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 and also in consistency with the benchmark rates received from local bankers mentioned above.

⁴⁶ http://www.isyatirim.com.tr/report_download.aspx?file=4563

⁴⁷ <http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem07.xls>

IRR Calculation of the Project

During the planning phase of the project in 2006 a cash flow analysis has been prepared for the project by the company. Aiming to show that the income of the GS VER is important for the financial performance of the project, two scenarios are presented in this section, one which excludes revenues from the sale of GS VERs and the second which includes the revenues from the sale of GS VERs. The assumptions used for this analysis are outlined as follows:

- A project lifetime of 20 years is used in the Feasibility Study for the project and is used in the IRR calculation for the proposed project. However, the project owner would hope that the lifetime of the project will in practice be higher than 20 years, possibly up to 30 years, but this would require additional significant investment after 20 years to replace and refurbish the key components of the plant.
- The financial analysis is performed over the 20 year period from 2009 to 2028, this, therefore includes the investments made by the project owner between 2007 and 2009 and the operational costs along the lifetime of the project.
- The Internal Rate of Return (IRR) of the project cash flow has been calculated.
- Annual operational cost of € 839,223 has been assumed along the project lifetime
- A tax rate of 20% is applied to the project in line with Turkish tax laws.
- The depreciation period of machinery and equipment was assumed as 20 years.
- For labour expenses, annual cost of labour in the project's region is estimated for each specific job descriptions. Actually, this is still on the conservative side as far as the Turkey averages are concerned. According to Turkish Employer Unions Confederation, the average cost of employee in Turkey is YTL 3,183 per month (around Euro 1,768) as of January 2008 (<http://www.tisk.org.tr/gostergeler.asp?id=524>). However, the average cost of labour per month assumption in the IRR calculation was Euro 1,308.
- The annual power generation figure is 59,928,000 kWh.
- The power purchase price for the project is assumed to be 5 Euro cent per kWh which is the minimum purchase guarantee offered by the State as an incentive to the investment (Please refer to Turkish Renewable Energy Law No: 5346 Article 6.c.)
- The revenues from GS VERs are excluded from scenario 1, and included in scenario 2. The volume of GS VERs generated by the project is calculated by multiplying the annual electricity output of the project by the emission factor. For sensitivity analysis, the revenues related to the sale of the GS VERs are applied by multiplying the volume of GS VERs by the €5, €6 and €7 price. The GS VERs are generated and sold between 2009 and 2019 for ten years.

Results

The cash flow analysis has been performed on two project scenarios;

- Scenario 1 – excludes revenues from the sale of GS VER
- Scenario 2 – includes revenues from the sale of GS VERs

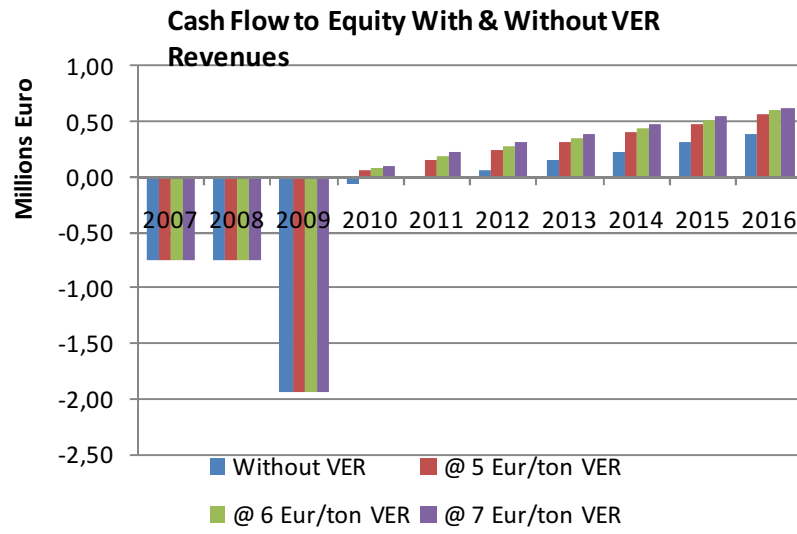


Chart 3: Project Cumulative Cashflow Comparison, with and without GS VER.

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

1. Parameters required for calculation of key financial indicators

According to the financial feasibility study of the proposed project⁴⁸, the parameters required for the calculation of key financial indicators are in Table 10:

| Parameter | Value |
|--|------------|
| Installed capacity (MW) | 17.00 |
| Grid connected output (MWh) | 59,928 |
| Capital investment (Euro) | 18,750,000 |
| Income tax rate (%) | 20.0 |
| Expected tariff (Euro/kWh) | 0,05 €/kWh |
| Expected VER price (Euro/tCO _{2e}) | 5-7 |
| O&M (Euro/year) | 839,223 |
| Project lifetime (years) | 20.0 |
| Benchmark rate (%) | 15.65 |

Table 9: Basic Parameters for Financial Analysis

2. Results of the Financial Analysis

Table 2.9 includes the results of the financial analysis for the Project, at the time that the decision to go ahead was made, both with and without VER financing. The IRR of the Project without VER financing was lower than the applicable benchmark rate of return. This therefore indicates that in comparison to alternative investments, the Project was financially unattractive in the absence of VER financing.

| | Without VER | @ 5 Euro/ton VER | @ 6 US\$/ton VER | @ 7 US\$/ton VER |
|----------------|----------------|---------------------|---------------------|---------------------|
| Equity IRR (%) | 13,9% | 15,9% | 16,3% | 16,8% |

Table 10: Summary of Project investment analysis without and with VER financing

3. Comparison of IRR for the proposed project to the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the project IRR⁴⁸, are much lower than the benchmark, the proposed project is not considered financially attractive.

⁴⁸ For Benchmark Analysis, the IRR shall be calculated as equity IRR, according to the “Tool for the demonstration and assessment of additionality”, version 05, from EB39.

Table 2.9 highlights the project IRR with and without carbon revenues. Without the additional income to the project developer resulting from VER sales, the Equity IRR is 13.9%, which is lower than the financial benchmark. Thus, the proposed project is not financially attractive.

Taking VER revenues into consideration, the Equity IRR increases to 15.9% (with 6 Euro/ton VER price).

While the IRR with VERs remains lower than the financial benchmark of 15.65%, the Project Developer will also benefit from the following intangible benefits that VERs provide:

- A third party review of project documents will give extra confidence to both investors and financiers.
- Enhanced corporate green image of the project developer through its contribution to a clean source of electricity and the diversification of electricity sources in Turkey, which broadens stakeholder confidence.

Sub-step 2d: Sensitivity Analysis

Sensitivity analysis was applied to Investment Costs and Energy Production. Applying variations on Investment costs, the range was considered to be in a bandwidth of +10% and –10% as advised in “Tool for the demonstration and assessment of additionality (Version 05.2).”

| Investment costs | -10,0% | -5,0% | 0,0% | 5,0% | 10,0% |
|--------------------|--------|-------|-------|-------|-------|
| Without VER | 17,5% | 15,6% | 13,9% | 12,3% | 10,9% |
| IRR @5 Eur/ton VER | 19,8% | 17,8% | 15,9% | 14,2% | 12,6% |
| IRR @6 Eur/ton VER | 20,3% | 18,2% | 16,3% | 14,6% | 13,0% |
| IRR @7 Eur/ton VER | 20,8% | 18,7% | 16,8% | 15,0% | 13,4% |

Table 2.12: Sensitivity to Variation in Investment Costs

Applying variations on Energy Production; the deviation between last 5 year, last 10 year average and the energy production on which the VER calculation is based on are +2.56% and 0.90% respectively as can be seen in Annex 5-Average monthly water flow and theoretical net electricity production. That is why, a variation in a bandwidth of +5% and –5% was deemed to be appropriate in the context of the specific project circumstances.

| Energy Production | -5,0% | -2,5% | 0,0% | 2,5% | 5,0% |
|--------------------|-------|-------|-------|-------|-------|
| Without VER | 12,1% | 13,0% | 13,9% | 14,8% | 15,8% |
| IRR @5 Eur/ton VER | 13,9% | 14,9% | 15,9% | 17,0% | 18,0% |
| IRR @6 Eur/ton VER | 14,3% | 15,3% | 16,3% | 17,4% | 18,5% |
| IRR @7 Eur/ton VER | 14,6% | 15,7% | 16,8% | 17,9% | 19,0% |

Table 2.13: Sensitivity to Variation in Energy Production

Due to the fact that the feed in tariff prices are fixed in Turkey, the unit energy price is not considered to be an exogenous variable. On the other hand, the potential changes in the revenue were already reflected through a sensitivity analysis on the amount of electricity generation.

The sensitivity analysis given above leads to the result that significant increase in the project investment costs reduce the financial attractiveness of the project as it goes down the acceptable IRR levels by the bankers. In that sense, it should be mentioned that the actual total investment has happened to be about 28.653.000 Euro which is 53% higher than the expected figure in the feasibility study.

Also, in the same sense, a 5% increase in the energy production makes the investment financially attractive barely without future carbon revenue. Nevertheless, the issues mentioned in the barrier analysis proves that the project would still face serious nonfinancial barriers even the IRR may go over the level which is acceptable to the banks.

Step 3: Barrier Analysis

Sub-step 3a: Identify barriers that would prevent the implementation of type of the proposed VER project activity

It is important to note that the participation of Turkish private sector in the renewable energy business is a very new concept. Hence, most of the private companies in Turkey have little experience and know-how in the management and operation of HEPPs. As a part of its energy policy during late 80's, Turkey started a liberalization process in its electricity market. The liberalization process commenced with electricity production and is expected to be completed early 2010's when full privatization of state-owned distribution and production assets are completed. Formerly, all energy plants but especially the HEPPs have been built and operated by the State. While the privatization of energy production through licenses for HEPPs and wind farms offers lucrative investment opportunities, the Turkish private sector still has limited experience in this field.

Despite somewhat reasonable figures in the financial feasibility studies, banks and other financial institutions are very cautious in providing loans to these projects for various reasons. When they do, the rates are significantly high due to risk premiums that stem from lack of full confidence in the projects due to limited technical knowledge and experience. Hence, most of the projects are presumed to be feasible but not bankable because composed with uncertainty about the future national policy on renewable energy, currency risks and opportunity costs, the banks cannot fully confide in such projects. In an economic environment where the cost of capital is very high – average Weighted Average Cost of Capital (WACC) in Turkey is 14%⁴⁹ – funds from international carbon credit buyers help to stimulate the appetite of financial institutions to finance such projects. On the other hand, the financial institutions in the country lack the technical capacity and know-how to assess such projects to ensure the output from them. Verification of output from an independent third party and the resulting financial support from international buyers of carbon emission would be a leap of faith for the banks and financial institutions which hesitate to be on the long-term financing side of such projects. The support would not only ease the crediting process for the project owners but would also give a stronger hand in negotiating for less expensive loans. Consequently, even if such projects achieve some financing from the banks; the project owners are seldom content with the credit terms regarding the tenor and the price.

Price Cap for Renewable Electricity

⁴⁹ <http://analiz.ibsyazilim.com/isapi/AI01/BETA01.asp>

For plants that start operation before the year 2012, the Energy Efficiency Law offers a minimum purchase guarantee of 5 Eurocent per kWh for ten years. The regulation also caps the price with 5.5 Eurocent per kWh, some cap which does not exist in Europe. Since the State dominates the energy production market with a market share of almost 50 percent, any competition above the minimum purchase guarantee is limited because the State is able to influence the prices anytime by regulating the energy market.

Privatization of Electricity Distribution

The ongoing privatization of the distribution poses some risks in terms of increasing distribution fees and charges. The project owners have to keep such uncertainty in mind while project planning. Such uncertainty and risk pose some extra hurdles for the project to access equity and debt financing with reasonable terms.

Availability of Debt Financing and Global Recession

The fundamental barrier for HEPPs in Turkey is actually a consequence of all the barriers that have been elaborated above. Financing of infrastructure projects in Turkey are still considered within the framework of “asset backed financing”. Lack of long term markets due to a few severe financial crises faced by the country along the last two decades makes the project financing, non-recourse financing in other words, very difficult. Even the projects appraised to be eligible for financing face the issue of collateral with tough “loan to value” conditions. The country risk is considered to be high so the projects cannot access the international capital markets easily. In addition, the private sector is still considered to be inexperienced in renewable energy operation, which increases the risks perceived by the investors. Debt financing of the HEPP projects with reasonable conditions is a rare case for the project owners not because the projects are not feasible but because they are not considered to be bankable.

The project achieved a Turkish bank. The details of financing obtained so far and the total budget. for the project can be seen below.

| Investment Details (EUR) | | | | |
|-----------------------------------|------------------|------------------|------------------|-------------------|
| | 2007 | 2008 | 2009 | Total |
| Civil Works | 1.115.976 | 7.253.846 | 2.789.941 | 11.159.764 |
| Access Roads | 156.892 | 0 | 0 | 156.892 |
| Local Machinery & Equipments | 9.098 | 59.136 | 22.745 | 90.979 |
| Import E&M Machinery & Equipments | 0 | 2.306.593 | 1.537.728 | 3.844.321 |
| Power Transmission Lines | 0 | 343.492 | 171.746 | 515.237 |
| Survey, Design And Consulting | 2.772.998 | 0 | 0 | 2.772.998 |
| Land Allocation And Expropriation | 161.534 | 0 | 0 | 161.534 |
| Insurance Costs | 16.091 | 16.091 | 16.091 | 48.274 |
| | | | | 0 |
| Total Investment Amount | 4.232.590 | 9.979.158 | 4.538.251 | 18.750.000 |

Table 2.14: Project Budget, 2008

| Financing Institution | Amount (Euro) | Tenor (years) |
|------------------------------|----------------------|----------------------|
| Garanti Bank | 15.000.000 | 12 |
| Equity | 3.750.000 | n/a |
| Total | 18.750.000 | |

Table 2.15: Project Financing Package

Sub-step 3b: The identified barriers would not prevent the implementation of at least one of the alternatives (except for the proposed project activity)

The barriers explained above are specific to HEPPs. They do not impact the alternatives that have been given in the baseline scenario elaborated by ACM0002, more precisely the electricity generation by existing power plants connected to the grid and the addition of new sources for electricity generation. The main reason why lack of transmission lines, delay in privatization of electricity distribution and high cost of capital impact primarily renewable energy projects is the State policy to refrain from renewable energy investments. Public funding is available and legitimate for energy projects other than renewable. Therefore, those projects are either undertaken by public agencies and the required infrastructure is completed through public funding or they are undertaken by private sector but the additional parts to the project are financed by the State.

Alleviation of Barriers through Carbon Revenue

As the main hurdle in realizing the HEPP projects is the availability of debt financing with reasonable terms, the additional revenue through the sale of VERs will play an extremely crucial role in the realization of these project. At this point, the decision universe is mainly based on the Internal Rate of Return (IRR). The table below displays the IRR values for 10, 15 and 20 years of operation respectively. The project proponent plans to revalidate the project after the first term of ten years and continue the VER sales for total period of 20 years. However below calculations include only the first crediting period.

Assumptions:

- Annual Electricity Generation 59,928 MWh
- Annual Emission Reductions 36,796 tCO₂e
- VER Price of 5, 6 and 7 Euro
- One crediting period of ten years with an opportunity to renew once. Maximum 20 years.

| | Without VER | @ 5 Eur/ton VER | @ 6 Eur/ton VER | @ 7 Eur/ton VER |
|-----------------|-------------|-----------------|-----------------|-----------------|
| 10 Years | -16,3% | -7,4% | -5,9% | -4,4% |
| 15 Years | 6,0% | 9,5% | 10,2% | 10,9% |
| 20 Years | 13,9% | 15,9% | 16,3% | 16,8% |

Table 2.16: Summary IRRs for Different VER prices

The positive impact of VER sales on the project IRR is very evident. Such impact is an important factor for potential lenders as the carbon revenue is generated as long as the project operates and the source of revenues is quite stable and could be pledged to the banks. On the other hand, any financial institution with insecurity on the technical capability and the output from the project will deem to have better opinion for the project. If Turkey happens to ratify the Kyoto Protocol and becomes a JI or Annex 2 country, the project proponent will aim at registering the project as a CDM project activity. With higher unit prices, the carbon revenues from the CDM market will have even more dramatic impact on the project IRR. There are strong signals that Turkey plans to ratify the protocol and such signal definitely creates a positive mood not only on the project owners but also those financial institutions taking a stake in the project.

Step 4: Common Practice Analysis*Sub-step 4a: Other activities similar to the proposed small-scale project activity*

As also mentioned above, participation of private sector in the electricity generation from hydropower plants is a very new concept in Turkey. Facing the growing demand for electricity and lacking the capital to realize hydro investment, the State outsourced the construction of those plants through licenses. As seen in the table below⁵⁰, the number of projects that are close to completion is very low (only 57 projects out of 477 were completed more than 50% as of now). The low rate of completion of the projects confirms the barriers elaborated above and also proves that the electricity generation from HEPP business is not a common practice.

| Completion Ratio (%) | Number of Facilities |
|----------------------|----------------------|
| >10% Completed | 143 |
| >20% Completed | 108 |
| >30% Completed | 92 |
| >40% Completed | 70 |
| >50% Completed | 57 |
| >60% Completed | 40 |
| >70% Completed | 34 |

Table 17: Number of HEPP facilities completed over a certain completion ratio

In addition, the new capacity from privately owned hydro facilities represents a friction of new facilities added to Turkey's capacity every year. As displayed in the table below, on average, the new privately owned hydro facilities represents only 2.3% of new additions. Similarly, new additions from privately held hydro projects represents only 0,1% of Turkey's installed capacity in the last 6 years.

| | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 |
|--|----------|----------|----------|----------|----------|----------|
| Total Additional Installed Capacity from Private Hydro* (MW) | 36,1 | 105,4 | 45,6 | 9,5 | 36,6 | 28,0 |
| Total Additional Installed Capacity (MW) | 1.059,6 | 1.817,6 | 2.019,5 | 1.236,9 | 3.741,3 | 3.513,4 |
| Turkey's Total Installed Capacity | 40.835,7 | 40.564,8 | 38.843,5 | 36.824,0 | 35.587,0 | 31.845,8 |
| Private Hydro / Total Addition | 3,4% | 5,8% | 2,3% | 0,8% | 1,0% | 0,8% |
| Private Hydro / Total Capacity | 0,1% | 0,3% | 0,1% | 0,0% | 0,1% | 0,1% |

*: Excluding Concessionary Rights and BOT Projects

Source:

<http://www.tejas.gov.tr/ist2007/8.xls>

<http://www.tejas.gov.tr/ist2006/8.xls>

<http://www.tejas.gov.tr/istatistik2005/7.xls>

<http://www.tejas.gov.tr/istat2004/7.xls>

<http://www.tejas.gov.tr/istatistik/7.xls>

Table 18: Annual privately held hydro projects' capacity additions, total additions and total installed capacity.

⁵⁰ http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm (Accessed on 3 September 2009)

What is more, the rate of electricity generation of these privately held HEPPs are much less than the rate of installed capacities of these projects. The additional electricity generation from private hydro projects is only 3% of the total additional capacity and only, 0.1% of Turkey's total electricity generation in 2007. Also, the total electricity production of private hydro projects has a rate of 2.5% in Turkey's total electricity generation.

On the other hand, there is no information accessible for the similar projects if they benefit from carbon revenues or not, since there is no registration authority in the host country to apply for this information.

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

As a result, the low rate of completion of the projects, the low contribution privately held hydro projects and also the implementation of the same type of projects in the same region with VER revenues confirm the barriers elaborated above and also proves that the electricity generation from HEPP business is not a common practice. Therefore Step 4 is satisfied.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The consolidated monitoring methodology for grid connected generation from renewable sources named as "Approved Monitoring Methodology ACM0002 / Version 10 is applied. In addition, the baseline for the project was established through the official methodology of ACM0002 / Version 10, named "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"⁵¹ as approved by the CDM Executive Board. Also, to prove additionality and to calculate the grid emission factor, the official methodologies: "Tool for the demonstration and assessment of additionality, Version 05.2"⁵² and "Tool to calculate the emission factor for an electricity system, Version 02"⁵³ are used. Conservative options and data were selected during the implementation of the methodology.

The application of ACM0002 / Version 10 to Cakirlar HEPP is justified because;

- Cakirlar 17.00 MW Runoff-River HEPP project is the installation of a grid connected renewable power generation project which adds electricity capacity to the grid from hydro power sources and which supplies electricity to a system that is supplied by at least one fossil fuel fired generating unit.
- The project involves construction of new units in a brand new plant, in other words the project does neither involve the addition of renewable energy generation units at an existing renewable power generation facility nor does it foresee to retrofit or modify an expired facility of renewable energy generation.

⁵¹ <http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDA0V5K382HW0JR14GS7XYQUMCP>

⁵² <http://cdm.unfccc.int/EB/016/eb16repan1.pdf>

⁵³ http://cdm.unfccc.int/Reference/tools/ls/meth_tool07_v01_1.pdf

- The project activity is not 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/m².
- The project activity does not result 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/m².
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available;
- 5 years of historical data are available;
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity,
- The project is not a hydro power plant that results in a new reservoir or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m².

B.6.2. Data and parameters that are available at validation:

| | |
|---|---|
| Data / Parameter: | EG_{gross, y} |
| Data unit: | MWh |
| Description: | Turkey's Gross Electricity Generated by primary energy source for the five most recent years (2003 - 2007). |
| Source of data used: | Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/ist2007/26(06-07).xls |
| Value applied: | Please see Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available. |
| Any comment: | |

| | |
|--------------------------|--|
| Data / Parameter: | FC_{i, y} |
| Data unit: | Ton (m ³ for Natural Gas) |
| Description: | Amount of fossil fuel type <i>i</i> consumed in the project electricity system in year <i>y</i> |
| Source of data used: | Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/ist2007/43.xls http://www.teias.gov.tr/ist2007/42.xls |
| Value applied: | Please see Annex 7 |

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| | |
|---|--|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available. |
| Any comment: | |

| | |
|---|--|
| Data / Parameter: | NCV |
| Data unit: | TJ/Ton (TJ/m ³ for Natural Gas) |
| Description: | Net calorific value of fossil fuel type |
| Source of data used: | Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/ist2007/45.xls http://www.teias.gov.tr/ist2007/44.xls |
| Value applied: | Please see Annex 7 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available. |
| Any comment: | The conversion factor of 4.187 Joules/Cal is used. |

| | |
|--------------------------|--|
| Data / Parameter: | EF_{CO₂,i,y} |
| Data unit: | tCO ₂ /GJ |
| Description: | Minimum CO ₂ emission factor of fossil fuel type i |
| Source of data used: | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter 1 Introduction, Table 1.4 (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf) |
| Value applied: | 0.614 |

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| | |
|---|---|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | There is no information on the fuel specific default emission factor in Turkey, hence, IPCC values have been used as per the “Tool to calculate the emission factor for an electricity system (version 1)”. |
| Any comment: | |

| | |
|---|--|
| Data / Parameter: | Electricity Imports |
| Data unit: | GWh |
| Description: | Electricity imported to the Grid from other countries |
| Source of data used: | Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/ist2007/47.xls |
| Value applied: | Please refer to Excel File “Baseline_Anadolu_Cakirlar_26.03.2010”, “Sheet “Electricity Consumption” |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available. |
| Any comment: | |

| | |
|--------------------------|--|
| Data / Parameter: | Capacity additions |
| Data unit: | Name of the plant; Installed capacity (MW); Fuel type; Commissioning date. |
| Description: | Set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently. |
| Source of data used: | Turkish Electricity Transmission Company (TEIAS) Generation units put into operation in 2004, 2005, 2006, and 2007. The Annex 2 of TEIAS Capacity Projection Reports for years 2008, 2007, 2006 and 2005 are applied for the capacity additions: http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202005.pdf for year 2004. |

| | |
|---|--|
| | http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf for year 2005. http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf for year 2006 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf for year 2007 |
| Value applied: | Please see Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available. |
| Any comment: | |

B.6.3. Ex-ante calculation of emission reductions:

As explained above, Project Emissions and Leakage Emissions are assumed as 0, as suggested in ACM0002 / Version 10. Therefore;

The baseline emissions BE_y are calculated as following:

$$BE_y = (EG_y - EG_{\text{baseline}}) \times EF_{\text{grid, CM, y}}$$

Where:

- BE_y Baseline emissions (tCO₂e)
 EG_y Annual electricity supplied by the project to the grid (MWh)
 EG_{baseline} Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh).
 For new power plants this value is taken as zero.
 $EF_{\text{grid, CM, y}}$ Baseline emission factor (tCO₂e/MWh)
 Y Refers to a given year

$$EG_y = 59,928 \text{ MWh/year}$$

$$EG_{\text{baseline}} = 0 \text{ (The figure is zero for the project as the project is new)}$$

Therefore, the expected baseline emission for the full year production of the project is:

$$BE_y = 0.614 \times (59,928 - 0) = 36,796 \text{ tCO}_2\text{e}$$

Emission Reductions

Last, according to the methodology Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

| | |
|-----------------|---|
| ER _y | : Emission reductions in year y (tCO ₂ e/yr) |
| BE _y | : Baseline Emissions in year y (tCO ₂ e/yr) |
| PE _y | : Project Emissions in year y (tCO ₂ e/yr) |
| LE _y | : Leakage Emissions in year y (tCO ₂ e/yr) |

As demonstrated above, PE_y and LE_y values are “0” for the proposed project activity. Therefore ER_y is equal to BE_y.

As a result;

$$ER_y = 36,796 \text{ tCO}_2\text{e/yr}$$

| | |
|--|--|
| Capacity of each wind turbines | 8.519 MW |
| Number of turbines | 2 |
| Total installed capacity | 17.00 MW |
| Net electricity delivered to the grid from all windturbines (EG _y) | 59,928 MWh |
| Baseline emission factor (Combined Margin) of Turkish grid (EF _y) EF _y = W _{OM} × EF _{OM,y} + W _{BM} × EF _{BM,y} | 0.50 × 0.661 + 0.50 × 0.566 = 0.614 tCO ₂ e/MWh |
| Baseline emissions from all wind turbines (BE _y) | 59,928 × 0.614 = 36,796 tCO ₂ e/year |
| Project emissions (PE _y) | 0 tCO ₂ e/year |
| Leakage emissions (LE _y) | 0 tCO ₂ e/year |
| Emission reduction (ER _y) | 36,796 tCO ₂ e/year |

B.6.4 Summary of the ex-ante estimation of emission reductions:

| Year | Estimation of project activity emission reductions (tonnes CO ₂ e) | Estimation of baseline emission reduction (tonnes CO ₂ e) | Estimation of leakage (tonnes CO ₂ e) | Estimation of emission reductions (tonnes CO ₂ e) |
|------|---|--|--|--|
| 2009 | 0 | 15,332 | 0 | 15,332 |
| 2010 | 0 | 36,796 | 0 | 36,796 |
| 2011 | 0 | 36,796 | 0 | 36,796 |

| | | | | |
|--------------|----------|----------------|----------|----------------|
| 2012 | 0 | 36,796 | 0 | 36,796 |
| 2013 | 0 | 36,796 | 0 | 36,796 |
| 2014 | 0 | 36,796 | 0 | 36,796 |
| 2015 | 0 | 36,796 | 0 | 36,796 |
| 2016 | 0 | 21,464 | 0 | 21,464 |
| Total | 0 | 257,572 | 0 | 257,572 |

B.7. Application of the monitoring methodology and description of the monitoring plan:

This monitoring plan is prepared as a road map for the verification of the information which needs to be monitored periodically.

All relevant baseline emission factors are defined ex-ante. Please see the baseline estimations for Operating and Build Margin estimations. Hence, there are two sets of data to be monitored during the project activity.

The first one is the amount of electricity fed into the grid. There is already an electricity meter installation plan to provide the data that is required by the monthly invoicing process to TEIAS. Cakirlar HEPP is a new power unit which did not replace a fossil fuel plant on the project site. The plant manager of Cakirlar HEPP will be responsible for providing the bills which shows the monthly electricity generation of the company.

The second data to be monitored is the installed capacity of the project activity. The data will be monitored from the digital displays on the equipments which show the installed capacity at the time, together with the electricity generation of the facility. The plant manager will be responsible to provide the data.

The data will be collected and stored by ANADOLU not only during the crediting period but also two years after the last issuance of GS VERs to Cakirlar HEPP project for that crediting period.

The emission factors are calculated ex-ante for the period of ten years. The combined margin will be recalculated through ACM0002 / Version 10, any time the crediting period is renewed. Please note that the project is a zero emission generating activity and no particularly sensitive or critical sustainable development indicator was identified.

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| ID Number | Data Variable | Source of Data | Data Unit | Measured (m) Calculated (c) Estimated (e) | Recording Frequency | Proportion of data to be monitored | How will the data be archived? (electronic or paper) | Comment |
|-----------------------------|---|--|--------------------------------|---|--|------------------------------------|--|---|
| 1. EG _{facility,y} | Quantity of net electricity delivered to the grid. | Metering device from the grid operator | MWh | m | Continuously | 100% | Electronic and paper | The data will be obtained from the monthly meter readings. "Meter reading document" is already required for the invoicing to TEIAS. |
| 2. EF _{grid,CM,y} | Combined margin CO2 emission factor for grid connected power generation in year y | As per the "Tool to calculate the emission factor for an electricity system" | tCO2 / MWh | c | Calculated once for any crediting period | 100% | Electronic and paper | Calculated once for any crediting period |
| 3. FC _{i,y} | Total amount of fossil fuel consumed by power plants | As per the "Tool to calculate the emission factor for an electricity system" | Ton (m3 for natural gas) | c | Calculated once for any crediting period | 100% | Electronic and paper | Calculated once for any crediting period |
| 4. NCV _{i,y} | Net Calorific Value of Fossil Fuel Type | As per the "Tool to calculate the emission factor for an electricity system" | TJ/Ton (TJ/m3 for Natural Gas) | c | Calculated once for any crediting period | 100% | Electronic and paper | Calculated once for any crediting period |
| 5. CapPJ | Installed capacity of project activity after implementation | Project site | W | m | Yearly | 100% | Electronic and paper | Data will be obtained from the digital displays on the equipments |

Table 19: Data to be monitored and monitoring process

| |
|---|
| B.7.1 Data and parameters monitored: |
|---|

| | |
|--|---|
| Data / Parameter: | Electricity Production / EG_{facility,y} |
| Data unit: | kWh |
| Description: | Quantity of net electricity delivered to the grid |
| Source of data to be used: | Monthly Invoice |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 59,928 kWh |
| Description of measurement methods and procedures to be | TEIAS readings and monthly invoices |

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| | |
|---------------------------------|-------------------------------------|
| applied: | |
| QA/QC procedures to be applied: | Double check with the grid operator |
| Any comment: | N/A |

| | |
|--|--|
| Data / Parameter: | Installed Capacity / Capacity |
| Data unit: | W |
| Description: | Installed Capacity of the hydropower plant after the implementation of the project activity |
| Source of data to be used: | Project Site |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 17,000,000 W |
| Description of measurement methods and procedures to be applied: | Supplier information on the equipment |
| QA/QC procedures to be applied: | Supplier information on the related equipment and the existence of the equipment will be checked |
| Any comment: | N/A |

| | |
|--|--|
| Data / Parameter: | Combined Margin CO2 Emission Factor / $EF_{grid,CM,y}$ |
| Data unit: | tCO ₂ / MWh |
| Description: | Combined margin emission factor for grid connected power generation in year y calculated using the latest version of “Tool to calculate the emission factor for an electricity system” |
| Source of data to be used: | As per the “Tool to calculate the emission factor for an electricity system” |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0.614 tCO ₂ /MWh |
| Description of measurement methods and procedures to be applied: | As per the “Tool to calculate the emission factor for an electricity system” |
| QA/QC procedures to be applied: | As per the “Tool to calculate the emission factor for an electricity system” |
| Any comment: | To be calculated once for each crediting period |

Table 20: Data and Parameters to be monitored

| |
|---|
| B.7.2. Description of the monitoring plan: |
|---|

| Data | Uncertainty Level of Data (High/Medium/Low) | Explain QA/QC Procedures Planned for this Data or why such procedures are not necessary |
|--|---|--|
| Quantity of net electricity delivered to the grid | Low | The metering equipment will be properly calibrated and checked periodically for accuracy, to ensure that any error resulting from such equipment shall not exceed +0.2% of full scale rating. Rules for meter accuracy are stated in the TEIAS connection agreement. In addition to the main meter, a redundant meter will be installed to exclude the possibility of data loss. |
| Combined margin CO2 emission factor for grid connected power generation in year y | Low | Combined margin CO2 emission factor for grid connected power generation in year y is calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated. |
| Turkey's Gross Electricity Generated by primary energy source for the five most recent years | Low | Turkey's Gross Electricity Generated by primary energy source for the five most recent years is calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated. |
| Net Calorific Values of Fossil Fuel Types | Low | Net Calorific Values of Fossil Fuel Types are calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated. |
| Installed capacity of the project after the implementation | Low | The installed capacity of the project is equal to the total installed capacities of the equipment implemented at the beginning of the project's life. The installed capacity will be monitored from supplier's documents related to the equipment. |

Table 20: Quality Control of Monitoring

The first data that should be monitored is the amount of electricity ($EG_{\text{facility},y}$) that is annually fed into the grid by the plant. The project owner, ANADOLU has already signed an agreement with TEIAS that includes measuring the amount of electricity that goes to the system accurately. Based on this sales agreement, there is no need for an additional process or equipment to monitor the data.

The second data to be monitored is the installed capacity of the project activity. The digital displays on the equipments which show the installed capacity at the time will be monitored during the verification process.

Each monitoring period is planned to last one year. At the end of each period, the installed capacity will be read from the digital displays and the annual net electricity generation will be calculated as an accumulation of monthly readings over the year. The total amount of the net electricity generation of that period will then be multiplied with the combined emission factor. An excel sheet that also includes the estimation of the combined emission factor will be used to calculate the amount of ERs through the multiplication of net electricity generated and combined emission factor. Thus, a transparent and traceable baseline approach and ER calculation will be provided. For quality assurance and follow-up, GAIA Carbon Finance will be present at each monitoring assembly. The kwh invoice from Arsan to the purchasers will be cross-checked with metering as well.

For each crediting period, the EF, FC and NCV values will be recalculated as per “Tool to calculate the emission factor of an electricity system.”

The management of ANADOLU is responsible with all monitoring and reporting issues in general.

Name of person/entity determining the monitoring methodology

GAIA Finansal Danismanlik, Turkey

Tel: 0090 (0) 212 224 0450

Fax: 0090 (0) 212 224 0466

Email: info@gaiacf.com

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Date of completion: 21 December 2009

GAIA Finansal Danismanlik, Turkey

Tel: 0090 (0) 212 224 0450

Fax: 0090 (0) 212 224 0466

Email: info@gaiacf.com

Contributor: ANADOLU ELEKTRİK ÜRETİM ve TİCARET A.Ş.

Gaia is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

Starting date of the project activity is the commissioning date which is July 2009.

C.1.2. Expected operational lifetime of the project activity:

The expected lifetime of the Cakirlar HEPP project is 20 years which is the technical lifetime of the electromechanical equipments.

C.2. Choice of the crediting period and related information:

A renewable crediting period has been selected for the project.

C.2.1. Renewable crediting period:**C.2.1.1. Starting date of the first crediting period:**

The first crediting period starts with commissioning of the hydro power plant which is July 2009

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

>>

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The domestic laws and regulations in Turkey do not require an Environmental Impact Analysis for renewable energy projects with an installed capacity less than 25 MW. Nevertheless, those projects still need to pursue a preliminary EIA which ensures that some further and detailed EIA is not necessary because the project does not pursue any risk for environmental and social sustainability. The indicators of environmental and social impact suggested by World Commission on Dams (WCD) are discussed, as seen below.

| | Basic requirements | Comments |
|--------------------------|---|---|
| Management domain | Minimum Flow Goal is a dynamic flow regime, which qualitatively simulates the natural hydrological regime | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life is defined by DSI and monitored via River Observation Stations. (Please see DSI Regulation on Minimum Water Rule: |

| | |
|--|---|
| | http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm |
| Minimum flow which guarantees habitat quality and prevents critical oxygen and chemical concentrations | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life is defined by DSI and monitored via River Observation Stations. (Please see DSI Regulation on Minimum Water Rule: http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm) |
| No disconnection of lateral rivers | There is no disconnection of lateral rivers. The water obtained by Cakirlar weir will be released back to the river bed after its potential energy is used for electricity production in the power house. |
| Minimum water depth for fish migration during critical periods | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life is defined by DSI and monitored via River Observation Stations. (Please see DSI Regulation on Minimum Water Rule: http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm) |
| Lateral and vertical connectivity (flood plains and groundwater) shall not be substantially disturbed | There is disconnection of lateral rivers. Also, groundwater will not be disturbed, since the project does not contain a dam for water storage. |
| Provides sufficient transport capacity for sediments | The project design is approved by State Hydraulic Works and Ministry of Environment and Forestry. Sediments will pass through the power plant in a controlled manner. The sediments will be released to the downstream of the weir by washing the gravel pass of the plant periodically. |
| Landscape compartments shall not be destroyed | For the conveyance of the water, the project design includes tunnels, but not channels. (Revised Feasibility dated July 2007) This project items will be used most properly for the environment and local people. |
| Flood plain ecosystems shall not be endangered | Flood plain ecosystem will not be endangered, since the project design does not include a dam for water storage. |

| | | |
|-----------------------------|--|--|
| | Conservation of locally adapted species and ecosystems | The locally adapted species and ecosystems will not be affected. There is no endangered flora or fauna in the region. |
| Hydropeaking | Rate of change of water level should not impair fish and benthic populations | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life will be released even in dry seasons and will be monitored by State Hydraulic Works. (Please see DSI Regulation on Minimum Water Rule: http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm) |
| | Reduction in water level should not lead to drying of the water course. | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life will be released even in dry seasons and will be monitored by State Hydraulic Works. (Please see DSI Regulation on Minimum Water Rule: http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm) |
| | Protective measures if flood plain ecosystems are impaired. | Cakirlar HEPP is a small and a run-off river hydro project and does not include a dam for water storage. Thus, it is not expected from the project to have an impact on flood plain ecosystem. |
| | No isolation of fish and benthic organisms when water level decreases | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life will be released even in dry seasons and will be monitored by State Hydraulic Works. (Please see DSI Regulation on Minimum Water Rule: http://www.dsi.gov.tr/ska/yonetmelik_tamami.htm) Also, the project design includes a fish passage. Also, the turbine technology (Francis type turbines) protects fishes from injuries and deaths. The fishes can pass through the turbines. |
| | No impairment of spawning habitat for fish | Ensured by the Monitoring Procedures of State Hydraulic Works (DSI). The minimum water flow which is necessary for the natural river life will be released even in dry seasons and will be monitored by State Hydraulic Works. Also, the project design includes a fish passage. |
| | | |
| Reservoir management | Are there feasible alternatives to reservoir management flushing? | The project design does not include a reservoir. |
| | Changes in reservoir levels should not impair lateral ecosystems (flood plains, river shores, ...) | The project design does not include a reservoir. |

| | | |
|----------------------------|--|--|
| | Connectivity with lateral rivers should not be impaired | The project will not impair connectivity with lateral rivers. The project design does not include a reservoir. |
| | Sediment accumulation areas should be used as valuable habitats, where feasible. | The project design does not include a reservoir. |
| | Special protection of flood plain ecosystems if they are impaired | It is not expected from the project to have an impact on flood plain ecosystem. The project design does not include a reservoir. |
| Sediment management | Sediments have to pass through the power plant. | The project design is approved by State Hydraulic Works and Ministry of Environment and Forestry. Sediments will pass through the power plant in a controlled manner. |
| | No erosion and no accumulation in the river bed below storage dams and water intakes because of a deficit in sediments. | The project is a run-off-river type project, so it does not include a dam for water storage. There is just a small reservoir to regulate water before it is taken by the conveyance tunnel. Thus, no erosion and no accumulation in the river bed are expected. |
| | Sediment transport should sustain morphological structures, which are typical for the river. | The project design is approved by State Hydraulic Works and Ministry of Environment and Forestry. Sediments will pass through the power plant in a controlled manner. |
| | No accumulation of sediments below dams | The project is a run-off-river type project, so it does not include a dam. |
| | Riverine habitats have to be established | Ensured by the Monitoring Procedures of State Hydraulic Works. DSI defines and monitors the minimum water requirement of the natural river life. Therefore, the enough water for natural river life will be released to the riverbed even in dry seasons. Also, a fish passage is added to project design. |
| | | |
| Power plant design | Free fish migration upwards and downwards (as far as technologically Power plant design feasible) | The project design includes a fish passage construction. Also, the turbine technology (Francis type turbines) protects fishes from injuries and deaths. The fishes can pass through the turbines. |
| | Protection of animals against injury and death stemming from power plant operations (turbines, canals, water intakes, ...) | The project design includes a fish passage construction. Also, the turbine technology (Francis type turbines) protects fishes from injuries and deaths. The fishes can pass through the turbines. |
| Social impacts | Cultural landscapes | There is no cultural landscape to be affected by the project implementation in the project area. |

| | |
|---|--|
| Human heritage (including protection of special ethnic groups) | The project will not have negative effect on human heritage. Also, there is no special ethnic group to protect in the region. |
| Preservation of lifestyles | As the project area -is a rugged and mountainous terrain, there is no remarkable agricultural activity. Therefore, there is not settlement to be affected by the project activity. (Please see Revised Feasibility Study, Section 7, p.7-1) |
| Empowerment of local stakeholders in the decision-making process (about mitigation and compensation of social impacts) | The project has made various formal and informal consultation meetings with the local people and the authorities. The project owner ensured that the stakeholders could contact the company at the construction site by just visiting the site manager in case they resume some harm of discomfort from the project. |
| Resettlement of local population under similar or better living conditions (than prior to the project) | There is no resettlement involved. |
| Build additional social infrastructure, sufficient to cope with population increase (due to migration induced by the project) | No population increase is foreseen in the region. However, the company have donated funds to local institutions to improve physical and social infrastructure in the region. |
| Water quality and fishing losses affecting downstream riverside population | There is no fishing activity at downstream riverside. Also, enough water for local people and natural river life will be released to the river bed. What is more, a fish pass is included in the project design. |

It is important to note that the project owner company is an internationally acclaimed construction undertaker with dedication to standards such ISO 9001 and ISO 14001 as well as ISO 18001 (OHSAS) that ensures strict procedures of health and safety regulations for the construction industry. The project owner is committed to apply all relevant procedures of those standards mentioned above on Cakirlar HEPP project site.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

According to the results of Local Stakeholder Consultations that company organised unofficially, environmental impacts are not considered significant by the stakeholders. The project participants have agreed that a detailed EIA is not necessary and minor issues of environmental impact can be addressed and solved during project implementation as the project owner is believed to have the best intention to address all concerns and bring solutions immediately.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

As the project is subject to retroactive project cycle, no Local Stakeholder Consultation Meetings had been organised in line with Gold Standard requirements until the date of application to Gold Standard Foundation. However, although the domestic laws and regulations do not require any stakeholders' participation, both in the project planning and construction phase, the project owner managed to conduct various unofficial and unstructured stakeholder participation meetings. The feedback from the stakeholders was reflected on the project design and implementation. Also, a contact person from ANADOLU and relevant contact information was announced in the same meeting for ongoing communication.

The project owner used different channels to invite comments by stakeholders. Most of the meetings were held through the Mukhtar (village governors) and Council of Elderly (İhtiyar Heyeti; the village council) of Kabaca village, and the officials of Municipality of Murgul. Due to the fact that the apiculture represents an important source of income for Kabaca Village, the project owner that maintained very good communication and relationship with the villagers dealing with apiculture took all necessary measures for the sustainability of the activity during the construction period. The project owner also visited various households in the project area to comprehend their needs and to identify how the project could assist in meeting the social and economic needs of the community.

E.2. Summary of the comments received:

Below is the list of stakeholder comments and the details of those comments were taken into account.

- The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.
- The stakeholders asked for assistance for some social needs of Kabaca Village, the nearest village to the project, and the Municipality of Murgul, the nearest town to the project.

- The stakeholders expressed their concerns about the possible harm to be done to the environment of the region, mainly the vicinity of the construction site.
- The stakeholders also asked for assistance in repairment of the roads which are essential for transporting especially in winter.
- The stakeholders, especially those that have homes close to the project site expressed some concerns about dust and noise.

| |
|---|
| E.3. Report on how due account was taken of any comments received: |
|---|

- *The stakeholders addressed unemployment and weak economic activity as the major social problems in the area.*

The total amount of local workers hired for the construction adds up to thirty-five. The local workers will be given priority during the hiring for plant operation. Also, during the construction, 14 construction machines and equipment have been hired from Murgul and the vicinity of Murgul. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Murgul.

- *The stakeholders asked for assistance for some social needs of Kabaca Village, the nearest village to the project, and the Municipality of Murgul, the nearest town to the project.*

The project owner donated some funds, and provided some construction materials to the Kabaca Village for the construction of a new mosque. Besides, some funds were provided to the Municipality of Murgul to sponsor a local festival, to support Murgul Soccer Club and the public schools in Murgul.

- *The stakeholders expressed their concerns about the possible harm to be done to the environment of the region, mainly the vicinity of the construction site.*

In collaboration with the local office of General Directorate of Forestry, the project owner has considered the environmental concerns in order to make sure a sustainable construction which does not damage the environment. In that sense, the road between the Kabaca Village and construction site has been afforested, and this activity was appreciated by a certificate of appreciation issued by Kabaca Local Station of General Directorate of Forestry. Also, the surrounding area of the construction site and the facility will be afforested before the commissioning of the project.

- *The stakeholders also asked for assistance in repairment of the roads which are essential for transporting especially in winter.*

The project owner widened and rearranged the road between Kabaca, and Murgul in 2008.

- *The stakeholders, especially those that have homes close to the project site expressed some concerns about dust and noise.*

The construction followed strict noise and dust standards (ISO 9613-2 and ISO 8134) to prevent any inconvenience to communities. Same standards will be followed during the operation of the plant. The project owner also promised to establish a play ground and a park to a nearby area after the construction is completed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|------------------|--|
| Organization: | Anadolu Elektrik Üretim ve Tic. A.Ş. |
| Street/P.O.Box: | |
| Building: | Ataturk Bulvarı No:229 Kavaklıdere 06880 |
| City: | Ankara |
| State/Region: | |
| Postcode/ZIP: | |
| Country: | Turkey |
| Telephone: | 0090 312 455 42 93 |
| FAX: | 0090 312 409 45 66 |
| E-Mail: | |
| URL: | |
| Represented by: | Mr. Munir Misirlioglu |
| Title: | Asst. Managing Director |
| Salutation: | |
| Last name: | Misirlioglu |
| Middle name: | |
| First name: | Munir |
| Department: | |
| Mobile: | |
| Direct FAX: | |
| Direct tel: | |
| Personal e-mail: | mmunir@gama.com.tr |

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

ODA LETTER WILL BE ADDED

Annex 3

BASELINE INFORMATION

Turkey's total CO2 emissions from electricity production:

| Fuel consumption | | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|-----------------------------|---------------|---------|---------|---------|-----------|-----------|-----------|-----------|--|------------|------------|------------|------------|------------|-------------|
| | | GJ | GJ | GJ | GJ | GJ | | | CO ₂ Emissions (t CO ₂) | | | | | | |
| EUAS | | | | | | | | | | | | | | | |
| | hard coal | 19.201 | 18.585 | 16.500 | 19.933 | 23.316 | 25.393 | 23.086 | 1.781.822 | 1.724.707 | 1.531.217 | 1.849.815 | 2.163.752 | 2.356.465 | 2.142.382 |
| | lignite | 262.738 | 208.875 | 200.912 | 227.624 | 293.357 | 358.729 | 393.748 | 23.882.925 | 18.986.762 | 18.262.898 | 20.690.999 | 26.666.107 | 32.608.485 | 35.791.657 |
| | fuel oil | 23.044 | 12.766 | 9.906 | 14.763 | 16.684 | 28.860 | 39.666 | 1.739.833 | 963.799 | 747.901 | 1.114.581 | 1.259.672 | 2.178.901 | 2.994.764 |
| | diesel oil | 3.437 | 515 | 1.168 | 1.197 | 2.294 | 2.152 | 3.580 | 249.553 | 37.387 | 84.805 | 86.933 | 166.571 | 156.236 | 259.887 |
| | natural gas | 170.168 | 84.377 | 51.108 | 74.500 | 110.318 | 170.189 | 199.895 | 9.240.139 | 4.581.648 | 2.775.179 | 4.045.346 | 5.990.267 | 9.241.275 | 10.854.276 |
| Autoproducers | | | | | | | | | | | | | | | |
| | hard coal | 4.099 | 3.592 | 3.555 | 3.308 | | 109.066 | 116.376 | 380.376 | 333.363 | 329.866 | 306.943 | 0 | 10.121.338 | 10.799.720 |
| | imported coal | 12.799 | 55.751 | 82.597 | 87.856 | 100.211 | | | 1.187.752 | 5.173.733 | 7.665.019 | 8.153.019 | 9.299.586 | 0 | 0 |
| | lignite | 12.975 | 14.574 | 15.592 | 17.178 | 58.050 | 61.291 | 59.377 | 1.179.418 | 1.324.799 | 1.417.280 | 1.561.520 | 5.276.743 | 5.571.312 | 5.397.387 |
| | fuel oil | 76.953 | 79.658 | 70.171 | 50.949 | 49.856 | 54.052 | 43.894 | 5.809.980 | 6.014.183 | 5.297.893 | 3.846.662 | 3.764.159 | 4.080.895 | 3.314.028 |
| | diesel oil | 50 | 63 | 46 | 21 | 331 | 13 | 1.980 | 3.648 | 4.559 | 3.344 | 1.520 | 24.013 | 912 | 143.774 |
| | lpg | 440 | 33 | 582 | 595 | 0 | 0 | 0 | 27.080 | 2.063 | 35.849 | 36.623 | 0 | 0 | 0 |
| | naphtha | 9.852 | 10.580 | 9.198 | 3.676 | 590 | 494 | 473 | 682.712 | 733.197 | 637.449 | 254.748 | 40.910 | 34.237 | 32.786 |
| | natural gas | 124.176 | 121.409 | 147.886 | 110.561 | 520.164 | 579.872 | 591.649 | 6.742.773 | 6.592.499 | 8.030.218 | 6.003.453 | 28.244.897 | 31.487.039 | 32.126.555 |
| Production companies | | | | | | | | | | | | | | | |
| | imported coal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | fuel oil | 0 | 1.440 | 4.660 | 7.155 | 0 | 0 | 0 | 0 | 108.740 | 351.823 | 540.221 | 0 | 0 | 0 |
| | diesel oil | 21 | 4 | 0 | 0 | 0 | 0 | 0 | 1.520 | 304 | 0 | 0 | 0 | 0 | 0 |
| | naphtha | 0 | 0 | 0 | 71 | 0 | 0 | 0 | 0 | 0 | 0 | 4.932 | 0 | 0 | 0 |
| | natural gas | 127.333 | 263.320 | 292.804 | 402.557 | 0 | 0 | 0 | 6.914.190 | 14.298.298 | 15.899.249 | 21.858.825 | 0 | 0 | 0 |
| Mobile | | | | | | | | | | | | | | | |
| | fuel oil | 27.344 | 20.787 | 11.062 | 7.586 | 3.668 | 6.829 | 2.717 | 2.064.471 | 1.569.453 | 835.145 | 572.779 | 276.907 | 515.565 | 205.151 |
| | diesel oil | 670 | 0 | 0 | 0 | 0 | 0 | 0 | 48.634 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOOR | | | | | | | | | | | | | | | |
| | lignite | 42.161 | 42.860 | 38.967 | 42.048 | 0 | 0 | 0 | 3.832.442 | 3.895.999 | 3.542.059 | 3.822.166 | 0 | 0 | 0 |
| | fuel oil | 356 | 251 | 188 | 197 | 0 | 0 | 0 | 26.869 | 18.966 | 14.225 | 14.857 | 0 | 0 | 0 |
| | diesel oil | 38 | 29 | 21 | 0 | 0 | 0 | 0 | 2.736 | 2.128 | 1.520 | 0 | 0 | 0 | 0 |
| | | 917.855 | 939.472 | 956.922 | 1.071.775 | 1.178.840 | 1.396.938 | 1.476.442 | 65.798.870 | 66.366.589 | 67.462.940 | 74.765.942 | 83.173.585 | 98.352.660 | 104.062.388 |

Net Calorific Values

| | Net Calorific Value (NCV _{i,y}) | | | | | | |
|-------------|---|------|------|------|------|------|------|
| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| hard coal | 17,6 | 21,0 | 22,5 | 21,1 | 22,0 | 22,3 | 22,2 |
| lignite | 7,5 | 7,5 | 7,6 | 5,9 | 6,9 | 6,9 | 6,8 |
| fuel oil | 40,1 | 40,1 | 39,9 | 40,2 | 40,2 | 39,9 | 39,7 |
| diesel oil | 42,9 | 43,3 | 42,4 | 42,8 | 42,7 | 43,1 | 42,4 |
| natural gas | 40,8 | 39,1 | 38,0 | 38,6 | 37,0 | 36,7 | 36,6 |
| lpg | 46,2 | 44,1 | 45,9 | 46,1 | 0,0 | 0,0 | 0,0 |
| naphtha | 45,0 | 40,0 | 44,1 | 44,4 | 43,9 | 43,2 | 44,6 |

Turkey's Net Electricity Production and Imports

| Electricity generation | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Gross Electricity Production | 129.399,5 | 140.580,5 | 150.698,3 | 161.956,2 | 176.299,8 | 191.558,1 | 198.418,0 |
| Net Electricity Production | 123.726,8 | 135.248,3 | 145.065,7 | 155.469,1 | 169.543,1 | 183.339,7 | 189.761,9 |
| Net/Gross | 0,956 | 0,962 | 0,963 | 0,960 | 0,962 | 0,957 | 0,956 |
| Net Electricity Production from Thermal Sources | 91.207,7 | 101.003,0 | 100.459,1 | 117.228,4 | 126.634,4 | 148.333,3 | 156.768,3 |
| Net Electricity Production incl. Mobile producers | 91.207,7 | 101.003,0 | 100.459,1 | 117.228,4 | 126.634,4 | 148.333,3 | 156.768,3 |
| Imports | 3.588 | 1.158 | 464 | 636 | 573 | 864 | 789 |
| Net Generated + Imports | 94.795,9 | 102.161,0 | 100.923,6 | 117.864,3 | 127.207,6 | 149.197,6 | 157.557,7 |

OM Emission Factor

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|----------------|-------|-------|-------|-------|-------|-------|
| EF _{grid,OMsimple} , | 0,721 | 0,657 | 0,672 | 0,638 | 0,657 | 0,663 | 0,664 |
| EF _{Grid,OM,y} (tCO ₂ /MWh) | 0,66149 | | | | | | |

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Details of BM Calculation

Recently Commissioned Power Plants

2008

| Company | Facility | Index | Installed Capacity (MW) | Commissioning Date | Energy Production (MWh)* | CO ₂ EF (ton/TJ) | (CO ₂ /MWh)* | Facility Energy Efficiency | BM Emission Factor (CO ₂ /MWh) | CO ₂ (tons) |
|--|--------------|-------|-------------------------|--------------------|--------------------------|-----------------------------|-------------------------|----------------------------|---|------------------------|
| MB Seker Nisasta San. A.S. (Sutarhani) | N.GAS | ANG | 8,80 | 2008 | 60,0 | 54,3 | 0,20 | 44,9% | 0,43 | 26,1 |
| AKSA ENERJİ (Antalya) | N.GAS | ANG | 183,80 | 2008 | 1.290,0 | 54,3 | 0,20 | 44,9% | 0,43 | 560,7 |
| AKSA ENERJİ (Manisa) | N.GAS | ANG | 52,38 | 2008 | 370,0 | 54,3 | 0,20 | 44,9% | 0,43 | 160,8 |
| ANTALYA ENERJİ (İlave) | N.GAS | ANG | 17,46 | 2008 | 122,3 | 54,3 | 0,20 | 44,9% | 0,43 | 53,1 |
| ATAÇ İNŞAAT SAN. A.S.B. (ANTALYA) | N.GAS | ANG | 5,40 | 2008 | 37,0 | 54,3 | 0,20 | 44,9% | 0,43 | 16,1 |
| BAHÇIVAN GIDA (LÜLEBURGAZ) | N.GAS | ANG | 1,17 | 2008 | 8,0 | 54,3 | 0,20 | 44,9% | 0,43 | 3,5 |
| CAN ENERJİ (Çorlu - Tekirdağ) (İlave) | N.GAS | ANG | 52,38 | 2008 | 304,2 | 54,3 | 0,20 | 44,9% | 0,43 | 132,2 |
| FOUR SEASONS OTEL (ATIK PASHA TUR) | N.GAS | ANG | 1,17 | 2008 | 7,0 | 54,3 | 0,20 | 44,9% | 0,43 | 3,0 |
| FRITOLAY GIDA San. Ve Tic. A.S. (İlave) | N.GAS | ANG | 0,60 | 2008 | 4,0 | 54,3 | 0,20 | 44,9% | 0,43 | 1,7 |
| İTÇKA Enerji Üretim A.S. (Mamak) (İlave) | ENEW.+WASTES | AR | 14,13 | 2008 | 107,0 | - | - | na | - | 0,0 |
| KARKEY (SİLOPİ-5) (İlave) | F.OIL | AF | 14,78 | 2008 | 103,2 | 75,5 | 0,27 | 21,6% | 1,26 | 130,0 |
| MELİKE TEKSTİL (GAZİANTEP) | N.GAS | ANG | 1,58 | 2008 | 11,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,8 |
| MİSİS APRE TEKSTİL BOYA EN. SAN. | N.GAS | ANG | 2,00 | 2008 | 14,0 | 54,3 | 0,20 | 44,9% | 0,43 | 6,1 |
| MODERN ENERJİ (LÜLEBURGAZ) | N.GAS | ANG | 13,40 | 2008 | 94,1 | 54,3 | 0,20 | 44,9% | 0,43 | 40,9 |
| ORTADOĞU ENERJİ (ODA YERİ) (Eyp/İST.) | ENEW.+WASTES | AR | 2,83 | 2008 | 22,0 | - | - | na | - | 0,0 |
| POLAT TURZ. (POLAT RENAISSANCE) | N.GAS | ANG | 1,60 | 2008 | 11,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,8 |
| SARAYKÖY JEOTERMAL (Denizli) | GEOHERMAL | AH | 6,85 | 2008 | 50,0 | - | - | na | - | 0,0 |
| YILDIZ SUNTA (Uzunciftlik-Köseköy)(Düzelt) | N.GAS | ANG | 22,63 | 2008 | 146,5 | 54,3 | 0,20 | 44,9% | 0,43 | 63,7 |
| SÖNMEZ Elektrik (İlave) | N.GAS | ANG | 8,73 | 2008 | 67,3 | 54,3 | 0,20 | 44,9% | 0,43 | 29,3 |
| ALP ELEKTRİK TINAZTEPE / ANTALYA | HYDRO | AH | 7,69 | 2008 | 29,0 | - | - | na | - | 0,0 |
| CANSU ELEKTRİK (Murçul/Artvin) | HYDRO | AH | 9,18 | 2008 | 47,0 | - | - | na | - | 0,0 |
| ÇELDERE ELK. (ÇALDERE HES) | HYDRO | AH | 8,74 | 2008 | 35,0 | - | - | na | - | 0,0 |
| DAREN HES ELEKTRİK | HYDRO | AH | 49,70 | 2008 | 182,0 | - | - | na | - | 0,0 |
| DEĞİRMENÜSTÜ EN. (Kahramanmaraş) | HYDRO | AH | 25,70 | 2008 | 69,0 | - | - | na | - | 0,0 |
| GÖZEDE HES (TEMSA ELEKTRİK) Bursa | HYDRO | AH | 2,40 | 2008 | 10,0 | - | - | na | - | 0,0 |
| H.G.M. Enerji (KEKLİÇEK HES) | HYDRO | AH | 8,67 | 2008 | 18,0 | - | - | na | - | 0,0 |
| HAMZALI HES (TÜRKHON MNG ELEKTRİK) | HYDRO | AH | 16,70 | 2008 | 117,0 | - | - | na | - | 0,0 |
| HİDRO KNT. (YUKARI MANAHOZ Reg. Ve Hes) | HYDRO | AH | 22,40 | 2008 | 79,0 | - | - | na | - | 0,0 |
| İÇ-EN ELK. (ÇALKIŞLA REG. Ve HES) | HYDRO | AH | 7,66 | 2008 | 18,0 | - | - | na | - | 0,0 |
| KALEN ENERJİ (KALEN II Reg. Ve Hes) | HYDRO | AH | 15,65 | 2008 | 50,0 | - | - | na | - | 0,0 |
| MARAŞ ENERJİ (FİRİN Reg. Ve Hes) | HYDRO | AH | 7,22 | 2008 | 36,0 | - | - | na | - | 0,0 |
| SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ) | HYDRO | AH | 21,04 | 2008 | 96,0 | - | - | na | - | 0,0 |
| SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ) | HYDRO | AH | 21,58 | 2008 | 108,0 | - | - | na | - | 0,0 |
| TORUL | HYDRO | AH | 105,60 | 2008 | 322,0 | - | - | na | - | 0,0 |
| YEŞİL ENERJİ ELEKTRİK (TAYFUN HES) | HYDRO | AH | 0,82 | 2008 | 5,0 | - | - | na | - | 0,0 |
| ZORLU ENERJİ (MERCAN) | HYDRO | AH | 1,28 | 2008 | 4,9 | - | - | na | - | 0,0 |
| BAKİ ELEKTRİK SAMLİ RÜZGAR | WIND | AR | 21,00 | 2008 | 104,0 | - | - | na | - | 0,0 |
| DATÇA RES | WIND | AR | 8,10 | 2008 | 24,0 | - | - | na | - | 0,0 |
| ERTÜRK ELEKTRİK Çatalca RES | WIND | AR | 60,00 | 2008 | 210,0 | - | - | na | - | 0,0 |
| İNNORES ELEKTRİK Yurtdağ RÜZG. (Aliağa) | WIND | AR | 42,50 | 2008 | 161,0 | - | - | na | - | 0,0 |
| LODOS RES (Taşoluk) | WIND | AR | 24,00 | 2008 | 85,0 | - | - | na | - | 0,0 |
| SAYALAR RÜZGAR | WIND | AR | 30,60 | 2008 | 97,0 | - | - | na | - | 0,0 |
| SEBENOBA (Deniz Elk.) | WIND | AR | 31,20 | 2008 | 100,0 | - | - | na | - | 0,0 |

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| Company | Facility | Index | Installed Capacity (MW) | Commissioning Date | Energy Production (MWh)* | CO ₂ EF (ton/TJ) | CO ₂ /MWh * | Facility Energy Efficiency | BM Emission Factor (CO ₂ /MWh) | CO ₂ (tmc) |
|---|-------------|-------|-------------------------|--------------------|--------------------------|-----------------------------|------------------------|----------------------------|---|-----------------------|
| HABAŞ (Alağa - İlave) | N.GAS | ANG | 9,10 | 2007 | 72,8 | 54,3 | 0,20 | 44,9% | 0,43 | 31,6 |
| MODERN ENERJİ | N.GAS | ANG | 5,20 | 2007 | 38,7 | 54,3 | 0,20 | 44,9% | 0,43 | 16,8 |
| ARENKO | N.GAS | ANG | 0,10 | 2007 | 0,8 | 54,3 | 0,20 | 44,9% | 0,43 | 0,3 |
| ALTNMARKA GDA | N.GAS | ANG | 0,10 | 2007 | 0,8 | 54,3 | 0,20 | 44,9% | 0,43 | 0,4 |
| TEKBOY ENERJİ | N.GAS | ANG | 0,10 | 2007 | 0,7 | 54,3 | 0,20 | 44,9% | 0,43 | 0,3 |
| VELSAN AKRİLİK | N.GAS | ANG | 0,10 | 2007 | 0,6 | 54,3 | 0,20 | 44,9% | 0,43 | 0,3 |
| Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kadıköy | N.GAS | ANG | 0,50 | 2007 | 4,0 | 54,3 | 0,20 | 44,9% | 0,43 | 1,7 |
| Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kozyatağı | N.GAS | ANG | 0,60 | 2007 | 5,0 | 54,3 | 0,20 | 44,9% | 0,43 | 2,2 |
| Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Bursa | N.GAS | ANG | 1,30 | 2007 | 11,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,8 |
| AKATEKS | N.GAS | ANG | 1,80 | 2007 | 14,0 | 54,3 | 0,20 | 44,9% | 0,43 | 6,1 |
| FLOKSER TEKSTİL / Poliser Tesisi | N.GAS | ANG | 2,10 | 2007 | 17,0 | 54,3 | 0,20 | 44,9% | 0,43 | 7,4 |
| FLOKSER TEKSTİL / Süetser Tesisi | N.GAS | ANG | 2,10 | 2007 | 17,0 | 54,3 | 0,20 | 44,9% | 0,43 | 7,4 |
| FRITOLAY GIDA | N.GAS | ANG | 0,50 | 2007 | 4,0 | 54,3 | 0,20 | 44,9% | 0,43 | 1,7 |
| KIVANÇ TEKSTİL | N.GAS | ANG | 3,90 | 2007 | 33,0 | 54,3 | 0,20 | 44,9% | 0,43 | 14,3 |
| KİL-KAN Kil San. Ve Tic | N.GAS | ANG | 3,20 | 2007 | 25,0 | 54,3 | 0,20 | 44,9% | 0,43 | 10,9 |
| SÜPERBOY BOYA SAN. | N.GAS | ANG | 1,00 | 2007 | 8,0 | 54,3 | 0,20 | 44,9% | 0,43 | 3,5 |
| SWISS OTEL | N.GAS | ANG | 1,60 | 2007 | 11,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,8 |
| TAV Esenboğa | N.GAS | ANG | 3,90 | 2007 | 33,0 | 54,3 | 0,20 | 44,9% | 0,43 | 14,3 |
| NUH ENERJİ-2 | N.GAS | ANG | 73,00 | 2007 | 514,0 | 54,3 | 0,20 | 44,9% | 0,43 | 223,4 |
| AKTEKS | F.OIL | AF | 0,80 | 2007 | 5,4 | 75,5 | 0,27 | 21,6% | 1,26 | 6,7 |
| UŞAK ŞEKER | LIGNITE | AL | 1,70 | 2007 | 10,3 | 80,9 | 0,33 | 27,2% | 1,20 | 12,4 |
| BOĞAZLIYAN ŞEKER | GAS+NAPHTHA | ANG | 16,40 | 2007 | 102,6 | 54,3 | 0,20 | 44,9% | 0,43 | 44,6 |
| KARTONSAN | GAS+NAPHTHA | ANG | 5,00 | 2007 | 40,0 | 54,3 | 0,20 | 44,9% | 0,43 | 17,4 |
| ESKİŞEHİR END. ENERJİ | GAS+NAPHTHA | ANG | 3,50 | 2007 | 26,8 | 54,3 | 0,20 | 44,9% | 0,43 | 11,7 |
| ESKİŞEHİR ŞEKER | GAS+NAPHTHA | ANG | 2,90 | 2007 | 18,1 | 54,3 | 0,20 | 44,9% | 0,43 | 7,9 |
| İGSAŞ | GAS+NAPHTHA | ANG | 2,20 | 2007 | 15,2 | 54,3 | 0,20 | 44,9% | 0,43 | 6,6 |
| DESA | GAS+NAPHTHA | ANG | 0,70 | 2007 | 5,6 | 54,3 | 0,20 | 44,9% | 0,43 | 2,4 |
| DENTAŞ | GAS+NAPHTHA | ANG | 0,30 | 2007 | 2,3 | 54,3 | 0,20 | 44,9% | 0,43 | 1,0 |
| SÜPER FİLMÇİLİK | GAS+NAPHTHA | ANG | 0,10 | 2007 | 0,8 | 54,3 | 0,20 | 44,9% | 0,43 | 0,3 |
| ATAER ENERJİ | GAS+NAPHTHA | ANG | 0,10 | 2007 | 0,6 | 54,3 | 0,20 | 44,9% | 0,43 | 0,2 |
| BİL ENERJİ | GAS+NAPHTHA | ANG | 0,10 | 2007 | 0,7 | 54,3 | 0,20 | 44,9% | 0,43 | 0,3 |
| İTC-KA | NEW+WASTES | AR | 1,40 | 2007 | 11,1 | - | - | na | - | 0,0 |
| BİS ENERJİ Bursa İlave | N.GAS | ANG | 43,00 | 2007 | 354,8 | 54,3 | 0,20 | 44,9% | 0,43 | 154,2 |
| ALİAĞA ÇAKMAKTEPE | N.GAS | ANG | 34,80 | 2007 | 278,0 | 54,3 | 0,20 | 44,9% | 0,43 | 120,8 |
| BİS ENERJİ Bursa DÜZELTİME | N.GAS | ANG | 28,30 | 2007 | 233,5 | 54,3 | 0,20 | 44,9% | 0,43 | 101,5 |
| BİS ENERJİ Bursa İlave | N.GAS | ANG | 48,00 | 2007 | 396,1 | 54,3 | 0,20 | 44,9% | 0,43 | 172,1 |
| BOŞEN ENERJİ | N.GAS | ANG | 142,80 | 2007 | 1.071,0 | 54,3 | 0,20 | 44,9% | 0,43 | 465,5 |
| SAYENERJİ ELEKTRİK | N.GAS | ANG | 5,90 | 2007 | 47,0 | 54,3 | 0,20 | 44,9% | 0,43 | 20,4 |
| T ENERJİ ÜRETİM A.Ş. | N.GAS | ANG | 1,60 | 2007 | 13,0 | 54,3 | 0,20 | 44,9% | 0,43 | 5,7 |
| ZORLU ENERJİ Kayseri | N.GAS | ANG | 7,20 | 2007 | 55,0 | 54,3 | 0,20 | 44,9% | 0,43 | 23,9 |
| SİİRT | F.OIL | AF | 25,60 | 2007 | 190,0 | 75,5 | 0,27 | 21,6% | 1,26 | 239,3 |
| MARDİN KIZILTEPE | F.OIL | AF | 34,10 | 2007 | 250,0 | 75,5 | 0,27 | 21,6% | 1,26 | 314,9 |
| KAREN | F.OIL | AF | 24,30 | 2007 | 180,0 | 75,5 | 0,27 | 21,6% | 1,26 | 226,7 |
| IDİL 2 (PS3 A-2) | F.OIL | AF | 24,40 | 2007 | 180,0 | 75,5 | 0,27 | 21,6% | 1,26 | 226,7 |
| BORÇKA HES | HYDRO | EH | 300,60 | 2007 | 1.039,0 | - | - | na | - | 0,0 |
| TEKLUĞ (KEBAN DERESİ) | HYDRO | AH | 5,00 | 2007 | 32,0 | - | - | na | - | 0,0 |
| YPM Ener. Yat. A.Ş. Altintepe Hidro | HYDRO | AH | 4,00 | 2007 | 18,0 | - | - | na | - | 0,0 |
| YPM Ener. Yat. A.Ş. Beypınar Hidro | HYDRO | AH | 3,60 | 2007 | 18,0 | - | - | na | - | 0,0 |
| YPM Ener. Yat. A.Ş. Korak Hidro | HYDRO | AH | 4,00 | 2007 | 19,0 | - | - | na | - | 0,0 |
| KURTEKS Tekstil (KARASU HES - Andırm) | HYDRO | AH | 2,40 | 2007 | 19,0 | - | - | na | - | 0,0 |
| ISKUR TEKSTİL (SULEYMANLI HES) | HYDRO | AH | 4,60 | 2007 | 18,0 | - | - | na | - | 0,0 |
| ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta) | HYDRO | AH | 6,30 | 2007 | 27,0 | - | - | na | - | 0,0 |
| ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta) İlave | HYDRO | AH | 6,30 | 2007 | 27,0 | - | - | na | - | 0,0 |
| ANEMON EN. ELEK. ÜRETİM A.Ş. | WIND | AR | 8,00 | 2007 | 24,2 | - | - | na | - | 0,0 |
| ANEMON EN. ELEK. ÜRETİM A.Ş. İlave | WIND | AR | 15,20 | 2007 | 46,0 | - | - | na | - | 0,0 |
| ANEMON EN. ELEK. ÜRETİM A.Ş. İlave | WIND | AR | 7,20 | 2007 | 21,8 | - | - | na | - | 0,0 |
| BURGAZ RES (Doğal Enerji Üretim A.Ş.) | WIND | AR | 4,00 | 2007 | 12,9 | - | - | na | - | 0,0 |
| BURGAZ RES (Doğal Enerji Üretim A.Ş.) | WIND | AR | 10,90 | 2007 | 35,1 | - | - | na | - | 0,0 |
| DENİZ ELEK. ÜRETİM Ltd. St. (Karakurt) | WIND | AR | 10,80 | 2007 | 28,0 | - | - | na | - | 0,0 |
| MARE MMANASTIR RÜZGAR ENERJİ | WIND | AR | 11,2 | 2007 | 36,9 | - | - | na | - | 0,0 |
| MARE MMANASTIR RÜZGAR ENERJİ | WIND | AR | 20,00 | 2007 | 65,8 | - | - | na | - | 0,0 |

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| Company | Facility | Index | Installed Capacity (MW) | Commissioning Date | Energy Production (MWh)* | CO ₂ EF (ton/TJ) | iCO ₂ /MWh * | Facility Energy Efficiency | BM Emission Factor (tCO ₂ /MWh) | CO ₂ (tons) |
|-------------------------------------|-------------|-------|-------------------------|--------------------|--------------------------|-----------------------------|-------------------------|----------------------------|--|------------------------|
| EKOTEN TEKSTİL GR-I | N.GAS | ANG | 1,93 | 18.02.2006 | 14,0 | 54,3 | 0,20 | 44,9% | 0,43 | 6,1 |
| ERAK GYİM GR-I | N.GAS | ANG | 1,37 | 22.02.2006 | 10,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,3 |
| ALARKO ALTEK GR-III | N.GAS | ANG | 21,89 | 23.02.2006 | 158,3 | 54,3 | 0,20 | 44,9% | 0,43 | 68,8 |
| AYDIN ÖRME GR-I | N.GAS | ANG | 7,52 | 25.02.2006 | 60,0 | 54,3 | 0,20 | 44,9% | 0,43 | 26,1 |
| NUH ENERJİ-2 GR II | N.GAS | ANG | 26,08 | 02.03.2006 | 180,1 | 54,3 | 0,20 | 44,9% | 0,43 | 78,3 |
| MARMARA ELEKTRİK (Çorlu) GR-I | N.GAS | ANG | 8,73 | 13.04.2006 | 63,0 | 54,3 | 0,20 | 44,9% | 0,43 | 27,4 |
| MARMARA PAMUK (Çorlu) GR-I | N.GAS | ANG | 8,73 | 13.04.2006 | 63,0 | 54,3 | 0,20 | 44,9% | 0,43 | 27,4 |
| ENTEK (Köseköy) GR IV | N.GAS | ANG | 47,62 | 14.04.2006 | 391,3 | 54,3 | 0,20 | 44,9% | 0,43 | 170,0 |
| ELSE TEKSTİL (Çorlu) GR II | N.GAS | ANG | 3,16 | 15.04.2006 | 25,0 | 54,3 | 0,20 | 44,9% | 0,43 | 10,9 |
| BARES IX WIND | WIND | AR | 13,50 | 20.04.2006 | 47,3 | - | - | na | - | 0,0 |
| SÖNMEZ ELEKTRİK (Çorlu) GR I - II | N.GAS | ANG | 17,46 | 03.05.2006 | 126,0 | 54,3 | 0,20 | 44,9% | 0,43 | 54,8 |
| DENİZLİ ÇİMENTO (DUZELTME) | N.GAS | ANG | 0,45 | 04.05.2006 | 3,2 | 54,3 | 0,20 | 44,9% | 0,43 | 1,4 |
| MENDERES ELEKTRİK GR I | GEOTHERMAL | AH | 7,95 | 10.05.2006 | 56,0 | - | - | na | - | 0,0 |
| KASTAMONU ENTEGRE BALIKSIR GR-I | N.GAS | ANG | 7,52 | 24.05.2006 | 54,0 | 54,3 | 0,20 | 44,9% | 0,43 | 23,5 |
| BARES X. VE XX. GRUPLAR | WIND | AR | 16,50 | 26.05.2006 | 57,8 | - | - | na | - | 0,0 |
| BOZ ENERJİ GR-I | N.GAS | ANG | 8,73 | 09.06.2006 | 70,0 | 54,3 | 0,20 | 44,9% | 0,43 | 30,4 |
| ADANA ATK SU ARITMA TESİSİ | NEW.+WASTES | AR | 0,80 | 09.06.2006 | 6,0 | - | - | na | - | 0,0 |
| AMYLUM NIŞASTA (ADANA) | N.GAS | ANG | 14,25 | 09.06.2006 | 34,0 | 54,3 | 0,20 | 44,9% | 0,43 | 14,8 |
| ŞİK MAKAS (Çorlu) GR-I | N.GAS | ANG | 1,58 | 22.06.2006 | 13,0 | 54,3 | 0,20 | 44,9% | 0,43 | 5,7 |
| ELBİSTAN B GR-III | LIGNITE | EL | 360,00 | 23.06.2006 | 2.340,0 | 90,9 | 0,33 | 35,1% | 0,93 | 2.180,1 |
| ANTALYA ENERJİ GR I - II - III - IV | N.GAS | ANG | 34,92 | 29.06.2006 | 245,0 | 54,3 | 0,20 | 44,9% | 0,43 | 106,5 |
| HAYAT TEM. VE SAĞLIK GR I - II | N.GAS | ANG | 15,04 | 30.06.2006 | 108,0 | 54,3 | 0,20 | 44,9% | 0,43 | 46,9 |
| EKOLOJİK EN. (Kemerburgaz) GR I | NEW.+WASTES | AR | 0,98 | 31.07.2006 | 6,0 | - | - | na | - | 0,0 |
| EROĞLU GYİM (Çorlu) GR-I | N.GAS | ANG | 1,17 | 01.08.2006 | 9,0 | 54,3 | 0,20 | 44,9% | 0,43 | 3,9 |
| CAM İŞ ELEKTRİK (Mersin) GR I | N.GAS | ANG | 126,10 | 13.09.2006 | 1.008,0 | 54,3 | 0,20 | 44,9% | 0,43 | 438,1 |
| ELBİSTAN B GR II | LIGNITE | EL | 360,00 | 17.09.2006 | 2.340,0 | 90,9 | 0,33 | 35,1% | 0,93 | 2.180,1 |
| YILDIZ ENT. AĞAÇ (Kocaeli) GR I | N.GAS | ANG | 6,18 | 21.09.2006 | 40,0 | 54,3 | 0,20 | 44,9% | 0,43 | 17,4 |
| ÇERKEZKÖY ENERJİ GR I | N.GAS | ANG | 49,16 | 06.10.2006 | 390,0 | 54,3 | 0,20 | 44,9% | 0,43 | 169,5 |
| ENTEK (Köseköy) GR V | N.GAS | ANG | 37,00 | 03.11.2006 | 304,0 | 54,3 | 0,20 | 44,9% | 0,43 | 132,1 |
| İTC-KA EN. MAMAK TOP.M. GR HI-III | NEW.+WASTES | AR | 4,24 | 03.11.2006 | 30,0 | - | - | na | - | 0,0 |
| ELBİSTAN B GRUP IV | LIGNITE | EL | 360,00 | 13.11.2006 | 2.340,0 | 90,9 | 0,33 | 35,1% | 0,93 | 2.180,1 |
| MARE MANASTIR RÜZGAR (X GRUP) | WIND | AR | 8,00 | 08.12.2006 | 25,0 | - | - | na | - | 0,0 |
| ÇIRAGAN SARAYI GR I | N.GAS | ANG | 1,32 | 01.12.2006 | 11,0 | 54,3 | 0,20 | 44,9% | 0,43 | 4,8 |
| ERTURK ELEKTRİK Tepe RES GR I | WIND | AR | 0,85 | 22.12.2006 | 2,0 | - | - | na | - | 0,0 |
| AKMAYA (Lüleburgaz) GR I | N.GAS | ANG | 6,91 | 23.12.2006 | 50,0 | 54,3 | 0,20 | 44,9% | 0,43 | 21,7 |
| BURGAZ (Lüleburgaz) GR I | N.GAS | ANG | 6,91 | 23.12.2006 | 54,0 | 54,3 | 0,20 | 44,9% | 0,43 | 23,5 |
| SEYHAN II | HYDRO | EH | 0,30 | 20.02.2006 | 1,7 | - | - | na | - | 0,0 |
| ŞANLIURFA GR HI | HYDRO | EH | 51,80 | 01.03.2006 | 124,0 | - | - | na | - | 0,0 |
| BEREKET ENERJİ GÖKYAR HES 3 Grup | HYDRO | AH | 11,62 | 05.05.2006 | 43,3 | - | - | na | - | 0,0 |
| MOLU EN. Zamanti Bahçelik GR I - II | HYDRO | AH | 4,22 | 31.05.2006 | 16,7 | - | - | na | - | 0,0 |
| SU ENERJİ BALKESİR GR I - II | HYDRO | AH | 4,60 | 27.06.2006 | 20,7 | - | - | na | - | 0,0 |
| BEREKET EN. MENTAS REG. GR I - II | HYDRO | AH | 26,60 | 31.07.2006 | 108,7 | - | - | na | - | 0,0 |
| EKN (Başaran Hes) (Nazilli) | HYDRO | AH | 0,60 | 11.08.2006 | 4,5 | - | - | na | - | 0,0 |
| ERE (Suçözü Reg. Ve Kızıldüz HES) | HYDRO | AH | 15,43 | 08.09.2006 | 31,6 | - | - | na | - | 0,0 |
| ERE (AKSU REG. VE ŞAHMALLAR HES) | HYDRO | AH | 14,00 | 16.11.2006 | 26,7 | - | - | na | - | 0,0 |
| TEKLUĞ (KALEALT) GR I - II | HYDRO | AH | 15,00 | 30.11.2006 | 52,0 | - | - | na | - | 0,0 |
| BEREKET EN. MENTAS REG. GR III | HYDRO | AH | 13,30 | 13.12.2006 | 54,4 | - | - | na | - | 0,0 |

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| Company | Facility | Index | Installed Capacity (MW) | Commissioning Date | Energy Production (MWh)* | CO ₂ EF (ton/TJ) | tCO ₂ /MWh * | Facility Energy Efficiency | BM Emission Factor tCO ₂ /MWh | CO ₂ (tons) |
|---|---------------|-------|-------------------------|--------------------|--------------------------|-----------------------------|-------------------------|----------------------------|--|------------------------|
| BOSEN GR-III | N.GAS | ANG | 51,02 | 30.12.2005 | 372,8 | 54,3 | 0,20 | 44,9% | 0,43 | 162,0 |
| KARKEY (SİLOP-4) GR-V | F.OIL | AF | 6,75 | 23.12.2005 | 51,9 | 75,5 | 0,27 | 21,6% | 1,26 | 65,3 |
| AKÇA ENERJİ GR-III | N.GAS+NAPHTHA | ANG | 8,73 | 14.12.2005 | 65,5 | 54,3 | 0,20 | 44,9% | 0,43 | 28,5 |
| KAHRAMANMARAŞ KAĞIT GR-I | IMPORTED COAL | AHC | 6,00 | 08.12.2005 | 45,0 | 92,8 | 0,33 | 44,1% | 0,76 | 34,1 |
| PAK GIDA | N.GAS | ANG | 5,67 | 07.12.2005 | 45,0 | 54,3 | 0,20 | 44,9% | 0,43 | 19,6 |
| KORUMA KLOR GR H-III | N.GAS | ANG | 9,60 | 03.12.2005 | 77,0 | 54,3 | 0,20 | 44,9% | 0,43 | 33,5 |
| İÇDAŞ ÇELİK GR-I | IMPORTED COAL | AHC | 135,00 | 30.11.2005 | 1.080,0 | 92,8 | 0,33 | 44,1% | 0,76 | 818,2 |
| KÜÇÜKÇALIK TEKSTİL GR H-III-IV | N.GAS | ANG | 8,00 | 27.11.2005 | 64,0 | 54,3 | 0,20 | 44,9% | 0,43 | 27,8 |
| ZORLU ENERJİ YALOVA GR H-I | N.GAS | ANG | 15,93 | 26.11.2005 | 122,0 | 54,3 | 0,20 | 44,9% | 0,43 | 53,0 |
| HABAŞ ALIĞA GR-V | N.GAS | ANG | 23,00 | 24.11.2005 | 184,0 | 54,3 | 0,20 | 44,9% | 0,43 | 80,0 |
| GRANİSER GRANİT GR-I | N.GAS | ANG | 5,50 | 14.11.2005 | 42,0 | 54,3 | 0,20 | 44,9% | 0,43 | 18,3 |
| MOSB GR H-III-IV-V-VI-VII | N.GAS | ANG | 84,83 | 11.11.2005 | 434,0 | 54,3 | 0,20 | 44,9% | 0,43 | 188,6 |
| AK ENERJİ (K.paşa) GR- III | N.GAS | ANG | 40,00 | 09.11.2005 | 256,9 | 54,3 | 0,20 | 44,9% | 0,43 | 111,7 |
| ZORLU ENERJİ KAYSERİ GR-IV | N.GAS | ANG | 38,63 | 26.10.2005 | 294,9 | 54,3 | 0,20 | 44,9% | 0,43 | 128,2 |
| ALTEK ALARKO GR H-I | N.GAS | ANG | 60,10 | 14.10.2005 | 420,0 | 54,3 | 0,20 | 44,9% | 0,43 | 182,5 |
| AYKA TEKSTİL GR-I | N.GAS | ANG | 5,50 | 24.09.2005 | 40,0 | 54,3 | 0,20 | 44,9% | 0,43 | 17,4 |
| HABAŞ ALIĞA GR IV | N.GAS | ANG | 44,62 | 21.09.2005 | 357,0 | 54,3 | 0,20 | 44,9% | 0,43 | 155,1 |
| EYVAP GR H-I | N.GAS | ANG | 5,12 | 27.08.2005 | 30,0 | 54,3 | 0,20 | 44,9% | 0,43 | 13,0 |
| ÇEBİ ENERJİ BT | N.GAS | ANG | 21,00 | 27.08.2005 | 164,7 | 54,3 | 0,20 | 44,9% | 0,43 | 71,6 |
| ÇAN ENERJİ GR-I | N.GAS | ANG | 3,90 | 26.08.2005 | 28,0 | 54,3 | 0,20 | 44,9% | 0,43 | 12,2 |
| NOREN ENERJİ GR-I | N.GAS | ANG | 8,73 | 24.08.2005 | 70,0 | 54,3 | 0,20 | 44,9% | 0,43 | 30,4 |
| ÇEBİ ENERJİ GT | N.GAS | ANG | 43,37 | 23.08.2005 | 340,1 | 54,3 | 0,20 | 44,9% | 0,43 | 147,8 |
| YAMULA GRUP H-I | HYDRO | EH | 100,00 | 31.07.2005 | 422,0 | - | - | na | - | 0,0 |
| ZORLU ENERJİ KAYSERİ GR-H-III | N.GAS | ANG | 149,87 | 22.07.2005 | 1.144,1 | 54,3 | 0,20 | 44,9% | 0,43 | 497,3 |
| BEREKET EN. (DALAMAN) GR XIII-XIV-XV | HYDRO | AH | 7,50 | 15.07.2005 | 35,8 | - | - | na | - | 0,0 |
| ETİMAD.(BAN.ASİT)GR-I | NEW.+WASTES | AR | 11,50 | 15.07.2005 | 88,0 | - | - | na | - | 0,0 |
| ZEYNEP GİYİM SAN. GR-I | N.GAS | ANG | 1,17 | 07.07.2005 | 9,0 | 54,3 | 0,20 | 44,9% | 0,43 | 3,9 |
| KARKEY (SİLOP-4) GR-IV | F.OIL | AF | 6,15 | 30.06.2005 | 47,2 | 75,5 | 0,27 | 21,6% | 1,26 | 59,5 |
| AKBAŞLAR GR-II(ZOLE) | N.GAS | ANG | 9,00 | 24.06.2005 | 71,3 | 54,3 | 0,20 | 44,9% | 0,43 | 31,0 |
| MODERN ENERJİ (DG) GR-III | N.GAS | ANG | 8,38 | 14.06.2005 | 61,1 | 54,3 | 0,20 | 44,9% | 0,43 | 26,6 |
| MODERN ENERJİ (DG+LPG) GR-II | N.GAS+LPG | ANG | 7,68 | 13.06.2005 | 56,0 | 54,3 | 0,20 | 44,9% | 0,43 | 24,4 |
| MODERN ENERJİ (DG+LPG) GR-II (DÜZELTME) | N.GAS+LPG | ANG | 4,50 | 13.06.2005 | 32,8 | 54,3 | 0,20 | 44,9% | 0,43 | 14,3 |
| MURATLI GR H-I | HYDRO | EH | 115,00 | 03.06.2005 | 444,0 | - | - | na | - | 0,0 |
| HABAŞ ALIĞA GR III | N.GAS | ANG | 44,62 | 02.06.2005 | 356,9 | 54,3 | 0,20 | 44,9% | 0,43 | 155,1 |
| HAYAT KAĞIT GR-I | N.GAS | ANG | 7,53 | 27.05.2005 | 56,0 | 54,3 | 0,20 | 44,9% | 0,43 | 24,3 |
| TEZCAN GALVANİZ GR H-I | N.GAS | ANG | 3,66 | 27.05.2005 | 29,0 | 54,3 | 0,20 | 44,9% | 0,43 | 12,6 |
| YONGAPAN(KAST.ENTG) GR-II | N.GAS | ANG | 5,20 | 26.05.2005 | 35,8 | 54,3 | 0,20 | 44,9% | 0,43 | 15,6 |
| NUH ENERJİ 2 GR I | N.GAS | ANG | 46,95 | 24.05.2005 | 319,7 | 54,3 | 0,20 | 44,9% | 0,43 | 138,9 |
| İÇTAŞ ENERJİ (Yükarı Mercan) GR H-I | HYDRO | AH | 14,19 | 22.05.2005 | 44,0 | - | - | na | - | 0,0 |
| AK ENERJİ (K.paşa) GR H-I | N.GAS | ANG | 87,20 | 30.04.2005 | 560,1 | 54,3 | 0,20 | 44,9% | 0,43 | 243,4 |
| TEKÜĞ (Karqık) GR H-I | HYDRO | AH | 23,90 | 25.04.2005 | 83,0 | - | - | na | - | 0,0 |
| SUNJUT(RES) GR H-I | WIND | AR | 1,20 | 23.04.2005 | 2,0 | - | - | na | - | 0,0 |
| KAREGE GR IV-V | N.GAS | ANG | 18,06 | 07.04.2005 | 141,9 | 54,3 | 0,20 | 44,9% | 0,43 | 61,7 |
| BİS ENERJİ GR VII | N.GAS | ANG | 43,70 | 18.03.2005 | 287,6 | 54,3 | 0,20 | 44,9% | 0,43 | 125,0 |
| ÇAN GR I (EUAS) | LIGNITE | EL | 160,00 | 15.03.2005 | 1.040,0 | 90,9 | 0,33 | 35,1% | 0,93 | 968,9 |
| ÇAN GR I (EUAS) | LIGNITE | EL | 160,00 | 15.02.2005 | 1.040,0 | 90,9 | 0,33 | 35,1% | 0,93 | 968,9 |
| ELBİSTAN-B GR I (EUAS) | LIGNITE | EL | 360,00 | 15.02.2005 | 2.340,0 | 90,9 | 0,33 | 35,1% | 0,93 | 2.180,1 |
| ENTEK ELK A.S.KOÇ ÜNİ GR H-I | N.GAS | ANG | 2,33 | 07.02.2005 | 19,0 | 54,3 | 0,20 | 44,9% | 0,43 | 8,3 |
| BAYDEMİRLER GR IV-V-VI | N.GAS | ANG | 6,21 | 04.02.2005 | 49,3 | 54,3 | 0,20 | 44,9% | 0,43 | 21,4 |
| MERCEDES BENZ TÜRK GR H-III-IV | N.GAS | ANG | 8,28 | 04.02.2005 | 68,0 | 54,3 | 0,20 | 44,9% | 0,43 | 29,6 |
| METEM ENERJİ (Hacıramat) GR H-I | N.GAS | ANG | 7,83 | 29.01.2005 | 58,0 | 54,3 | 0,20 | 44,9% | 0,43 | 25,2 |
| METEM ENERJİ (Peliklik) GR H-III | N.GAS | ANG | 11,75 | 29.01.2005 | 89,0 | 54,3 | 0,20 | 44,9% | 0,43 | 38,7 |

2004

| Company | Facility | Index | Installed Capacity (MW) | Commissioning Date | Energy Production (MWh)* | CO ₂ EF (ton/TJ) | tCO ₂ /MWh * | Facility Energy Efficiency | BM Emission Factor tCO ₂ /MWh | CO ₂ (tons) |
|----------------------------------|---------------|-------|-------------------------|--------------------|--------------------------|-----------------------------|-------------------------|----------------------------|--|------------------------|
| ALTINMARKA GIDA GR H-III | N.GAS | ANG | 3,60 | 17.12.2004 | 28,8 | 54,3 | 0,20 | 44,9% | 0,43 | 12,5 |
| KARKEY-II 3+3 DGM | FUEL-OIL | AF | 54,30 | 12.11.2004 | 370,0 | 75,5 | 0,27 | 21,6% | 1,26 | 466,1 |
| STANDART PROFİL 3 GM | N.GAS | ANG | 6,74 | 22.10.2004 | 49,2 | 54,3 | 0,20 | 44,9% | 0,43 | 21,4 |
| HABAŞ ALIĞA GRUP H-I | N.GAS | ANG | 89,23 | 08.10.2004 | 713,7 | 54,3 | 0,20 | 44,9% | 0,43 | 310,2 |
| AYEN ÖSTİM ENERJİ ÜRETİM(BT) | N.GAS | ANG | 9,89 | 01.10.2004 | 84,0 | 54,3 | 0,20 | 44,9% | 0,43 | 36,5 |
| KOMBASSAN KAĞ. MATBAA GIDA | N.GAS | ANG | 5,50 | 24.09.2004 | 35,7 | 54,3 | 0,20 | 44,9% | 0,43 | 15,5 |
| BEREKET EN.(Feslek Hes) Gr-1-2 | HYDRO | AH | 9,48 | 05.08.2004 | 41,0 | - | - | na | - | 0,0 |
| ÇELİK ENERJİ ÜR.ŞTİ. 2 GM | N.GAS | ANG | 2,42 | 09.07.2004 | 19,0 | 54,3 | 0,20 | 44,9% | 0,43 | 8,3 |
| BESLER GR-2, BT (5,2+7,5) | N.GAS | ANG | 12,70 | 07.07.2004 | 95,3 | 54,3 | 0,20 | 44,9% | 0,43 | 41,4 |
| ŞAHİNLER ENERJİ 1 GM | N.GAS | ANG | 3,20 | 29.06.2004 | 24,9 | 54,3 | 0,20 | 44,9% | 0,43 | 10,8 |
| ENERJİ-SA ADANA 1 BT | NAPHTA | AN | 49,77 | 23.06.2004 | 373,3 | 69,3 | 0,25 | 32,5% | 0,77 | 286,3 |
| BİS ENERJİ 2 GT | N.GAS | ANG | 73,04 | 16.06.2004 | 602,6 | 54,3 | 0,20 | 44,9% | 0,43 | 261,9 |
| AYEN ÖSTİM ENERJİ ÜRETİM | N.GAS | ANG | 31,08 | 11.06.2004 | 264,1 | 54,3 | 0,20 | 44,9% | 0,43 | 114,8 |
| KOMBASSAN KAĞIT GIDA VE TEKS | N.GAS | ANG | 5,50 | 09.06.2004 | 38,1 | 54,3 | 0,20 | 44,9% | 0,43 | 16,6 |
| GÜL ENERJİ GR-II | FUEL-OIL | AF | 12,50 | 03.06.2004 | 93,8 | 75,5 | 0,27 | 21,6% | 1,26 | 118,2 |
| TEKBOY TEKSTİL 1 GM | N.GAS | ANG | 2,25 | 18.05.2004 | 16,0 | 54,3 | 0,20 | 44,9% | 0,43 | 7,0 |
| ÇOLAKOĞLU/KAPASİTE ARTIRIMI | IMPORTED COAL | AHC | 45,00 | 05.05.2004 | 347,8 | 92,8 | 0,33 | 44,1% | 0,76 | 263,5 |
| İSKUR TEKSTİL(SÜLEYMANLI) GR H-I | HYDRO | AR | 4,60 | 28.04.2004 | 17,9 | - | - | na | - | 0,0 |
| ELTA ELK(DODURGA) GR-H-III-IV | HYDRO | AR | 4,14 | 26.04.2004 | 12,3 | - | - | na | - | 0,0 |
| TANIRVERDİ 4 GM | N.GAS | ANG | 4,66 | 24.03.2004 | 38,7 | 54,3 | 0,20 | 44,9% | 0,43 | 16,8 |
| ERE(BİR KAPILI HES) GRUP-I | HYDRO | AR | 48,50 | 11.03.2004 | 170,5 | - | - | na | - | 0,0 |
| ATATEKS 2 GM | N.GAS | ANG | 5,63 | 20.02.2004 | 45,0 | 54,3 | 0,20 | 44,9% | 0,43 | 19,6 |
| ENTEK GR-IV | N.GAS+NAPHTA | ANG | 31,13 | 12.02.2004 | 233,5 | 54,3 | 0,20 | 44,9% | 0,43 | 101,5 |
| ANKARA D.G.(BAYMNA) GR-H-III | N.GAS | ANG | 798,00 | 08.01.2004 | 6.500,0 | 54,3 | 0,20 | 44,9% | 0,43 | 2.825,0 |

Summary Table of the Baseline Calculation

| Parameter | SI Unit | Result |
|-------------------------|-----------------------|--------|
| EF _{Grid,OM,y} | tCO ₂ /MWh | 0,661 |
| EF _{Grid,BM,y} | tCO ₂ /MWh | 0,567 |
| EF _{Grid,CM,y} | tCO ₂ /MWh | 0,614 |

Annex 4**MONITORING INFORMATION**

Monitoring plan is explained in detail under Section B.7.

Annex 5**LICENCE OF THE PROJECT**

T.C.
ENERJİ PİYASASI DÜZENLEME
KURUMU

EPDK

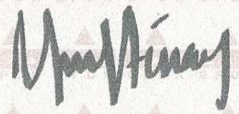
ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi
Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/1127-1/811

Tarih : 15/03/2007

Bu Lisans, Anadolu Elektrik Üretim Ticaret Sanayi Anonim Şirketi'ne, Artvin İli'nde kurulacak olan Çakırlar Hidroelektrik Santrali üretim tesisinde 15/03/2007 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 15/03/2007 tarihli ve 1127-1 sayılı Kararı ile verilmiştir.


Yusuf GÜNAY
Başkan

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

Annex 6

PRELIMINARY EIA REPORT

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NAZKA MUHENDISLIK

PAGE 01/01

T.C.
Çevre ve Orman
Bakanlığı

T.C.
ARTVIN VALİLİĞİ
İL ÇEVRE VE ORMAN MÜDÜRLÜĞÜ

ÇEVRESEL ETKİ DEĞERLENDİRME BELGESİ

Karar Tarihi : 22/11/2008
Karar No : 2/

17 Temmuz 2008 Tarih ve 26939 Sayılı Resmî Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin Ek-II listesinde yer alan "16,9 MW Kurulu İçinde Çakırlar Hidroelektrik Santrali Kapasite Arttırma Projesi" ile ilgili olarak inceleme faaliyetlerine yapılmış ve Proje Tanıtım Dosyasında çevresel etkilere sebep alınması öngörülen faaliyetler yerli değerlendirilmiştir. Ayrıca ÇED Raporu hazırlanmasına gerek bulunmadığı tespit edilmiş olup, söz konusu proje ÇED Yönetmeliğinin 17. Maddesi gereğince Vali Hükümetince "Çevresel Etki Değerlendirmesi Gerekli Değildir" kararı verilmiştir.

Osman ALTIN
Vali
VAT Yürütücüsü

Proje Sahibi : Anadolu Elektrik Üretim Tls. Şou. A.Ş.
Projein Yeri : Artvin İli, Şarğur İlçesi, Kalınca Köyü

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Annex 7**FUEL CONSUMPTIONS AND NET CALORIFIC VALUES**

| Fuel consumption | | 2002 | 2003 | 2004 | 2005 | *2006 | *2007 | *2008 |
|-----------------------------|---------------|------------------|------------------|------------------|-------------------|----------------|----------------|----------------|
| | | t | t | t | t | t | t | t |
| EUAS | | | | | | | | |
| | hard coal | 1.402.093 | 1.420.846 | 1.209.020 | 1.589.140 | 1.567.333 | 1.707.037 | 1.636.566 |
| | lignite | 37.163.881 | 30.106.638 | 28.703.772 | 42.763.044 | 45.130.071 | 55.232.102 | 60.284.929 |
| | fuel oil | 573.414 | 317.570 | 246.524 | 367.277 | 415.127 | 718.032 | 986.942 |
| | diesel oil | 79.740 | 11.909 | 27.116 | 27.787 | 53.275 | 49.971 | 83.041 |
| | natural gas | 3678557,25 | 1823868,75 | 1104826,5 | 1612468,5 | 3185327 | 4932282 | 5789269 |
| Autoproducers | | | | | | | | |
| | hard coal | 139.026 | 120.182 | 118.583 | 113.088 | 4.050.530 | 4.322.106 | 4.633.442 |
| | imported coal | 509.581 | 496.622 | 469.450 | 574.048 | | | |
| | lignite | 815.199 | 931.721 | 927.249 | 1.110.346 | 5.453.739 | 5.991.719 | 6.089.191 |
| | fuel oil | 1.917.800 | 1.988.351 | 1.760.408 | 1.254.894 | 1.239.859 | 1.362.369 | 1.118.667 |
| | diesel oil | 1.863 | 1.503 | 1.510 | 500 | 8.226 | 262 | 48.165 |
| | lpg | 9.521 | 759 | 12.673 | 12.908 | 33 | 0 | 0 |
| | naphta | 219.122 | 264.371 | 208.749 | 82.862 | 13.453 | 11.441 | 10.606 |
| | natural gas | 3.373.033 | 3.366.795 | 4.060.733 | 3.057.851 | 13.849.221 | 15.525.511 | 15.818.366 |
| Production companies | | | | | | | | |
| | imported coal | | 1.668.036 | 2.767.660 | 2.982.782 | | | |
| | fuel oil | | 35.836 | 116.484 | 190.208 | | | |
| | diesel oil | 445 | 49 | 26 | 155 | | | |
| | naphta | | | | 1.619 | | | |
| | natural gas | 3.278.974 | 6.792.327 | 7.791.886 | 10.548.955 | | | |
| Mobile | | | | | | | | |
| | fuel oil | 680.662 | 516.425 | 275.222 | 188.579 | 91.384 | 170.285 | 67.762 |
| | diesel oil | 15.445 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOOR | | | | | | | | |
| | lignite | 4.597.159 | 4.517.669 | 4.145.639 | 4.445.753 | | | |
| | fuel oil | 8.825 | 6.210 | 4.700 | 4.941 | | | |
| | diesel oil | 881 | 662 | 489 | | | | |

| Fuel Calorific Values | | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|-----------------------------|---------------|------|------|------|------|---------------------------------|------|------|
| | | GJ/t | GJ/t | GJ/t | GJ/t | GJ/t | GJ/t | GJ/t |
| EUAS | | | | | | | | |
| | hard coal | 13,7 | 13,1 | 13,6 | 12,5 | 14,9 | 14,9 | 14,1 |
| | lignite | 7,1 | 6,9 | 7,0 | 5,3 | 6,5 | 6,5 | 6,5 |
| | fuel oil | 40,2 | 40,2 | 40,2 | 40,2 | 40,2 | 40,2 | 40,2 |
| | diesel oil | 43,1 | 43,2 | 43,1 | 43,1 | 43,1 | 43,1 | 43,1 |
| | natural gas | 46,3 | 46,3 | 46,3 | 46,2 | 34,6 | 34,5 | 34,5 |
| Autoproducers | | | | | | | | |
| | hard coal | 29,5 | 29,9 | 30,0 | 29,2 | 24,7 | 25,2 | 25,1 |
| | imported coal | 25,1 | 27,9 | 27,9 | 27,8 | *imported and hard coal given i | | |
| | lignite | 15,9 | 15,6 | 16,8 | 15,5 | 10,6 | 10,2 | 9,8 |
| | fuel oil | 40,1 | 40,1 | 39,9 | 40,6 | 40,2 | 39,7 | 39,2 |
| | diesel oil | 27,0 | 41,8 | 30,5 | 41,9 | 40,2 | 47,9 | 41,1 |
| | lpg | 46,2 | 44,1 | 45,9 | 46,1 | 0,0 | 0,0 | 0,0 |
| | naphta | 45,0 | 40,0 | 44,1 | 44,4 | 43,9 | 43,2 | 44,6 |
| | natural gas | 36,8 | 36,1 | 36,4 | 36,2 | 37,6 | 37,3 | 37,4 |
| Production companies | | | | | | | | |
| | imported coal | 0,0 | 25,1 | 25,1 | 24,1 | 0,0 | 0,0 | 0,0 |
| | fuel oil | 0,0 | 40,2 | 40,0 | 37,6 | 0,0 | 0,0 | 0,0 |
| | diesel oil | 47,0 | 85,4 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| | naphta | 0,0 | 0,0 | 0,0 | 44,0 | 0,0 | 0,0 | 0,0 |
| | natural gas | 38,8 | 38,8 | 37,6 | 38,2 | 0,0 | 0,0 | 0,0 |
| Mobile | | | | | | | | |
| | fuel oil | 40,2 | 40,3 | 40,2 | 40,2 | 40,1 | 40,1 | 40,1 |
| | diesel oil | 43,4 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 | 0,0 |
| TOOR | | | | | | | | |
| | lignite | 9,2 | 9,5 | 9,4 | 9,5 | 0,0 | 0,0 | 0,0 |
| | fuel oil | 40,3 | 40,5 | 40,1 | 39,8 | 0,0 | 0,0 | 0,0 |
| | diesel oil | 42,8 | 44,3 | 42,8 | 0,0 | 0,0 | 0,0 | 0,0 |