Voluntary Carbon Standard
Project Description

19 November 2007

31 August 2009

Contents

List of Abbreviations

DSİ: General Directorate of State Hydraulic Works
EİE: General Directorate of Electrical Power Resources Survey and Development Administration
CDM: Clean Development Mechanism
JI: Joint Implementation
REC: Regional Environmental Center
UNFCCC: United Nations Framework Convention on Climate Change
EU: European Union
IEA: International Energy Agency
OECD: Organization for Economic Co-Operation and Development
CEE: Central and Eastern Europe
MENR: Ministry of Energy and Natural Resources
EÜAŞ: Electricity Generation Co. Inc.
EMRA: Energy Market Regulatory Agency
RER: Renewable Energy Resources
EML: Energy Market Law
ORKOY: General Directorate of Forest and Village Relations
TEİAŞ: Turkish Electricity Transmission Company
IPCC: Intergovernmental Panel on Climate Change
TISK: Turkish Employer Unions Confederation

1 Description of Project:

1.1 Project title

Grid connected electricity generation from renewable sources:
Akcay 28.78 MW Hydroelectric Power Plant Project, Turkey
(Akcay HEPP, hereafter)

Document Version: 07
Date of Completion: 31 August 2009

1.2 Type/Category of the project

The subject project is not a grouped project. According to domestic regulations, with an installed capacity of 28.78 MW the Akcay HEPP is qualified as a large-scale project. The project comes under Type I – Renewable Energy Project as per Appendix B of the procedures for CDM project activities. The project is a 28.78 MW HEPP and it uses renewable sources to produce electricity. Since the installed capacity of the planned HEPP larger than 15 MW; it is a large scale renewable energy project activity according to the Decision 17/ CP.7 Article 6.
The expected annual emission reduction is 64 138 tonnes as stated in Table 1.1. According to the VC 2007:1 Guideline section 5; the project falls into the individual validation and verification of a GHG programme option and the project size is "project" since the expected annual emission reduction is less than 1000000 tonnes and more than 5000 tonnes.

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

The project is a large-scale project and not a grouped project. The crediting period of the project begins with the commissioning of the plant. The exact commencement date for the plant is the day of first documented supply to the grid with entire capacity. The expected annual electricity output and the estimated emission reduction along the first ten year of crediting is given below. The anticipated date for the project to supply electricity to the grid is July 15, 2009.

Year	Electricity Output MWh	VCUs
2009	35.253	22.738,0
2010	76.915	49.610,2
2011	76.915	49.610,2
2012	76.915	49.610,2
2013	76.915	49.610,2
2014	76.915	49.610,2
2015	76.915	49.610,2
2016	76.915	49.610,2
2017	76.915	49.610,2
2018	76.915	49.610,2
2019	41.662	26.872,2
TOTAL		496.101,8

Table 1.1: Estimated amount of VCUs over the crediting period.

$ER_y = BE_y - PE_y - LE_y$

Where:
ER_y = Emission reductions in year y (t CO_2e/yr)
BE_y = Baseline emissions in year y (t CO_2e /yr)
PE_y = Project emissions in year y (t CO_2/yr)
LE_y = Leakage emissions in year y (t CO_2/yr)

The Project emissions are calculated with the formula mentioned in ACM0002 / Version09 as:

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:
PE_y = Emission from reservoir expressed as tCO_2e/year
EF_{Res} = Is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e /MWh
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

However, again according to ACM0002 / Version 10 if the power density (PD) of the hydro power plant is above 10 W / m^2 , PEy is 0.

The power density of the project activit is calculated as follows:

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

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

Cap_{PJ} = 28780
Cap_{BL} = 0 (Justification: The project is a new hydro power plant)
A_{PJ} = 0 (Justification: there is no reservoir in the project design)
A_{BL} =0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (28780 – 0)/(0 – 0) = ∞

Therefore;

PE_y and LE_y are assumed to be 0.

. The electricity generation capacity of Akçay is completely based on the water amount which is left from Kemer Dam. Thus, annual average electricity production figure was not calculated according to the historical water flow data and dam operation simulations.
The water flow data for the project was collected from EÜAŞ annuals related with Kemer Dam. There are 15 years dam output water flows between 1995 and 2006. The water flow and theoretical electricity production (with the suggested facility) data was provided in Annex 5. Also, the formula used for the electricity production calculation and details of the results for the year 1993 can be found in Annex 7.

1.4 A brief description of the project:

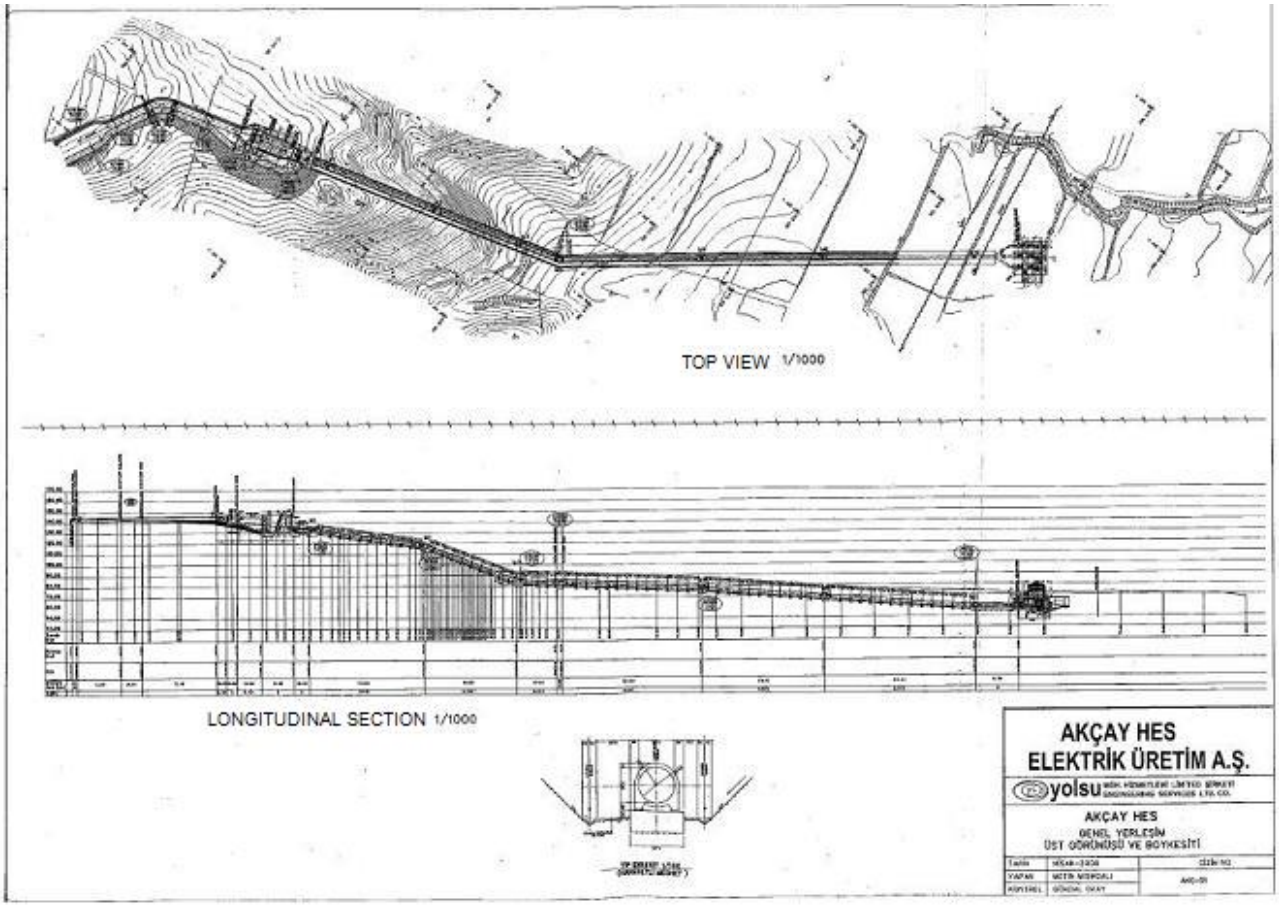
Akcay Hes Elektrik Üretim A.Ş.(AKCAY, hereafter) is in the phase of installing a large-scale runoff-river hydropower plant near Akcay creek in Aydin, Turkey. The project aims the installation of a 28.78 MW runoff-river hydropower electricity plant (HEPP) at the end point of Bozdoğan – Akçay Left Coast Main Irrigation Channel in Aydin, Turkey. The plant will use the water left from the channel to generate electricity, before conveying water to the Akcay river bed. Therefore, the construction of Akcay HEPP does not include any reservoir area or diversion weir construction. The project not only produces electricity from water, but also plays a role of conveying water to the river bed as a part of the irrigation channel. The objective of the project is to generate electricity and supply it into the public grid. Akcay HEPP will be registered as a Voluntary Emission Reduction (VER) project and facilitate the project implementation with carbon revenue coming from the carbon 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 VCS and qualify for carbon finance. The project has not been rejected by another GHG program before. In addition, the project highly supports the sustainable economic development in the region. (Please see Section 1.16)

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

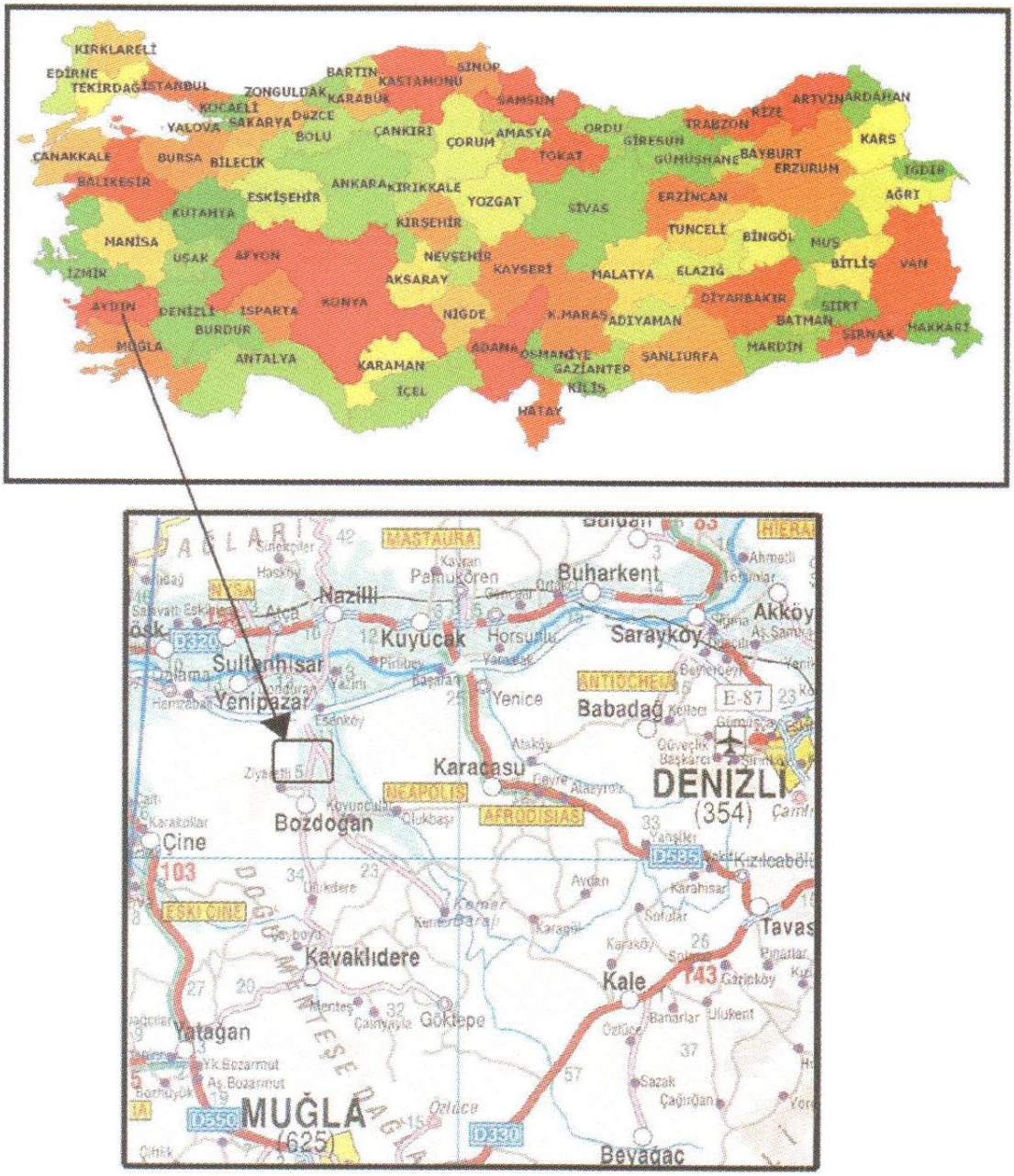
Turkey is the host country. Turkey has ratified the Kyoto Protocol in February 2009. The Ministry of Environment and Forestry is responsible with climate change policy making and climate protection project matters. The country office of the REC (Regional Environmental Center) in Turkey took the role of a National Focal Point for UNFCCC Article 6.

The project is located in the Aegean Region of Turkey, within the province of Aydin. The project is on the Akcay creek. The altitude at the location is 65.00 m.

The project's geographical location is 37º 47´ 13.95´´ North and 28 º 18´ 34.77´´ East.


TOP VIEW 1/1000
LONGITUDINAL SECTION 1/1000
AKÇAY HES
ELEKTRİK ÜRETİM A.Ş.
yolsu
AKÇAY HES
GENEL YERLEŞİM
ÜST GÖRÜNÜŞÜ VE BOYKESİTİ

Site Layout



Project Location on Turkey Map

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

- Penstock with length of 380.00 m.,
- Power house with Francis type turbines;

In the power house, three vertical shaft Francis turbines will be installed, two 11.60 and one 5.58 MW (total capacity 28.78 MW). The efficiency of the turbines is 93%. There are three generators attached to the facility. Generators have power factor of 0,85 d/d, a frequency of 50 Hz and an output of 32 MVA.

1.6 Duration of the project activity/crediting period:

The project reached a financial closure in September 2008.

Starting date of the project activity is July 15, 2009, when the plant commences electricity generation. The carbon crediting period and therefore the monitoring starts when the plant commences electricity generation. The crediting life is a maximum of ten years which may be renewed utmost twice.

The expected life time of the project is minimum 40 years which corresponds to the duration of the licence obtained from EMRA. However, the equipments may be renewed (as recommended) in years according to the conditions of the equipments. The owner of the company will be able to renew the license, by applying to EMRA in 9 – 12 months before the expiration date of the first license duration.

1.7 Conditions prior to project initiation:

Prior to project initiation, the project area did not host livestock production activity. The project area hosted some agricultural production activity in some land. Such land has been expropriated with full consent from the villagers because the agricultural land under project affected area did not pose a commercial value to the farmers as those fields happened to be used for low value added crops such as cereals for household use and livestock feeding. The farmers were content with selling those fields for a good value and use the funds to improve their land they used for olive groves or for new machinery to for better olive oil processing. The project site had been vacant as the project is a new power unit and it did not replace an old plant.

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

The existing electricity grid in Turkey is an interconnected single entity which to a larger extend fed by fossil fuel fired power plants. Akcay 28.78 MW Runoff-River HEPP Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources which otherwise would have been generated by the fossil fuel fired power plant.

The subject project will not cause any GHG emissions during the operation. The quantity of emissions created for the construction of the project is negligible according to ACM002 / Version 10.

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

Akcay HEPP project entails the construction and operation of a 28.78 MW hydroelectric power plant, the construction of connection canals, and penstock. The project consists of hydro power plant with two turbines of 11.60 and one 5.58 MW. The first-hand turbines which will be used in the project will be supplied from Hangzhou Yatai Hydro Equipment Completing Co., Ltd., China. The turbines will be Francis 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 76.915 GWh per annum. The quantity of electricity required for operation of the plant is at a negligible level.

The project was designed by Yol – Su Müh. ve Müş. Ltd. Şti. which is experienced in energy structures, roadways and bridge construction. There are many projects the company finished such as Dim Dam, Kilavuzlu Dam, Süleymanlı HEPP and Sırma HEPP and over 50 various projects on which company has still been working. [1]

[1] http://www.yolsu.com.tr/index.php?p=tsrlr

The technology used in the plant is a state-of-the-art technology with extensive automatization. The equipment to be provided is brand new according to the electromechanical equipment agreement. The equipments were produced at the end of 2008. 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 planning 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. (A copy of the agreement was provided to DOE and also related part of the agreement can be seen in Annex 8)

The economic life of an HEPP in Turkey is assumed as 50 years[2]. However, it is recommended to renew the equipment in every 20 years[3].

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

It is important to note that there are no local laws and regulations in Turkey because it is not a federal state. The Akcay HEPP is in compliance with relevant national laws and regulations related to the project. The general scheme of the regulations this kind of facilities in line with, are defined by The Renewable Energy Law and Environmental Law.[4, 5] Such laws also include land use regulations, forest use permissions and environmental risk management regulations. The company has had the Pre-Assessment Report, Energy Production Licence and water use agreement until now. In addition to these, company will have to have TEİAŞ Connection Agreement, System Usage Agreement and then Substantial Completion Agreement in the coming months.

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

There is no technical risk that could affect the GHG emission reduction capacity of the project substantially. The only risk that project may face is the decrease of rainfall in the region due to the climate change. The Lehner, Czisch and Vassolo's article "The impact of global change on the hydropower potential of Europe: a model-based analysis" shows that the region in which the plant will be commenced has potential to be affected by such a risk.[6]

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

Not applicable.

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

There is no another form of environmental credit generated by the project because there is no such system within the country. The projects originate from Turkey do not comply for renewable energy certificates of EU because there is no energy trade between EU and Turkey because of different grid structures.

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

[2] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.25)
[3] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26
[4] http://www.epdk.gov.tr/mevzuat/diger/diger.htm
[5] http://www.cevreorman.gov.tr/yasa/k/2872.doc
[6] Bernhard Lehner, Gregor Czisch, Sara Vassolo, Energy Policy 33 (2005) 839–855

Not applicable. The project was not rejected by any other GHG program.

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

SUPPLIER DATA

Name	Akçay Hes Elektrik Uretim A.Ş.
Organizational category	Private Company
Address	1380 Sok 2/1 Alyans Apt. B Blok No:3/5 Alsancak/İzmir
Main activities	Akcay Hes Elektrik Uretim A.Ş. is a subsidiary of ENDA Enerji which is mainly involved with energy generation business.
Contact	Mr. Celal Tugcu + 90 232 463 98 11 ctugcu@endaenerji.com.tr

CARBON ASSET DEVELOPER

Name	GAIA Carbon Finance (GAIA)
Organizational category	Private Company
Address	GAIA Finansal Danismanlik Hiz. Tic. Ltd. Sti Gunesli Sok. No: 41/3 Beyoglu 34433 ISTANBUL - TURKEY
Main activities	Carbon asset identification, development in Turkey. GAIA is the first domestic carbon asset development consulting company in Turkey.
Contact	Mr. Gurkan Bayraktar 0090 – 212- 244 4243 gbayraktar@gaiacf.com

Akcay whose contact details given above is a project participant. Gaia Carbon Finance whose contact details given above is not a project participant.

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

The concept of hydropower projects undertaken by private sector is a very immature concept in the country. In this sense, the project will help Turkey to stimulate the commercial application of grid connected renewable energy technologies and markets. It will also be a crucial sample of establishing the feasibility of larger grid connected small to medium scale runoff-river HEPPs as a tool to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The specific benefits of the project are:

- Reduce greenhouse gas emissions in Turkey compared to the business-as-usual scenario,
- help to stimulate private sector participation in hydro power industry in Turkey,
- create employment during the construction and the operation phase of the plant,
- relatively reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,
- help to diminish Turkey's increasing energy deficit,
- diversify the electricity generation portfolio and reduce dependency on import of other energy sources.

Despite somewhat reasonable figures in the financial feasibility studies, bankability of renewable energy projects is still in question because banks and other financial institutions are very cautious in providing loans to these projects for various reasons: Lack of long-term markets in the country, poor understanding of private sector participation in renewable energy investment and the fragile macro-economic stability play a significant role in long-term financing decisions of financial institutions. [7], Even if the projects are appraised to be bankable, the interest rates are significantly high due to risk premiums stemming from limited appetite of banks in providing loans to the industry. As private sector participation in renewable energy industry is a very new practice in the country, banks have limited experience and technical knowledge in the appraisal of such projects. The appetite for lending in such projects is curbed because the final output from the project in terms of electricity is always in question. Hence, confirmation of project existence 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. Eventually, even if such projects achieve some financing from the local banks; the project owners are seldom content with the credit terms regarding the tenor and the price. As also seen in the subject Akcay HEPP project, there are also cases that the project developers face unexpected costs over the construction of the projects and seek extra financing to complete the project. Carbon finance revenue also becomes vital while raising extra financing for such projects.

The project contributes to sustainable development in Turkey in two major ways:

- Hydropower presents significant environmental benefits:

    - Generating electricity from hydropower energy does not result in emissions of pollutants into the atmosphere with zero residuals that carry adverse impacts on soil, water etc. Regular emissions from conventional electricity generation such as sulphur dioxide, nitrogen oxide and particulates will not occur in this case.

    - As a renewable energy source hydropower can be used without jeopardizing the supply of primary energy sources in the future

    - The proposed project will significantly contribute to the reduction of GHGs.

- Hydropower presents significant economic benefits:

    - The region is energy poor but thanks to its proximity to Aegean markets, it carries enormous potential for industrial growth. Main livelihood in the region is agriculture and industry based on the agricultural production. Cotton, paprika and corn are the main products produced in the region. In recent years, citrus fruit agriculture has improved. In rain fed areas, olive and fig gardens hold huge areas in the region. Emission of pollutants such as sulphur dioxide through shifting to fossil fuel based electricity generation in the region to satisfy the needs of fast growing industry will result in damaging the quality of agriculture and cause economic harm in the region.

- Construction of Akcay HEPP and operation of the plant will result in extra employment and has already provided many contributions in kind in the local area.

    - During the construction of the project 20 workers were employed periodically from

[7] Hoffman, Scott L. The Law and Business of International Project Finance. Section 1-15. Cambridge Publications. August, 2007.

the region and after the plant commenced, 6 people are being planned to work for the operation of the plant constantly.

- Construction materials for tunnels and all other equipment were supplied through local resources.

- A marsh area was filled with the excavated earth to be utilized for agriculture

- In Osmaniye Village, concrete was donated for the construction of the village mosque.

- More than 500 acre agricultural area located at lower altitude was filled by excavated earth and rescued against possible floods.

- Some land which has alluvial soil was filled with clay to raise its water holding capacity and made more convenient for agricultural production.

- Inclined lands were flattened by the company's construction equipments for better use of land for agriculture.

- Before the construction of the plant, villagers had to trespass many land slots to reach their land. Thanks to the road opened for the construction site, transportation in the village has become easier and more efficient

- The company cares about the landscape around the plant.. After the installation of the electromechanical equipments and completion of the power house, the plant area will be afforested to be an orchard

1.17 List of commercially sensitive information (if applicable):

There is no commercially sensitive information for the project.

2 VCS Methodology:

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

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"[8] as approved by the CDM Executive Board. Conservative options and data were selected during the implementation of the methodology. The completion date of the baseline study is 12/06/2009

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

[8] http://cdm.unfccc.int/EB/015/eb15repan2.pdf (Accessed on March 17, 2008)

The choice of methodology ***ACM0002 / Version 10*** is justified as the proposed project activity meets relevant applicability criteria:

- Akcay 28.78 MW Runoff-River HEPP Project is a grid connected renewable power generation project which adds electricity capacity 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 activity is not implemented in an existing reservoir,
- 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 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 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,

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

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 do not need to be taken into account.

Turkish Electricity Sector

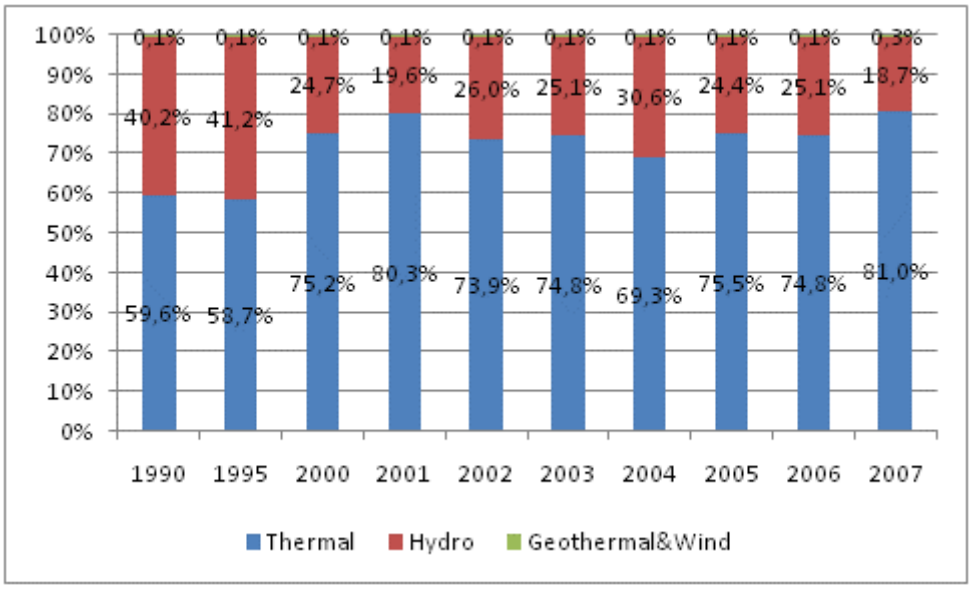
Demand Side:

Gross electricity demand (Gross Generation + Imports – Exports) in Turkey rose at a rate of 8,4% 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 190,000 GWh in 2007. Even the devastating earthquake that hit Turkey in 1999, and the economic crisis in 2001, could not reverse this robust growth record.[9] 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 8.0% increase since 1984, reaching to 155,135 GWh in 2007.[10] 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.[11] According to International Energy Agency (IEA) reports, OECD average per capita electricity consumption is 78,381 kWh in 2006, which is an indicator of the growth potential in Turkey.[12] This figure has been 3,258 kWh among CEE countries.[13] 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%.

[9] http://www.teias.gov.tr/ist2007/23(75-07).xls
[10] http://www.teias.gov.tr/ist2007/30(84-07).xls
[11] http://www.iea.org/Textbase/country/maps/EUROPE/ele_pop.htm
[12] http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=28
[13] http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=33

Supply Side:

Installed capacity and electricity generation in Turkey increased in line with consumption growth in recent decades. In 2007, electricity generation reached 191,558 GWh while imports stood at 864.3 GWh – 0.45% of total supply. Turkey became an importer in the mid-1970s, however, the share of imports in total 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%.[14] By the end of 2007 the installed capacity of Turkey reached 40,835.7 MW, representing a CAGR of 7.4% since 1975. The rate of the increase in the capacity was well above 10% from 1970 to 1980.[15] 49,1% of the installed capacity of 40,836 MW in 2007, was held by the State Generation Company EUAS, 9,4% by Affiliated Partnerhips of EUAS, 0,6% Mobile Power Plants and the remaining 40,9% owned by autoproducers, Production companies, TOOR and ADÜAŞ.[16] 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%.[17] 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 2007, thermal power plants accounted for the 66,8% of the installed capacity whereas the hydro power plants' contribution was 32,8%. This is one of the lowest figures since 1970. On the other hand geothermal and wind powered capacity is still negligible with 0,4%.[18] The existing electricity grid in Turkey is an interconnected single entity which to a larger extend fed by fossil fuel fired power plants. (Graph 1)

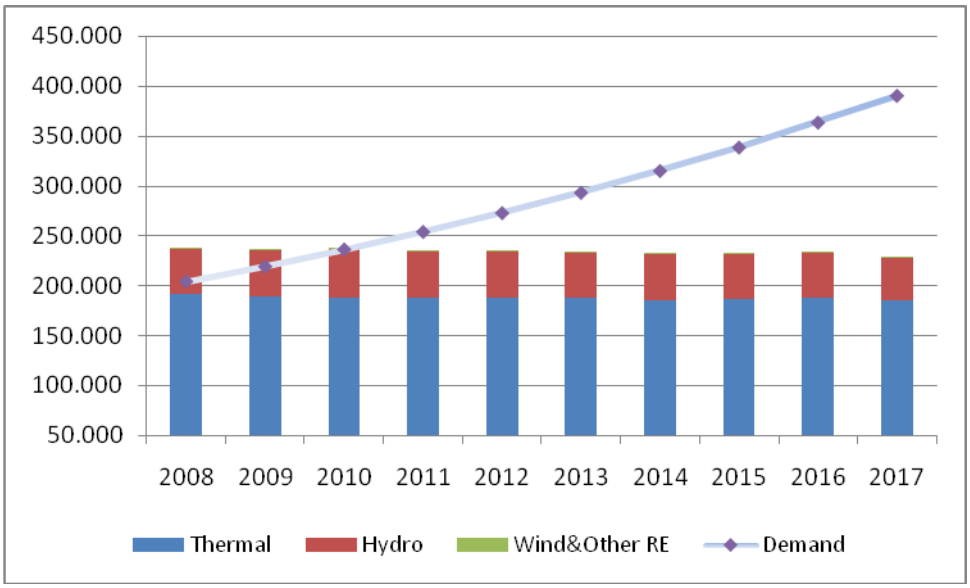


Graph 2.1: Electricity Production Fuel Type [19]

The Graph below displays the forecast in increasing demand along the years between 2008 and 2016. 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

[14] http://www.teias.gov.tr/ist2007/23(75-07).xls
[15] http://www.teias.gov.tr/ist2007/13.xls
[16] http://www.teias.gov.tr/ist2007/13.xls
[17] http://www.teias.gov.tr/ist2007/5(1984-05).xls
[18] http://www.teias.gov.tr/ist2007/3.xls
19 Source: http://www.teias.gov.tr/ist2007/3.xls

thermal power plants as they present higher financial feasibility with relatively short construction periods.



Graph 2.2: Electricity Supply and Demand Projections for Turkey[20]

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 Energy[21] (**"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.[22]

- Renewable energy resources (**"RER"**) is not a brand-new topic, as the Electricity Market Law[23](**"EML"**), which was enacted in March 2001 and the Electricity Market License

20 Source: http://www.teias.gov.tr/projeksiyon/CAPACITY%20PROJECTION%202008-2017.pdf

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

22 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.

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

Regulation[24] (**"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 Turkey[25], 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."

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 km^2.

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).

24 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.

25 OJ 2006 L 22/34.

(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.

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

The Akcay Hydroelectric Power Plant Project entails the construction and operation of a 28.78 MW hydroelectric power plant. The project consists of hydro power plant with turbines of two 11,60 and one 5,58MW.

	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.
Project Activity	Construction and operation of HEPP	CO_2	No	As net electricity approach is adopted, emissons that occur during construction and during the operation are negligible and non-existent respectively.
		CH_4	No	The project is a run off river HEPP and there is no reservoir in the project design.
	Emission of CH_4 from the reservoir	CO_2	No	Minor emission source as suggested by ACM0002 Version 10
		CH_4	Yes	Main emission source as suggested by ACM0002 Version 10.

Table 2.1: The justification for project boundary

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 page 2". 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 this case "the project electricity system" and "the connected system" are same as also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.),[26] the Turkish transmission system is interconnected. There is not an independent regional grid system neither in Aydin nor in Aegean 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" was used. 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

[26] *TEIAS is the legal entity responsible by law to collect and announce data related to electricity production and consumption in Turkey. All Turkey related electricity production, fuel consumption in electricity production, average full load working hour, electricity consumption etc figures(or data used in calculating the related data) used in this document were received from the internet site of TEIAS (which is www. TEIAS.gov.tr) unless otherwise stated.*

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", "if these criteria does 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 is no layered dispatch system in the 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.

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 electric power 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 page 2". 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 Aydin nor in Aegean 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" 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", "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: Select an operating margin (OM) method

According to "Tool to calculate the emission factor for an electricity system", 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 OM1 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 0.40 percent for the years between 2003 and 2007. There is no example of coal being used as must-run and nuclear energy is not practiced in Turkey.
As depicted in Table 2.1[27] the share of low-cost/must run resources were never higher than 50 percent in the last five years.

	2003	2004	2005	2006	2007
Turkey's Gross Electiricity Production (GWh)	140.581	150.698	161.956	176.300	191.558
Electricity Production From Hydro (GWh)	35.330	46.084	39.561	44.244	35.851
Share (%)	25,1%	30,6%	24,4%	25,1%	18,7%

Table 2.2: Share of hydroelectric production in Turkey, 2003 – 2007[28]

Step 3. Calculate the operating margin emission factor according to the selected method
The Simple Operating Margin Emission Factor ($EF_{OM,y}$) is computed as the generation-weighted average emissions per electricity unit (tCO_2 /MWh) of the entire bundle of generating sources that supply into the system, except for low operating cost and must run resources including hydro, geothermal, wind, low-cost biomass, nuclear and solar generation as determined by the Baseline Methodology.

27 All data presented in the baseline calculations are provided from official sources as mentioned in related footnotes.Therefore, uncertainities of data sets were not estiamted.

28 *http://www.teias.gov.tr/ist2006/31(40-07).xls*

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

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

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO2 emission factor in year y (tCO2/MWh)
FCi,y	=	Amount of fossil fuel type i consumed in the project electricity system in ye (mass or volume unit)
NCVi,y	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mas volume unit)
EFCO2,i,y	=	CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
EGy	=	Net electricity generated and delivered to the grid by all power sources servin system, not including low-cost / must-run power plants / units, in year y (MW
i	=	All fossil fuel types combusted in power sources in the project electricity sys in year y
y	=	Either the three most recent years for which data is available at the tim submission of the CDM-PDD to the DOE for validation (ex ante option) or applicable year during monitoring (ex post option), following the guidance on vintage in step 2

As the data for carbon emissions for electricity production with fuel combustion in Turkey for the years 2005 and 2006[29] is available and there is no must run coal fired electricity production plant in Turkey, the official data was used in OM calculations of 2005 and 2006. The emission data used in the OM calculation was computed by Ministry of Environment of Turkey and announced by State Institute of Statistics of Turkey.

On the other hand, on the date of submission of this PDD the carbon emission figure from the electricity production in Turkey was not announced by State Institute of Statistics for the year 2007.

Therefore total CO_2 emission from the electricity production in 2006 was calculated in line with the methodology mentioned above which is Simple OM Option C. . Hence, the calculation of the OM is based on the data for the year 2007. Details of the calculation can be found in Annex 3.

In order to calculate the emission amounts from each fuel types, emission factors from IPCC website were used.[30] Three sets of emission factors were identified as minimum, medium and maximum values.

[29] http://www.turkstat.gov.tr/yillik/stat_yearbook.pdf Page: 20 (Accessed on May 13th, 2008)
[30] http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef_s1.php

Fuel Type	kg C/TJ			efficiency of oxidation
	min	mid	max	
hard coal	24,2	25,8	27,2	1,0
lignite	24,8	27,6	31,3	1,0
fuel oil	20,6	21,1	21,5	1,0
diesel oil	19,8	20,2	20,4	1,0
natural ga	14,8	15,3	15,9	1,0
lpg	16,8	17,2	17,9	1,0
naphta	18,9	20,0	20,9	1,0

Table 2.3: Emission factors from IPCC

In addition to this, it is also proven that the mid carbon emission figures are appropriate for Turkey due to the fact that Turkey's carbon emission figures which were calculated by State Authorities and presented to UNFCCC were calculated with the same figures presented above. Please refer to Turkey's "National Inventory Submissions 2008" which can be accessed via http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr_2008_crf_21may.zip. Please see TUR-2008-2006-v1.1xls, sheet Table 1.A(b), column N in the relevant zip file.

All in all;

	2005	2006	2007
CO_2 Emmission from Electricity Production (tons)	83.679.692	85.311.751	100.661.511

Table 2.5: CO_2 Emission of Turkey from Electricity Production

The calculation of net electricity production is demonstrated below.[31,32] 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 2.3 shows the overall gross/net relation where the estimated net electricity production from thermal resources were calculated by using the same relation.

	2005	2006	2007
Gross Electricity Production (GWh) (a)	161.956	176.300	191.558
Net Electricity Production (GWh) (b)	155.469	169.543	183.340
Net/Gross (c= a/b)	0,960	0,962	0,957
Gross Electricity Production from thermal sources (GWh) (d)	122.120	131.681	154.983
Net Electricity Production from thermal sources (GWh) (c*d)	117.228	126.634	148.333

Table 2.6: 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.

[31] http://www.teias.gov.tr/ist2007/30(84-07).xls
[32] http://www.teias.gov.tr/ist2007/31(40-07).xls

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 tCO_2/MWh.

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

	2005	2006	2007
OM (MWh/tCO_2)	0,710	0,671	0,675

Table 2.7: OM Emission Factor for 2005 – 2007

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 mean value of the figures between 2005 and 2007 is computed, the OM emission factor is 0,685 tCO_2 / MWh.

STEP 4: Identify the cohort 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:

- The five power plants that have been built most recently, or
- The most recently built power plants with capacity additions to the electricity system that cover 20 percent of the system generation in MWh.

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 156.91 GWh. Such capacity represents approximately 0.09 percent of the overall electricity generation capacity in Turkey which is in the amount of 176.3 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 35.3 TWh which is 20 percent of the overall generation of 176.3 TWh. This approximately matches to last 143 plants.

The table in Appendix 4 displays the details of generation from those 143 plants in specific.

STEP 5: 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:

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

Where:

$EF_{grid, BM, y}$	Build margin CO2 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 annual electricity production and CO2 emission data for each power unit included in the BM calculation. The available data for on plant basis is the name, type, and installed capacity figures of these facilities. Therefore, annual electricity production of these facilities was calculated with the following formula unless the exact production figures are reached. In addition, after 2005, TEIAS had not announced facility specific data. For these years, some facility (which belong to EUAS (State Electricity Production Company)) specific figures were reached through announced figures by EUAS.

$EG_{m,y}$= Full Load Working Hours x 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 higher 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.

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 CO_2 emission factors were estimated from the same factors. Please refer to the Table 2.2 and Table 2.3 for details.

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 2007, 2006, 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 May 3rd, 2003 and December 31st, 2006.

Electricity Production (GWh): Multiplication of running hours and installed capacity for each fuel type for each facility listed in Appendix 4.

The computations display a weighted Build Margin emission factor of 0.605.

STEP 6: 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:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The default values recommended by "Methodological tool (Version 01) Tool to calculate the emission factor for an electricity system" for w_{OM} and w_{BM} for activities other than wind and solar power generation projects are 0.5 and 0.5, respectively.

$$\mathbf{EF_{grid,\,CM,\,y} = 0.685 \times 0.5 + 0.605 \times 0.5}$$

Therefore resulting $EF_{grid,CM,y}$ is 0.645 tCO_2/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. Although the project does not have a reservoir and result in only a small lake which is attached to the regulator of the facility, the proposed calculations were run to prove the fact that the project's emissions can be assumed "0".

The Project emissions are calculated with the formula mentioned in ACM0002/Version10 as:

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

Where:

$PE_{HP,y}$ = Emission from reservoir expressed as tCO2e/year

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year y (CO_2e /MWh)

TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

However, again according to ACM0002 / Version 10 if the power density (PD) of the hydro power plant is above 10 W / m^2 , PEy is 0.

The power density of the project activit is calculated as follows:

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

Where:

PD = Power density of the project activity, in W/m^2

CapPJ = Installed capacity of the hydro power plant after the implementation of the project activity (W)

CapBL = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

APJ = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

ABL = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

CapPJ = 28,780,000 W

CapBL = 0 (Justification: The project is a new hydro power plant)
APJ = 0 m^2 (Justification: The project does not include a reservoir)
ABL = 0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (28,780,000 – 0)/(0 – 0) = ∞

Therefore;

Since the Power Density of the Project is greater than 10 W/m^2 PE_y is 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 (tCO_2e)
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 (tCO_2e/MWh)
y Refers to a given year

EG_y = 76,915 MWh/year

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

Therefore resulting BE_y is 49.610 tCO_2/year

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

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 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 (Akcay 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.

In specific parts of the Aegean region, there is good potential for wind power plants and geothermal plants but realizing projects that fulfil the entire potential of wind and geothermal in the region could not meet the accelerated energy demand in the region. Thus, the policy makers and the investors dare to tap all the renewable energy sources in all areas of the region. In addition to this, wind and geothermal alternatives have strict licensing obligations and needs higher investment amounts for the same output of the planned plant. Thus, Alternative 3 for the region is eliminated.

As mentioned above, the Turkish Electricity Sector is heavily dependent on fossil fuel plants. According to the latest bill that passed in 2001, the public funding in energy investments have stopped. The new bill allows incentives for private sector participation in energy investments. (Electricity Market Law, Law No: 4628, Acceptance Date: 20.02.2001, Appeared in the Gazette on 03.03.2001) 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, Akcay Hes Elektrik Uretim. A.Ş. cannot influence the future fuel mix but can only decide to invest on the project or not. Under these circumstances, the only 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 alternatives discussed above are in line with applicable legal and regulatory requirements.

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. Before the Energy Law, companies had never been responsible for the whole process (planning and financing of the project, choosing the technology and operating of HEPPs) of the investment and had never taken all the risks related to the entire investment process 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.

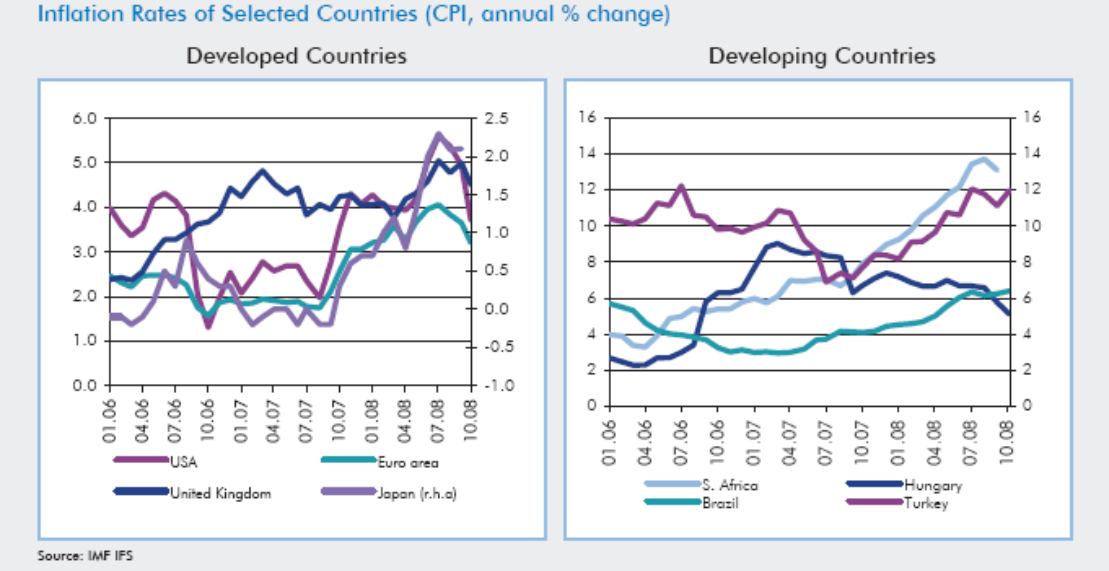
Despite somewhat reasonable figures in the financial feasibility studies, banks and other financial institutions are very cautious in providing loans to these projects for various reasons. When they do, the rates are significantly high due to risk premiums that stem from lack of full confidence in the 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% [33]- 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.

Investment Barriers

Unstable Economic Condition in the Host Country

As a developing country, Turkey has rather achieved rapid growth in recent years. On the other hand, because of it is volatile economic structure, the country was not able to reach a stable level of economic growth. High inflation rates coupled with rapidly changing exchange rates make long-term investments very risky.

High Inflation Rate: As seen below, Turkey's inflation rate between January 2006 and October 2008 is constantly higher not only than the developed countries such as USA and Euro Zone but also than the developing economies such as Brazil and Hungary. [34]



Graph 2.3: Inflation Rates of Selected Countries (CPI, annual % change)

Rapid Changes in the Exchange Rate: The project owner obtained a loan fixed to the USD to use in the construction of the plant, because there has been an encouraging financial

[33] http://analiz.ibsyazilim.com/isapi/AI01/BETA01.asp

34 http://www.tcmb.gov.tr/yeni/eng/ (Financial Stability Report November 2008, Volume 7 / Macroeconomic Developments)

environment to borrow in USD. When the changes in the USD/TL exchange rates for the years 2007 and 2008 are considered, the currency risk is obvious. While the exchange rate has fallen 17.1% from January to December in 2007, it has seen a sharp increase of 30.4% in 2008.

Year	Exchange Rate (USD / TL)		Yearly Fluctuation (%)
	January	December	
2007	1,4056	1,1647	-17,1%
2008	1,1593	1,5123	30,4%
2009	1,5218	1,5466*	1,6%

** Exchange rate on June 22, 2009*

Table 2.8: Changes of USD/TL Exchange rate for years 2007, 2008 and 2009[35]

Consequently, such sharp fluctuations in the exchange rate added extra burden the firm's financial liabilities.

Market Liberalisation and Privatization of Electricity Distribution

The Turkish Market has been going under a liberalization process since the ratification of the "Electricity Market Law" No: 4628 issued in 2001. The related bill targets the privatization of publicly owned electricity assets in production and distribution as well as adopting a liberalization process which would ultimately reach a free market structure which free market rules are working.

However, the process has been so slow to establish the envisaged market structure. The non-existence of an efficient market in the current transition period put a lot of impediments in front of investors who are willing to invest in the Turkish Electricity Market. [36]

The project owners have to bear with enormous uncertainty during the project planning. If the distribution and transmission sides of the market are not regulated properly in the new market structure, the discrimination among companies can lead to unfair competition. [37] . Such uncertainty and risks pose some extra hurdles for the project to access equity and debt financing with reasonable terms and makes the investment decision even more difficult for the investors.

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.

35 http://evds.tcmb.gov.tr/yeni/cbt-uk.html

36 Prof. Dr. I. Yilmaz Aslan, Prof. Dr. Erol Katircioglu, Doc. Dr. Galip Altinay, Av. Sahin Ardiyok, Ali Ilicak, Av. Banı Gultekin, Av. Emre Onal, Av Can Akcaoglu, Enerji Hukuku Cilt 1 Elektrik Piyasasında Rekabet ve Regülasyon, , Page 7 and Page 51 Ekin Basım Yayınevi, 2007.

37 Prof. Dr. I. Yilmaz Aslan, Prof. Dr. Erol Katircioglu, Doc. Dr. Galip Altinay, Av. Sahin Ardiyok, Ali Ilicak, Av. Banı Gultekin, Av. Emre Onal, Av Can Akcaoglu, Enerji Hukuku Cilt 1 Elektrik Piyasasında Rekabet ve Regülasyon, , Page 68 Ekin Basım Yayınevi, 2007.

Also, in the article "Renewable Energy Market Conditions and Barriers in Turkey" Çiçek, Öztürk and Özek explain, "Much of the cost of generating electricity with oil, coal and gas is the cost fuel; this investment is made and recouped in relatively small increments over many years. With renewable technologies, however, the initial capital outlay is large and must be recovered slowly over a period of many years, making it difficult for renewable to attract capital. Thus, investment in renewable energy technologies is discouraged at the outset."(2009, p. 1433) [38]

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

Investment Details (USD)			
	2008	**2009**	**Total**
Civil Works	1.370.000	3.680.000	**5.050.000**
Penstock	1.750.000	1.750.000	**3.500.000**
Electromechanic Equipments	1.841.840	4.856.160	**6.698.000**
Power Transmission Lines	90.000	360.000	**450.000**
Survey, Design And Consulting	280.000	420.000	**700.000**
Insurance Costs	125.000	375.000	**500.000**
Unexpected Construction Costs (%5)	9.000	21.000	**30.000**
Other Costs	68.500	184.000	**252.500**
Total Investment Amount	**5.534.340**	**11.646.160**	**17.180.500**

Table 2.9: Project Budget, 2008

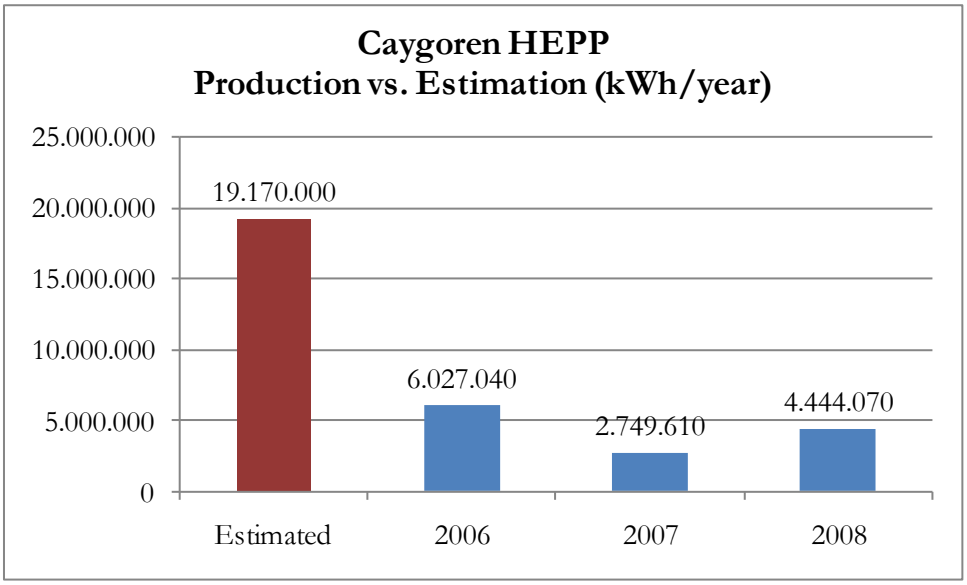
Financing Institution	**Amount (USD)**	**Tenor (Years)**
Bank Asya	13.000.000	1+5
Equity	4850275	n/a
Total	**17.850.275**	

Table 2.10: Project Financing Package

Unsuccessful Previous Investment Due to Drought

Akcay Project is indirectly owned by Enda Group which has other renewable energy investments in the region. The Group had completed the construction of another run-off-river HEPP, namely Caygoren HES, in Balikesir in 2006 which is very close to the project's location. Unfortunately, this investment was proven to be unsuccessful in its first three years of operation due to unexpectedly low production figures despite the fact that the investment is located on the tail water of the Great Caygoren Dam. Caygoren HES had produced only 6,027 MWh in 2006, 2,750 MWh in 2007 and 4,444 MWh in 2008 compared to forecasted production of 19,170 MWh per year.

[38] Çiçek, B. N., Öztürk M. & Özek, N. (2009) *"Renewable Energy Market Conditions and Barriers in Turkey",* Renewable and Sustainable Energy Review, No. 13, pp. 1428 – 1436



Graph 2.3: Electricity production of Caygoren HEPP Actual vs. Estimation

As a natural consequence of considerably low performance of the facility, the project had difficulties in meeting its financial obligations especially to the financier bank. Projects owners had to look for alternative financings to replace the existing loan. All in all, the project became a symbol of what sort of risks hydroelectric power plants have in Turkey. The low performance of Caygoren HEPP and other projects in the region had negative effects on the perception of banks and investors who are willing to invest in the energy field in Turkey. The project could never reach its estimated production figures but was able to restructure its financial obligations after long negotiations with the financier.

All in all, due to bitter experience from another project of the same company, the investor had some doubts whether the project can reach desired performance as projected during the feasibility. Therefore, carbon finance became very important for both financier bank and the investor where it is seen as a buffer to boost the IRR and aid to meet the repayments of the project investment loans.

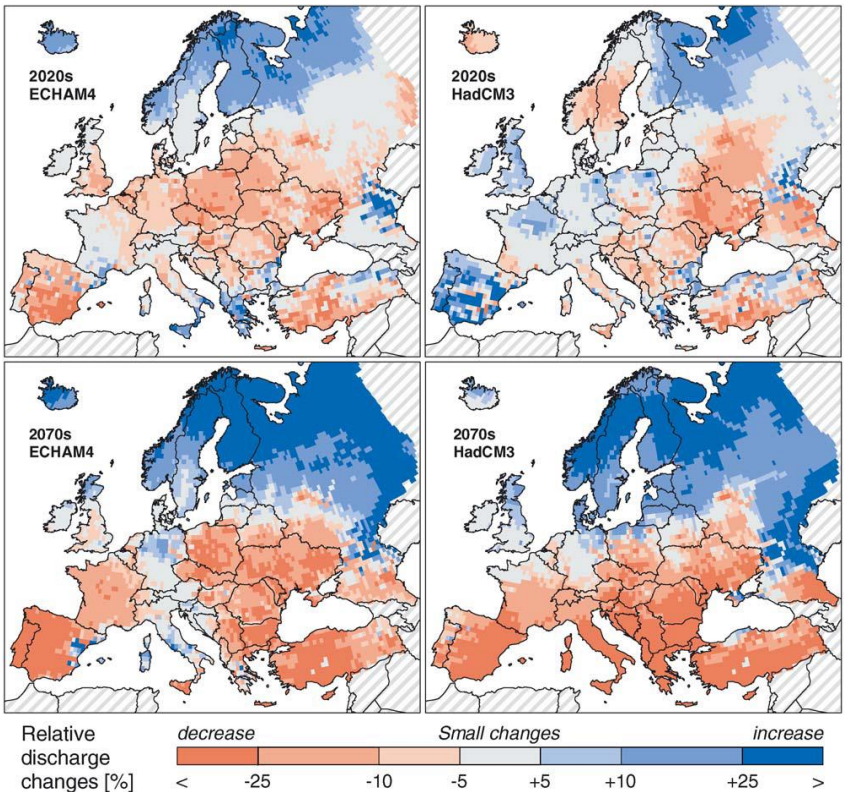
The financier of Caygoren HES refrained from financing the new project and it has become very hard for the project owner to find a new financier due to impression that the region is drought vulnerable. Yet, the project owner managed to raise financing from another Bank by using carbon finance and by offering extra collateral.

To be more specific on the fact that how difficult for Akcay to find financing it is worth to mention the fact that Akcay Hes Elektrik Uretim A.S. prepared a project folder which contains all the documents for the financing of Akcay HEPP and applied to 16 domestic and foreign banks. After that, the project was discussed with the banks by telephone calls and face to face interviews and requested from banks to share their proposals for the financing of the project. However, only 5 of these 16 banks responded the request of the firm by indicating their interest and asking for extra information. After that, only Bank Asya (the financier of the project) and another bank submitted a proposal to the company for the financing of Akcay. However, only Bank Asya, the financier of the project had provided a competitive offer for the project..

Other Barriers

Effect of Climate Change on Water Flow

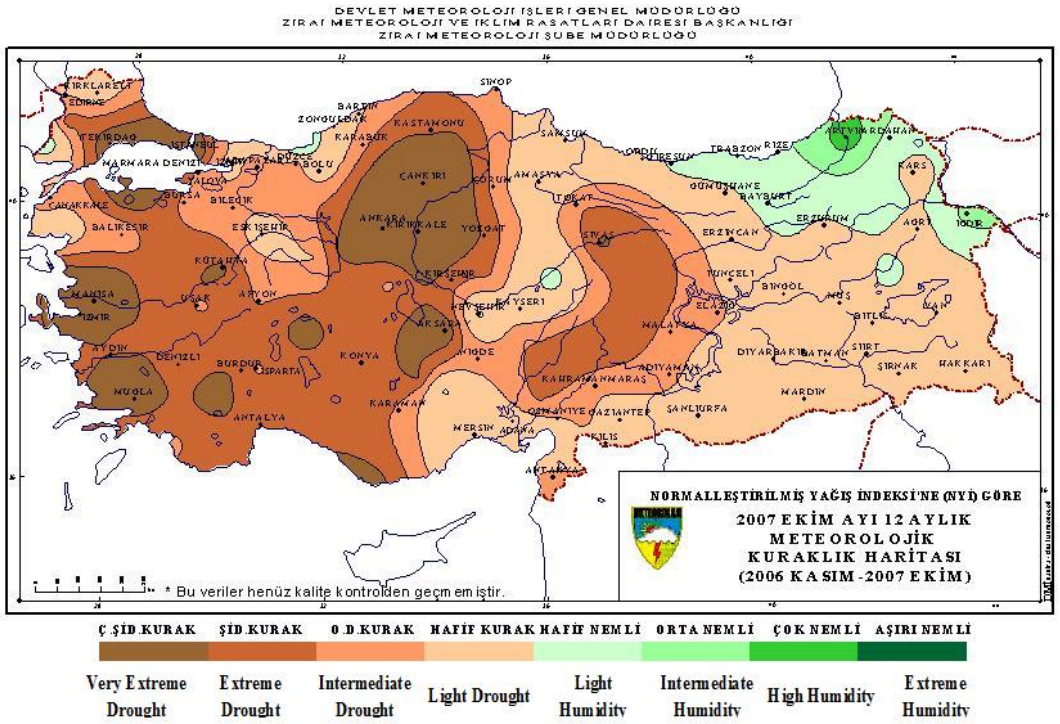
The region in which the project exists is one of the regions which has been affected and will be most affected from Global Warming in Turkey. In fact the underperformance of HEPPs in this region is not something totally unexpected but the experts forecasted a drought in the long run. However, the climate change had showed its negative effects much earlier than expected. As evidenced in Arnell's article "The effect of climate change on hydrological regimes in Europe: a continental perspective"[39] and Lehner, Czisch and Vassolo's article "The impact of global change on the hydropower potential of Europe: a model-based analysis"[40], the global climate change may change the flow regime in Turkey and in especially the regions where Caygoren HEPP and Akcay HEPP are located. Water flows in these regions are projected to decrease from 10% to 25% compared to historical values until 2020.



Picture 2.1: Estimated Flow Volumes Until 2020 and 2070 According to Lehner, Czisch and Vassolo

Also, the drought the project region faced between October 2006 and September 2007 can be seen in the Drought Map of Turkey.

[39] Nigel W. Arnell, Global Environment Change 9 (1999) 5-23
[40] Bernhard Lehner, Gregor Czisch, Sara Vassolo, Energy Policy 33 (2005) 839–855



Picture 2.2: Drought Map of Turkey (October 2006 to September 2007)[41]

In addition, the electricity production figure of the plant totally depends on the water amount Kemer Dam releases. The plant comes after Kemer Dam and the land which benefits from the irrigation channel in using the water of Akcay River first. Considering the fact that both Akcay benefits from the river last and the region has a high drought risk, Akcay HEPP has a significant risk of drought.

Long Waiting Period to start construction of the Plant arising from the Construction of the Irrigation Channel

DSİ (State Hydraulic Works) has been constructing a 5 km channel (Bozdoğan – Akçay Left Coast Main Irrigation Channel) to deliver Akcay water to the land which had significant irrigation problem. According to the channel construction planning, there would be a head load opportunity before releasing the water from channel to the river bed. Therefore, the feasibility of Akçay HEPP was prepared by the company in November 2000 to define if it was feasible to produce electricity from this head load opportunity. After that, the company applied to EPDK (Energy Market Regulatory Agency) to produce electricity using such head load opportunity and obtained the related production license in 24/11/2003. Yet, the construction of the channel took longer than expected because of insufficient allowance and as a result, the construction of the project was delayed. The company exchanged correspondences with DSI (State Hydraulic Works) in years and could never receive a positive answer about the completion of the irrigation channel until 2008. At last, after the construction of the channel was completed the company prepared the last version of the feasibility in May 2008, and the expected energy production decreased approximately 25% (from 94.880 GWh to 76.915 GWh) albeit the company decided to start the construction of the plant. In addition, in order to compensate for the delay of the Bozdoğan – Akçay Left Coast Main Irrigation Channel, the company accelerated the construction process and Akçay HEPP will be commenced in June 2009, in only approximately

[41] http://www.tck.org.tr/files/news_1211140827.jpg

one year, which is half of an average construction period of a HEPP. Under these circumstances, the company had to focus on this project and postpone other projects in its portfolio.

What's more, Akcay HEPP is the only project which is dependent to an irrigation channel construction work in the host country and as a result, the waiting period after the license obtained became too long if it is compared with the similar project activities. The company started the construction works 4.5 years later than they obtained the license. However, most of the hydro projects start the construction works in at most a few years after the licenses are obtained.

Also, thermal power plants do not face such a waiting period arising from this kind of external factors. As a consequence, in comparison to both thermal power plants and similar hydro projects, Akcay HEPP has been exposed to long delay which leads a considerable revenue loss, as the company commenced the plant later than they expected.

All in all, the barriers elaborated above put significant impediments on the realization of the project. Therefore sub-step 3a is satisfied.

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 renewable energy projects in general and to HEPPs in particular. They do not apply to thermal power plants (Alternative 1). The barriers of price cap and market liberalization have not applied to thermal power plants in Turkey because such plants are provided with off-take agreements up to now as part of the incentive mechanism for energy investments. As for side investments that the government refrains from, such as transmission lines do not apply to thermal power plant projects because those plants have higher investment return that encourage the project owner to realize side investments to finish the project as soon as possible. In addition, thermal power plants have an "economies of scale" advantage where the cost of side investments is very small compared to their capital investments. All in all, sub-step 3b is satisfied because the identified barriers do not apply to Alternative 1, therefore, subject to outcome of Common Practice Analysis (Step 4), the project is additional.

Alleviation of Barriers through Carbon Revenue

The positive impact of carbon revenues 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 project activity

Analyzing similar activities in the region that means the same city where the subject project is located, it is seen that there is only one more hydro-power plant project in Aydın. Yet, the other hydropower project in Aydın is only 6.7 MW, less than quarter of the subject project in installed power capacity. Also, the project is already in operation. Because there is no detailed information accessible for the project, it is not possible to compare the projects.

As 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 below[42], the number of projects that are close to completion is very low (only 40 projects out of 407 were completed more than 50% as of now). [43] 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	129
>20% Completed	94
>30% Completed	72
>40% Completed	54
>50% Completed	40
>60% Completed	31
>70% Completed	24

Table 2.11: Number of HEPP facilities completed over a certain completion ratio

In addition, the new capacity from privately owned hydro facilities represents a small fraction 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.teias.gov.tr/ist2007/8.xls
http://www.teias.gov.tr/ist2006/8.xls
http://www.teias.gov.tr/istatistik2005/7.xls
http://www.teias.gov.tr/istat2004/7.xls
http://www.teias.gov.tr/istatistik/7.xls

Table 2.17: Annual privately held hydro projects' capacity additions, total additions and total installed capacity.

[42] *http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm*
[43] *http://www.epdk.gov.tr/lisans/elektrik/proje/yenilenebilir.xls*

All in all, the low rate of completion of the projects and the low contribution privately held hydro projects 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

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

The number of projects developed by the private sector and commenced operation is less than 50. This is far below the 407 licenses outsourced. The projects that came to life so far are those projects with high feasibility and were cherry picked to be realized by strong companies of Turkey that did not face fewer problems in recourse debt financing. Low accomplishment of projects display that most of the remaining license owners face difficult conditions to finish and operate their projects. Thus, those existing HEPPs should not be included in common practice analysis. As a result, no similar options occur because private participation in HEPP business is not common practice in Turkey.

As a summary, one can argue that the commercial risks are significantly high for this project. The significant investment barriers make the investment repelling to the investors due to strain on resources of financing. The recent developments in the financial markets, the credit crunch and the political uncertainty put the project completion in jeopardy. Thus, the presence of carbon finance is a source of relief for the investor to finish the construction of the project timely.

3 Monitoring:

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

The consolidated monitoring methodology for grid connected generation from renewable sources named as "Approved Monitoring Methodology ACM0002 / Version 10 is applied. The monitoring methodology is applicable as the data will be archived electronically and be kept at least for 2 years after the end of the last crediting period. All measurements will be conducted with calibrated measurement equipment according to relevant industry standards.

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

- Akcay 28.78 MW Runoff-River HEPP Project is a grid connected renewable power generation project which adds electricity capacity 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 activity is not implemented in an existing reservoir,
- 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 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 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 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.

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

All relevant baseline emission factors are defined ex-ante. Please see the baseline estimations – Section 2.4- for Operating and Build Margin estimations. Hence, there are three 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. Akcay HEPP is a new power unit which did not replace a fossil fuel plant on the project site. AKCAY 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 third data to be monitored is the reservoir area for HEPP projects in general. However, because the subject project will use the water left from the irrigation channel and it has no reservoir area, this data is not applicable for the project.

The data will be collected and stored by AKCAY not only during the crediting period but also two years after the last issuance of VCUs to Akcay 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.

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	Continiously	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.Cap_{PJ}	Installed capacity of project activity after implementation	Project site	W	m	Yearly	100%	Electronic and paper	

Table 3.1: Data to be monitored and monitoring process

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

Data Parameter	EGfacility,y
Data Unit	MWh
Description	Quantitiy of net electricity delivered to the grid.
Source of Data	Monthly invoice
Measurement Procedures (if any)	MWh
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC Procedures	Double check with the grid operators
Any comment	NA

Data Parameter	CapPJ
Data Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of Data	Project site
Measurement Procedures (if any)	Supplier information on the equipment
Monitoring frequency	Yearly
QA/QC Procedures	Supplier information on the related equipment and existence of the equipment will be checked
Any comment	NA

Table 3.2: Data to be monitored and parameters

3.4 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.
Installed capacity of project activity after implementation	Low	The project's installed capacity is equal to the total installed capacities of the equipment s implemented at the beginning of the project's life. The installed capacity will be monitored from supplier's documents related to the equipments.

Table 3.3: Quality Control of Monitoring

The first data that should be monitored is the amount of electricity (GEN_y) that is annually fed into the grid by the plant. The project owner, Akçay Hes Elektrik Üretim A.Ş., has already signed an agreement with TEIAS that includes measuring the amount of electricity that goes to the system continuously and 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.

The third data to be monitored is the reservoir area for HEPP projects in general. However, because the subject project will use the water left from the irrigation channel and it has no reservoir area, this data is not applicable for the project.

Each monitoring period is planned to last one year. At the end of each period, 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 AKCAY to the purchasers will be cross-checked with metering as well.

The management of AKCAY 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) 212 244 4243
Fax: 0090 (0) 212 244 4245
Email: info@gaiacf.com

Gaia is not a project participant.

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

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"[44] as approved by the CDM Executive Board. Conservative options and data were selected during the implementation of the methodology.

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

Please see section 2.4.

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

The Project emissions are calculated with the formula mentioned in ACM0002 / Version09 as:

$$PE_y = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:
PE_y = Emission from reservoir expressed as tCO_2e/year
EF_{Res} = Is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO_2e /MWh
TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

Since there is no reservoir in the project, the project emissions (PEy) are assumed to be 0 in line with ACM0002 / Version 10 "Project emissions: For most renewable energy project activities, PEy = 0. However, for following categories of project activities, project emissions have to be considered.".

[44] Revised version 9 (give the link)

Anthropogenic emission reduction is a function of the expected net amount of electricity produced, for the given project, which amounts to 76,915 MWh per annum. The annual baseline emissions amount to 49,610 tCO_2e. Over the period of ten years, the total amount of baseline emissions will reach 496,100tCO_2e. For all calculations, the rounded value of the combined emission factor, 0.645 is applied.

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

Not applicable.

5 Environmental Impact:

The domestic law and regulation does not require any environmental impact assessment. According to applicable law, the project owner is required to conduct a pre-assessment where they need to prove that the project site is not particularly sensitive to any environmental and social impact. Such pre-assessment has been conducted and the project has been qualified not to have any further environmental and social assessment. (Please see Annex 6)

The project design identifies and addresses all social and environmental issues. The project pursues a pre-assessment report approved by the Ministry of Environment where all environmental and social concerns were identified through non-formal meetings and hearings with local stakeholders. The pre-assessment report asserted that all issues were taken into consideration in the project design.

6 Stakeholders comments:

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 AKÇAY and relevant contact information was announced in the relevant meetings 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 Osmaniye village, and the officials of Municipality of Nazilli. The project owner 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. Due to the fact that the region is the least developed and most problematic region in terms of geographical conditions, during the construction period, the company helped the residents in the region to mitigate the effects of tough living conditions, as listed above. (Section 1.16)

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.

  Within the context of the project 20 workers were employed from the region. The local workers were given priority during the hiring for plant operation. Also, during the construction, construction machines and equipment have been hired from the vicinity of Nazilli. The project owner has procured the all needs of the construction site from local resources in order to contribute to the local economy of Nazilli, Aydın.

➢The stakeholders asked for assistance for some social needs of Osmaniye and other villages, and the Municipality of Nazilli, the nearest town to the project.

The project owner provided concrete for the construction of village mosque and construction machines to the villagers for their needs. Also, the contributions the company has already provided can be seen in detail under Section 1.17.

7 Schedule:

A revised feasibility study for the project was originally finalized in March 2007. Almost a year then elapsed before the detailed project design work was completed. The search for financing of the project started early April 2007 and it took significant amount of time before the financing package was wrapped up for the project (September 2008).

During the search of financing, the project owner was aware of that GHG emission trade could be an option to straighten the feasibility of the project. The project owner started the construction of the project with the knowledge of carbon finance. The project owner was contacted by the subject asset developer in earlier stages of civil works. The civil works for the project commenced in May 2008, the technical equipment has been contracted in May 2008. The schedule below displays various stages of project activity.

Project Activity	Q107	Q207	Q307	Q407	Q108	Q208	Q308	Q408	Q109	Q209
Revised Feasibility study completed										
Design completed										
GHG emission reduction opportunity identified										
Applications submitted to the Banks										
Banks approve debt facility										
Civil works commenced at site										
Delivery/ installation of the HEPP										
Completion of Grid Connection										
Commissioning/testing of HEPP										
Operation, delivery of power to the national grid.										

Table 7.1: Akcay HEPP Project Schedule

8 Ownership:

8.1 Proof of Title:

Please see Annex 2 for licence.

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

Not applicable.

ANNEX 1
QUALITY OF REDUCTIONS

Compliance with the National Environmental Standards

The Akcay HEPP is located near Akcay Creek. The project is located within the province of Aydin and it is situated in a valley, non- agricultural area. It will be constructed with the aim of utilisation of river for electric energy production. According to the current Turkish legislation, the construction, operation and location of a Akcay HEPP should conform to the environmental protection law and standards. The laws and ordinances to which it should correspond are:

Turkey's environmental legislation[45]

The Environmental Law No. 28721 is the primary legislation governing environmental protection and improvement of the environment, appropriate and efficient use and protection of natural resources and land, the prevention of pollution and the protection and maintenance of wildlife and plantations. On 26 April 2006, Law No. 5491 was passed; revising, modernizing and expanding the Environmental Law (**"Revised Environmental Law"**). While keeping the general outline and spirit of the original law, the Revised Environmental Law is more specific on various issues and embraces a more modern perspective regarding environmental issues, with a view to draw level with EU legislation.

Core Principles and Purpose

The Revised Environmental Law introduces two principles as the main purpose of this law, namely a sustainable environment and sustainable development. The sustainable environment principle is defined as the *"improvement, protection, and development of all environmental assets that constitute the environment of the present and future generation in every (social, economical, physical, etc.) way without endangering the existence and quality of the resources that will be needed by future generations."* Similarly, the sustainable development principle is defined as the *"development and growth based on the principle of establishing balance between the environmental, economical, and social targets, which ensure that future generations shall live in a healthy environment."*

The expansion of the Revised Environmental Law's definition section is noteworthy, not only due to its inclusion of these two core principles, but also due to its definitive coverage of various concepts and entities new to the Turkish environmental legislation, such as 'biological diversity', 'ecological balance', 'sensitive lands', 'environmental management' and 'non-ionizing radiation'.

The High Council and the Ministry

The High Council of Environment, members of which shall be appointed by the Prime Minister from amongst the Council of Ministers and shall be chaired by him, has replaced the former Central Environmental Council. The High Council of Environment is responsible for, and authorized to, among others, (i) determining the targets, policies and strategies to be implemented to ensure an efficient environmental management; (ii) adopting legal and administrative measures that enable environmental issues to be considered with respect to economical decisions under the sustainable development principle; and (iii) resolving disputes on environmental issues concerning different ministries. The Ministry of Environment and

45 Published in the Official Gazette dated 11 August 1983 and numbered 18132.

Forestry (**"Ministry"**) is the sole body authorized to inspect compliance with the provisions of the New Environmental Law. The Ministry may delegate this duty to the relevant City Private Administration, municipalities that established environmental management units, and certain other administrative bodies. The Ministry is also in charge of implementing all types of legal, technical, fiscal, and administrative measures to comply with national obligations that arise due to ratification of international treaties on the environment.

Protection of the Environment

Turkish law prohibits the direct or indirect release, storage, transportation and dislodgement of any type of waste or residue in a manner that may harm the environment. Entities falling within the scope of the relevant prohibitions, are obligated to take preventive measures if there is a possibility of pollution; to stop pollution; and to lessen or restore its impact on the environment if pollution has taken place. The Ministry shall procure and implement country-wide zoning plans on the scale of 1/50,000 and 1/100,000 to prevent environmental pollution that may arise due to meeting various needs of urban and rural populations.

The protection of biological diversity and ecological balance are essential. Commercial activities regarding endangered fauna and flora as well as rare species, unless otherwise allowed by legislation, are prohibited. Similarly, marine fish farms cannot be established either in any closed coves bearing a sensitive-lands quality or within natural and archeologically protected areas. All types of resources, income, fees and fines that are collected and gained within the framework of environmental legislation shall be allotted towards environmental matters before all else.

Hazardous Chemicals and Wastes

Importing hazardous wastes into Turkey is strictly prohibited by the Revised Environmental Law and stringent provisions regarding the handling, production, storage, transportation, annihilation of hazardous chemicals and wastes are also introduced. Entities that produce, sell, store, use or transport hazardous chemicals; or those that collect, transport, store, recycle, re-use or annihilate hazardous wastes are severally liable in respect of various obligations for different types of wastes, as detailed in the Revised Environmental Law. For example, such entities must procure *"hazardous chemicals and wastes financial obligation insurance"* and obtain the Ministry's permission before commencing their operations.

Shutting Down Operations, New Administrative Fines, Criminal Behaviours

One of the most significant aspects of the Revised Environmental Law is the strict application with regard to doling out penalties and fines, which previously were often deserved but rarely applied. The Revised Environmental Law provides that, should the activities of any persons or entities be found to be in violation of the applicable environmental regulations, the Ministry[46], in its sole discretion, may grant such persons or entities a one-time-only grace period of less than one year. When a grace period has not been granted, the operations of such violating-party shall be immediately shut down; whereas when a grace period has been granted, operations shall be shut down if such violation has not been rectified at the end of such period.

Another equally important aspect of the Revised Environmental Law is the significant increase of administrative fines. For instance, those who produce, sell, store, use or transport hazardous chemicals or who collect, transport, store, recycle, re-use or annihilate hazardous wastes in violation of the relevant legislation, are subject to administrative fines ranging between 100.000 YTL and 1.000.000 YTL (approximately €75,000 and €500,000, respectively).

46 Or the authorized bodies to whom the Ministry's inspection authority has been delegated.

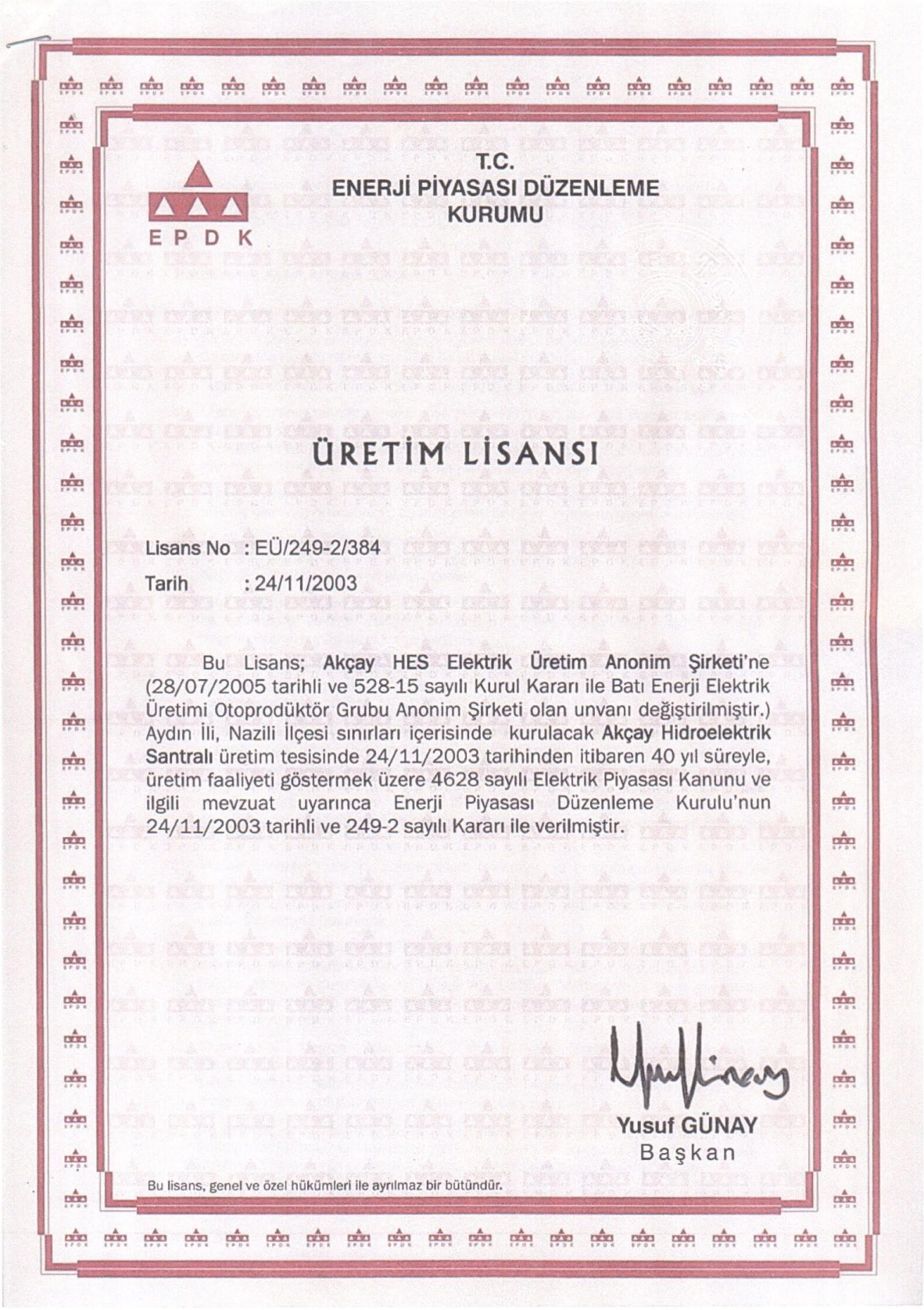
A penalty of between six months and one year of imprisonment may be imposed on those who provide wrong or misleading information regarding environmental matters, in violation of the obligation to notify and provide information. The provisions of the (New) Turkish Criminal Code regarding "counterfeiting documents" shall be applicable to those who issue false or misleading documents in matters regarding the application of the Revised Environmental Law. Further, the provisions of the (New) Turkish Criminal Code, regarding intentional and negligent pollution of the environment, imposing monetary as well as imprisonment penalties, shall come into effect on 12 October 2006.

Financial Incentives

The Revised Environmental Law sets forth financial and fiscal incentives for activities focused upon the prevention and restoration of environmental pollution. Persons and entities that establish and operate treatment facilities and meet their various obligations under relevant regulations may receive a credit of up to 50% of their energy costs.

ANNEX 2

Proof of Title



T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

EPDK

ÜRETİM LİSANSI

Lisans No : EÜ/249-2/384

Tarih : 24/11/2003

Bu Lisans; **Akçay HES Elektrik Üretim Anonim Şirketi**'ne (28/07/2005 tarihli ve 528-15 sayılı Kurul Kararı ile Batı Enerji Elektrik Üretimi Otoprodüktör Grubu Anonim Şirketi olan unvanı değiştirilmiştir.) Aydın İli, Nazili İlçesi sınırları içerisinde kurulacak **Akçay Hidroelektrik Santralı** üretim tesisinde 24/11/2003 tarihinden itibaren 40 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 24/11/2003 tarihli ve 249-2 sayılı Kararı ile verilmiştir.

Yusuf GÜNAY
Başkan

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

ANNEX 3
Details of OM Calculation

Fuel consumption		2002	2003	2004	2005	2006	2007	2002	2003	2004	2005	2006	2007
		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	1.816.383	1.758.160	1.560.917	1.885.695	2.205.721	2.402.172
	lignite	262.738	208.875	200.912	227.624	293.357	358.729	26.589.131	21.138.177	20.332.292	23.035.524	29.687.679	36.303.396
	fuel oil	23.044	12.766	9.906	14.763	16.684	28.860	1.782.849	987.628	766.392	1.142.138	1.290.816	2.232.772
	diesel oil	3.437	515	1.168	1.197	2.294	2.152	254.594	38.143	86.519	88.689	169.936	159.393
	natural gas	170.168	84.377	51.108	74.500	110.318	170.189	9.546.442	4.733.526	2.867.174	4.179.445	6.188.839	9.547.616
Autoproducers													
	hard coal	4.099	3.592	3.555	3.308		109.066	387.754	339.829	336.265	312.896	0	10.317.657
	imported coal	12.799	55.751	82.597	87.856	100.211		1.210.790	5.274.085	7.813.694	8.311.160	9.479.966	0
	lignite	12.975	14.574	15.592	17.178	58.050	61.291	1.313.059	1.474.914	1.577.874	1.738.458	5.874.658	6.202.605
	fuel oil	76.953	79.658	70.171	50.949	49.856	54.052	5.953.627	6.162.878	5.428.878	3.941.767	3.857.225	4.181.791
	diesel oil	50	63	46	21	331	13	3.721	4.652	3.411	1.551	24.498	930
	lpg	440	33	582	595	0	0	27.725	2.112	36.703	37.495	0	0
	naphta	9.852	10.580	9.198	3.676	590	494	722.446	775.870	674.549	269.574	43.292	36.230
	natural gas	124.176	121.409	147.886	110.561	520.164	579.872	6.966.290	6.811.035	8.296.413	6.202.462	29.181.192	32.530.808
Production companies													
	imported coal						0	0	0	0	0	0	0
	fuel oil	0	1.440	4.660	7.155	0	0	0	111.428	360.522	553.577	0	0
	diesel oil	21	4	0	0	0	0	1.551	310	0	0	0	0
	naphta	0	0	0	71	0	0	0	0	0	5.220	0	0
	natural gas	127.333	263.320	292.804	402.557	0	0	7.143.390	14.772.275	16.426.296	22.583.427	0	0
Mobile													
	fuel oil	27.344	20.787	11.062	7.586	3.668	6.829	2.115.513	1.608.257	855.793	586.941	283.753	528.311
	diesel oil	670	0	0	0	0	0	49.616	0	0	0	0	0
TOOR													
	lignite	42.161	42.860	38.967	42.048	0	0	4.266.701	4.337.459	3.943.415	4.255.261	0	0
	fuel oil	356	251	188	197	0	0	27.533	19.435	14.576	15.224	0	0
	diesel oil	38	29	21	0	0	0	2.791	2.171	1.551	0	0	0
		917.855	939.472	956.922	1.071.775	1.178.840	1.396.938	70.181.906	70.352.345	71.383.233	79.146.505	88.287.575	104.443.682

	GJ/t			kg C/GJ			efficiency of oxidation
	min	mid	max	min	mid*	max	
hard coal	19,9	25,8	30,5	24,4	25,8	27,2	1
lignite	5,5	11,9	21,6	24,8	27,6	31,3	1
fuel oil	39,8	40,4	41,7	20,6	21,1	21,5	1
diesel oil	41,4	43	43,3	19,8	20,2	20,4	1
natural gas	46,5	48	50,4	14,8	15,3	15,9	1
lpg	44,8	47,3	52,2	16,8	17,2	17,9	1
naphta	41,8	44,5	46,5	18,9	20,0	20,9	1

**: The carbon emission figures are exactly the same figures which are used in Turkey's "National Inventory Submissions 2008" document to UNFCCC.*
The document can be accesses via http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr_2008_crf_21may.zip
Please see TUR-2008-2006-v1.1xls, sheet Table 1.A(b), column N

ANNEX 4

Recently Commissioned Power Plants

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Load Factor	Energy Production (MWh)	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficiency	BM Emission Factor tCO2/MWh	CO_2 (tons)
2007 New Facilities - NG[6]	N.GAS	ANG	635,56	2007	6.202	3.941,8	54,3	0,20	44,9%	0,43	1.712,2
2007 New Facilities - Wind	WIND	AR	87,30	2007	4.066	354,9	-	-	na	-	0,0
2007 New Facilities - EUAS Hydro[1]	HYDRO	EH	300,60	2007		565,2	-	-	na	-	0,0
2007 New Facilities - IPP Hydro	HYDRO	AH	36,10	2007	2.615	94,4	-	-	na	-	0,0
2006 New Facilities - EUAS[2]	LIGNITE	EL	1.080,00	2006		4.611,6	90,9	0,33	35,1%	0,93	4.298,0
2006 New Facilities - NG[6]	N.GAS	ANG	533,30	2006	6.202	3.307,6	54,3	0,20	44,9%	0,43	1.436,7
2006 New Facilities - Wind	WIND	AR	46,80	2006	4.066	190,3	-	-	na	-	0,0
2006 New Facilities - EUAS Hydro[3]	HYDRO	EH	52,10	2006	3.121	162,6	-	-	na	-	0,0
2006 New Facilities - IPP Hydro	HYDRO	AH	105,38	2006	2.615	275,5	-	-	na	-	0,0
BOSEN GR-III	N.GAS	ANG	51,02	30.12.2005	6.202	316,4	54,3	0,20	44,9%	0,43	137,4
KARKEY	F.OIL	AF	6,75	23.12.2005	4.046	27,3	75,5	0,27	21,6%	1,26	34,4
AKÇA ENERJİ GR-III	N.GAS+NAPHTHA	ANG	8,73	14.12.2005	6.202	54,1	54,3	0,20	44,9%	0,43	23,5
KAHRAMANMARAŞ KAĞIT GR-I	IMPORTED COAL	AHC	6,00	08.12.2005	7.268	43,6	88,7	0,32	44,1%	0,72	31,6
PAK GIDA	N.GAS	ANG	5,67	07.12.2005	6.202	35,2	54,3	0,20	44,9%	0,43	15,3
KORUMA KLOR GR I-II-III	N.GAS	ANG	9,60	03.12.2005	6.202	59,5	54,3	0,20	44,9%	0,43	25,9
İÇDAŞ ÇELİK GR-I	IMPORTED COAL	AHC	135,00	30.11.2005	7.268	981,1	88,7	0,32	44,1%	0,72	710,8
KÜÇÜKÇALIK TEKSTİL GR I-II-III-IV	N.GAS	ANG	8,00	27.11.2005	6.202	49,6	54,3	0,20	44,9%	0,43	21,6
ZORLU ENERJİ YALOVA GR I-II	N.GAS	ANG	15,93	26.11.2005	6.202	98,8	54,3	0,20	44,9%	0,43	42,9
HABAŞ ALİAĞA GR-V	N.GAS	ANG	23,00	24.11.2005	6.202	142,7	54,3	0,20	44,9%	0,43	62,0
GRANİSER GRANİT GR-I	N.GAS	ANG	5,50	14.11.2005	6.202	34,1	54,3	0,20	44,9%	0,43	14,8
AK ENERJİ(K.paşa) GR- III	N.GAS	ANG	40,00	09.11.2005	6.202	248,1	54,3	0,20	44,9%	0,43	107,8
ZORLU ENERJİ KAYSERİ GR-IV	N.GAS	ANG	38,63	26.10.2005	6.202	239,6	54,3	0,20	44,9%	0,43	104,1
ALTEK ALARKO GR I-II	N.GAS	ANG	60,10	14.10.2005	6.202	372,8	54,3	0,20	44,9%	0,43	161,9
AYKA TEKSTİL GR-I	N.GAS	ANG	5,50	24.09.2005	6.202	34,1	54,3	0,20	44,9%	0,43	14,8
HABAŞ ALİAĞA GR IV	N.GAS	ANG	44,62	21.09.2005	6.202	276,7	54,3	0,20	44,9%	0,43	120,2
EVYAP GR I-II	N.GAS	ANG	5,12	27.08.2005	6.202	31,8	54,3	0,20	44,9%	0,43	13,8
ÇEBİ ENERJİ BT	N.GAS	ANG	21,00	27.08.2005	6.202	130,2	54,3	0,20	44,9%	0,43	56,6
ORS RULMAN	N.GAS	ANG	12,42	25.08.2005	6.202	77,0	54,3	0,20	44,9%	0,43	33,5
CAN ENERJİ GR-I	N.GAS	ANG	3,90	25.08.2005	6.202	24,2	54,3	0,20	44,9%	0,43	10,5
NOREN ENERJİ GR-I	N.GAS	ANG	8,73	24.08.2005	6.202	54,1	54,3	0,20	44,9%	0,43	23,5
ÇEBİ ENERJİ GT	N.GAS	ANG	43,37	23.08.2005	6.202	269,0	54,3	0,20	44,9%	0,43	116,8
MOSB GR I-II-III-IV-V-VI-VII	N.GAS	ANG	84,83	01.08.2005	6.202	526,2	54,3	0,20	44,9%	0,43	228,5
YAMULA GRUP I-II	HYDRO	EH	100,00	31.07.2005	3.121	312,1	-	-	na	-	0,0
ZORLU ENERJİ KAYSERİ GR-I-II-III	N.GAS	ANG	149,87	22.07.2005	6.202	929,5	54,3	0,20	44,9%	0,43	403,7
BEREKET EN.	HYDRO	AH	7,50	16.07.2005	2.615	19,6	-	-	na	-	0,0
ETİ MAD.(BAN.ASİT)GR-I	ENEW.+WASTES	AR	11,50	15.07.2005	4.066	46,8	-	-	na	-	0,0
ZEYNEP GİYİM SAN. GR-I	N.GAS	ANG	1,17	07.07.2005	6.202	7,2	54,3	0,20	44,9%	0,43	3,1
KARKEY	F.OIL	AF	6,15	30.06.2005	4.046	24,9	75,5	0,27	21,6%	1,26	31,4
AKBAŞLAR GR-II(İZOLE)	N.GAS	ANG	9,00	24.06.2005	6.202	55,8	54,3	0,20	44,9%	0,43	24,2
MODERN ENERJİ GR-II	N.GAS	ANG	7,68	14.06.2005	6.202	47,6	54,3	0,20	44,9%	0,43	20,7
MODERN ENERJİ GR-III	N.GAS+LPG	ANG	8,38	14.06.2005	6.202	52,0	54,3	0,20	44,9%	0,43	22,6
MURATLI GR I-II	HYDRO	AH	115,00	03.06.2005	2.615	300,7	-	-	na	-	0,0
HABAŞ ALİAĞA GR III	N.GAS	ANG	44,62	02.06.2005	6.202	276,7	54,3	0,20	44,9%	0,43	120,2
HAYAT KAĞIT GR-I	N.GAS	ANG	7,53	27.05.2005	6.202	46,7	54,3	0,20	44,9%	0,43	20,3
TEZCAN GALVANİZ GR I-II	N.GAS	ANG	3,66	27.05.2005	6.202	22,7	54,3	0,20	44,9%	0,43	9,9
YONGAPAN(KAST.ENTG) GR-II	N.GAS	ANG	5,20	25.05.2005	6.202	32,3	54,3	0,20	44,9%	0,43	14,0
NUH ENERJİ-2 GR I	N.GAS	ANG	46,95	24.05.2005	6.202	291,2	54,3	0,20	44,9%	0,43	126,5
İÇTAŞ ENERJİ GR I-II	HYDRO	AH	14,19	22.05.2005	2.615	37,1	-	-	na	-	0,0
AK ENERJİ(K.paşa) GR I-II	N.GAS	ANG	87,20	30.04.2005	6.202	540,8	54,3	0,20	44,9%	0,43	234,9
TEKTUĞ GR I-II	HYDRO	AH	23,90	25.04.2005	2.615	62,5	-	-	na	-	0,0
SUNJÜT(RES) GR I-II	WIND	AR	1,20	23.04.2005	4.066	4,9	-	-	na	-	0,0
KAREGE GR IV-V	N.GAS	ANG	18,06	07.04.2005	6.202	112,0	54,3	0,20	44,9%	0,43	48,7
BİS ENERJİ GR VII	N.GAS	ANG	43,70	18.03.2005	6.202	271,0	54,3	0,20	44,9%	0,43	117,7
EÜAŞ[4]	LIGNITE	EL	160,00	15.03.2005		1.025,3	90,9	0,33	35,1%	0,93	955,6
EÜAŞ[4]	LIGNITE	EL	160,00	15.02.2005		1.025,3	90,9	0,33	35,1%	0,93	955,6
EÜAŞ[5]	LIGNITE	EL	360,00	15.02.2005		1.537,2	90,9	0,33	35,1%	0,93	1.432,7
ENTEK ELK.A.Ş.KOÇ ÜNİ.GR I-II	N.GAS	ANG	2,33	07.02.2005	6.202	14,5	54,3	0,20	44,9%	0,43	6,3
BAYDEMİRLER GR IV-V-VI	N.GAS	ANG	6,21	04.02.2005	6.202	38,5	54,3	0,20	44,9%	0,43	16,7
MERCEDES BENZ TURK GR I-II-III-IV	N.GAS	ANG	8,28	04.02.2005	6.202	51,4	54,3	0,20	44,9%	0,43	22,3
METEM ENERJİ GR I-II	N.GAS	ANG	7,83	29.01.2005	6.202	48,6	54,3	0,20	44,9%	0,43	21,1
METEM ENERJİ GR I-II-III	N.GAS	ANG	11,75	29.01.2005	6.202	72,9	54,3	0,20	44,9%	0,43	31,6
ÇUMRA ŞEKER	N.GAS	ANG	16,00	01.01.2005	6.202	99,2	54,3	0,20	44,9%	0,43	43,1
ALTINMARKA GIDA GR I-II-III	N.GAS	ANG	3,60	17.12.2004	6.202	22,3	54,3	0,20	44,9%	0,43	9,7
KARKEY-II 3+3 DGM	FUEL-OIL	AF	54,30	12.11.2004	4.046	219,7	75,5	0,27	21,6%	1,26	276,9
STANDART PROFİL 3 GM	N.GAS	ANG	6,74	22.10.2004	6.202	41,8	54,3	0,20	44,9%	0,43	18,2
HABAŞ ALİAĞA GRUP I-II	N.GAS	ANG	89,23	08.10.2004	6.202	553,4	54,3	0,20	44,9%	0,43	240,4
AYEN OSTİM ENERJİ ÜRETİM(BT)	N.GAS	ANG	9,89	01.10.2004	6.202	61,3	54,3	0,20	44,9%	0,43	26,6
KOMBASSAN KAĞ. MATBAA GIDA	N.GAS	ANG	5,50	24.09.2004	6.202	34,1	54,3	0,20	44,9%	0,43	14,8
BEREKET EN.(Feslek Hes) Gr-1-2	HYDRO	AH	9,48	05.08.2004	2.615	24,8	-	-	na	-	0,0
ÇELİK ENERJİ ÜR.ŞTİ. 2 GM	N.GAS	ANG	2,42	09.07.2004	6.202	15,0	54,3	0,20	44,9%	0,43	6,5
BESLER GR-2, BT (5,2+7,5)	N.GAS	ANG	12,70	07.07.2004	6.202	78,8	54,3	0,20	44,9%	0,43	34,2
ŞAHİNLER ENERJİ 1 GM	N.GAS	ANG	3,20	29.06.2004	6.202	19,8	54,3	0,20	44,9%	0,43	8,6
ENERJİ-SA ADANA 1 BT	NAPHTA	AN	49,77	23.06.2004	4.440	221,0	69,3	0,25	32,5%	0,77	169,5
BİS ENERJİ 2 GT	N.GAS	ANG	73,04	16.06.2004	6.202	453,0	54,3	0,20	44,9%	0,43	196,8
AYEN OSTİM ENERJİ ÜRETİM	N.GAS	ANG	31,08	11.06.2004	6.202	192,7	54,3	0,20	44,9%	0,43	83,7
KOMBASSAN KAĞIT GIDA VE TEKS	N.GAS	ANG	5,50	09.06.2004	6.202	34,1	54,3	0,20	44,9%	0,43	14,8
GÜL ENERJİ GR-II	FUEL-OIL	AF	12,50	03.06.2004	4.046	50,6	75,5	0,27	21,6%	1,26	63,7
TEKBOY TEKSTİL 1 GM	N.GAS	ANG	2,25	18.05.2004	6.202	13,9	54,3	0,20	44,9%	0,43	6,1
ÇOLAKOĞLU(KAPASİTE ARTIRIMI)	IMPORTED COAL	AHC	45,00	05.05.2004	7.268	327,0	88,7	0,32	44,1%	0,72	236,9
İSKUR TEKSTİL(SÜLEYMANLI) GR I-II	HYDRO	AR	4,60	28.04.2004	4.066	18,7	-	-	na	-	0,0
ELTA ELK(DODURGA) GR-I-II-III-IV	HYDRO	AR	4,14	26.04.2004	4.066	16,8	-	-	na	-	0,0
TANRIVERDİ 4 GM	N.GAS	ANG	4,66	24.03.2004	6.202	28,9	54,3	0,20	44,9%	0,43	12,6
ERE(BİR KAPILI HES) GRUP-I	HYDRO	AR	48,50	11.03.2004	4.066	197,2	-	-	na	-	0,0
ATATEKS 2 GM	N.GAS	ANG	5,63	20.02.2004	6.202	34,9	54,3	0,20	44,9%	0,43	15,2
ENTEK GR-IV	N.GAS+NAPHTA	ANG	31,13	12.02.2004	6.202	193,1	54,3	0,20	44,9%	0,43	83,9
ANKARA D.G.(BAYMİNA) GR-I-II-III	N.GAS	ANG	798,00	08.01.2004	6.202	4.949,3	54,3	0,20	44,9%	0,43	2.149,8
Bahariye Mensucat (Isolated)	N.GAS	ANG	1,00	01.01.2004	6.202	6,2	54,3	0,20	44,9%	0,43	2,7
Mercan Gr I-II-III	HYDRO	AH	19,10	25.12.2003	2.615	49,9	-	-	na	-	0,0
Kürtün Gr-II	HYDRO	AH	42,50	18.12.2003	2.615	111,1	-	-	na	-	0,0
Batman Gr II-IV	HYDRO	AH	70,00	09.12.2003	2.615	183,0	-	-	na	-	0,0
Iskenderun (Øsken) Gr I-II	IMPORTED COAL	AHC	1.320,00	23.11.2003	7.268	9.593,5	88,7	0,32	44,1%	0,72	6.949,8
TOTAL						**42.783,4**					**24.863,1**
Net Electricity Production						**41.101,3**			**BM Emission Factor :**		**0,605**

1: Borcka HEPP of EUAS. The electricity production figure is provided from http://www.teias.gov.tr/ist2007/1011.xls. Accesed on 9 April 2009

2: Afsin Elbistan Power Plant of EUAS which is fueled with lignite. The electricity production figures are provided from http://www.teias.gov.tr/ist2007/9.xls. Accesed on 9 April 2009

3: Sanliurfa HEPP of EUAS. The electricity production figure is provided from http://www.teias.gov.tr/ist2007/1011.xls. Accesed on 9 April 2010

4:Can Power Plant of EUAS which is fueled with lignite. The electricity production figures are provided from http://www.teias.gov.tr/ist2007/9.xls. Accesed on 9 April 2009

5: Afsin Elbistan Power Plant of EUAS which is fueled with lignite. The electricity production figures are provided from http://www.teias.gov.tr/ist2007/9.xls. Accesed on 9 April 2009

6: The TEIAS data does not provide facility specific information. To be on the conservative side, all facilities assummed to be natural gas fired unless other information is provided.

*: 1 Terrajoule = 278 MWh

http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_8x_Ch8_An1_Units_Index.pdf

ANNEX 5

Average Monthly Water Flow and Theoretical Net Electricity Production of the Plant based on Average Monthly Water Flow

Average Monthly Flow Volume (m³/sec.)

Year / Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
1993	0,00	0,00	0,00	1,67	3,25	12,41	36,00	28,24	12,08	3,46	0,00	0,00
1994	0,00	0,00	0,00	0,00	4,55	6,51	36,00	24,78	0,31	2,60	0,00	0,00
1995	0,00	0,00	5,26	16,72	8,20	17,59	36,00	34,27	7,40	1,79	0,00	0,00
1996	0,00	10,54	22,29	10,85	8,43	20,54	36,00	32,94	3,79	0,24	0,00	0,00
1997	0,00	0,00	0,00	2,85	14,36	14,28	36,00	36,00	12,87	0,90	0,00	0,00
1998	0,00	0,00	7,69	15,45	13,03	8,41	36,00	36,00	14,31	3,43	0,39	0,00
1999	0,63	40,00	40,00	28,92	10,74	11,36	36,00	32,65	12,48	4,06	0,00	0,00
2000	0,00	0,00	0,00	1,25	9,82	21,33	36,00	31,70	10,71	0,15	0,00	0,00
2001	0,00	0,00	0,00	0,00	4,30	13,13	29,58	18,88	6,61	0,00	0,00	0,00
2002	14,86	1,16	0,00	15,02	8,77	16,41	34,24	33,51	5,36	2,39	0,00	0,00
2003	34,31	40,00	32,78	23,25	12,61	38,80	36,00	36,00	10,51	2,00	0,00	0,00
2004	18,93	40,00	5,53	12,33	8,27	20,08	36,00	36,00	8,05	1,49	0,00	0,00
2005	0,00	0,00	0,00	3,44	8,90	18,90	29,39	24,15	10,64	0,00	0,00	0,04
2006	16,4	33,7	38,9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Avg	**0,09**	**11,82**	**10,89**	**10,14**	**8,86**	**16,90**	**34,86**	**31,16**	**8,86**	**1,73**	**0,03**	**0,00**

Annual Electricity Generation (GWh)

Year / Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1993	0,00	0,00	0,00	953,02	1914,77	7041,02	20424,65	15733,08	7086,94	2039,61	0,00	0,00	**55.193**
1994	0,00	0,00	0,00	0,00	2679,98	3703,43	20424,65	13879,19	183,57	1529,94	0,00	0,00	**42.401**
1995	0,00	0,00	3097,61	9455,77	4821,52	9936,98	20424,65	18884,36	4348,05	1055,23	0,00	0,00	**72.024**
1996	0,00	5588,88	12941,77	6165,22	4951,57	11567,08	20424,65	18197,36	2229,64	140,71	0,00	0,00	**82.207**
1997	0,00	0,00	0,00	1625,50	8407,01	8090,17	20424,65	19765,80	7544,30	527,65	0,00	0,00	**66.385**
1998	0,00	0,00	4521,57	8742,90	7634,57	4782,22	20424,65	19765,80	8380,69	2022,04	219,86	0,00	**76.494**
1999	373,76	20315,46	22492,12	16094,07	6305,15	6450,15	20424,65	18049,41	7315,72	2390,97	0,00	0,00	**120.211**
2000	0,00	0,00	0,00	710,12	5768,05	11998,96	20424,65	17554,38	6284,80	87,94	0,00	0,00	**62.829**
2001	0,00	0,00	0,00	0,00	2530,73	7446,48	16986,91	10651,81	3886,50	0,00	0,00	0,00	**41.502**
2002	8695,96	615,59	0,00	8504,72	5155,86	9280,66	19497,00	18492,49	3154,92	1406,88	0,00	0,00	**74.804**
2003	19534,35	20315,46	18718,76	13047,90	7395,00	21172,53	20424,65	19765,80	6170,03	1178,32	0,00	0,00	**147.723**
2004	11034,29	20315,46	3251,13	6996,61	4858,68	11314,58	20424,65	19765,80	4732,32	879,39	0,00	0,00	**103.573**
2005	0,00	0,00	0,00	1961,60	5230,11	10663,44	16883,03	13535,81	6246,55	0,00	0,00	21,99	**54.543**
2006	9.600,2	17.365,0	21.912,4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	**48.878**
Avg	**3517,04**	**6036,84**	**6209,67**	**5712,11**	**5204,08**	**9495,98**	**19816,42**	**17233,93**	**5197,23**	**1019,90**	**16,91**	**1,69**	**79.462**

ANNEX 6

T.C.
Çevre ve Orman
Bakanlığı

T.C.
AYDIN VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Belge Tarihi:28.05.2008
Belge No : 2008/22

ÇED GEREKLİ DEĞİLDİR BELGESİ

16 Aralık 2003 tarih ve 25318 Sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 17. Maddesi gereğince, " ***Akçay Hidroelektrik Santrali Projesi*** " projesi hakkında Çevresel Etki Değerlendirmesi Gerekli Değildir kararı verilmiştir.

Mustafa MALAY
VALİ

Proje Sahibi : Akçay HES Elektrik Üretim A.Ş.

Projenin Yeri : Osmaniye Köyü, Bozdoğan –Akçay Havzasının kuzeyinde Talas Tepe Mevkii

Bozdoğan/ AYDIN

Total Power Generated (MW) = 8,78* X Amount of water captured to Headpond (m3/s) X Net Fall (m.) / 1000

*In the formula above, "8,78" is the constant comes from the gravitational acceleration and the efficiency of the equipment

Total Electricity Generated (GWh) = Total Power Generated (MW) X Total Working Hour (sa.)

YIL	AY	YÜKLEME ODASINA ALINAN SU MİKTARI (m^3/s)	YÜKLEME ODASI SU KOTU (m)	KUYRUKSUYU KOTU (m)	BRÜT DÜŞÜ (m)	TOPLAM KAYIP (m)	NET DÜŞÜ (m)	ÜRETİLEN TOPLAM GÜÇ (MW)	ÜRETİLEN ENERJİ (MWh)
1993	OCAK	0,0	149,60	59,18	90,42	0,00	90,42	0,00	0,00
	ŞUBAT	0,0	149,60	59,18	90,42	0,00	90,42	0,00	0,00
	MART	0,0	149,60	59,18	90,42	0,00	90,42	0,00	0,00
	NİSAN	1,7	149,60	59,18	90,42	0,01	90,41	1,32	952,63
	MAYIS	3,3	149,60	59,18	90,42	0,03	90,39	2,57	1913,98
	HAZİRAN	12,4	149,60	59,18	90,42	0,39	90,03	9,78	7038,14
	TEMMUZ	36,0	149,60	59,18	90,42	3,30	87,12	27,44	20416,32
	AĞUSTOS	28,2	149,60	59,18	90,42	2,03	88,39	21,84	16250,88
	EYLÜL	12,1	149,60	59,18	90,42	0,37	90,05	9,52	6855,53
	EKİM	3,5	149,60	59,18	90,42	0,03	90,39	2,74	2038,78
	KASIM	0,0	149,60	59,18	90,42	0,00	90,42	0,00	0,00
	ARALIK	0,0	149,60	59,18	90,42	0,00	90,42	0,00	0,00

ANNEX 8

CONTRACT

This CONTRACT has been concluded between the following Parties:

Akcay HES Elektrik Uretim A.S.

with its registered office at:

1380 Sokak No.:2/1 Alyans Apt. 6/11 35220 Alsancak, Izmir / TURKEY

(hereinafter referred to as "AKCAY" or the "BUYER") of one Party

and

Hangzhou Yatai Hydro Equipment Completing Co., Ltd.

with its registered office at:

122 Xueyuan Road, 310012, Hangzhou / CHINA

(hereinafter referred to as "HANGZHOU YATAI" or the "CONTRACTOR") of the other Party

Dated: May 1, 2008 in Shanghai / CHINA

TABLE OF CONTENTS

The system will be handed over to AKCAY by HANGZHOU YATAI after 72-hour trial run after PAC (provisional acceptance certificate) or acceptance with the Ministry of Energy for each unit of the supply scope under this Contract.

Maximum dimensions and weight of equipment shall be in accordance with the local transportation in Turkey. If not, the necessary action shall be taken to solve this problem under the responsibility of HANGZHOU YATAI.

2.6 The qualities and functions (operation, control, monitoring and maintenance etc.) of these equipment and the systems to be supplied by HANGZHOU YATAI shall be equivalent or better than the other existing 3 HEPPs in the Holding Group of Companies.

3. TECHNICAL SPECIFICATION AND TECHNICAL DOCUMENT

a) HANGZHOU YATAI shall submit for approval within 30-45 days after the starting of this Contract, outline drawings for the equipment under this Contract. Data shall be in sufficient detail to permit civil works contractor to design and detailing of concrete work and reinforcement and the dimensioning of all concrete blockouts required. The drawings shall cover overall dimensions of anchorage and machinery location of field joints, piping layout, location of all required connections, general data regarding items to be embedded in concrete and such other data as requested by AKCAY.

b) All drawings submitted will form a part of this Contract. Mainly the following drawings and documents shall be given by HANGZHOU YATAI in 1 soft copy to AKCAY for examination:

- 3 copies of foundation loads and preliminary drawings for turbines and generators equipment for civil works and design calculations.
- 3 copies of erection instructions before installation.
- 3 copies of factory test reports after completion of the related tests
- 3 copies of operation and maintenance instructions.
- 3 copies of the as-built main drawings.
- Catalogues of standard instrument manufacturers.

c) After receipt of the drawings, AKCAY will comment on drawings as soon as possible and give some suggestions accordingly, as to save the time for equipment production.

d) Any manufacturing work done prior to examination of drawings will be at HANGZHOU YATAI's risk. Examination of HANGZHOU YATAI's drawings by AKCAY shall not be held to relieve HANGZHOU YATAI of any part of obligation to meet all of the requirements of this

Contract or of the responsibility for the correctness of HANGZHOU YATAI's drawings.

e) Upon completion of the work under this Contract, HANGZHOU YATAI shall furnish to AKCAY the following number of copies of each drawing mentioned above which shall conform to equipment as finally installed.

f) Three (3) copies and one CD (software programs and whole compilers shall be suitable for AKCAY to manipulate)

In addition, 3 copies in English of design notes, complete testing reports made in shops and installation instructions and maintenance manuals shall be submitted to AKCAY.

g) Supervision services;

In performance of this Contract, HANGZHOU YATAI shall supply supervision services and training as mentioned as three (3) months in the Schedule of Prices. In case this period is extended for more days with reasons not attributable to HANGZHOU YATAI, the AKCAY shall pay HANGZHOU YATAI USD100 / man x day as the additional allowances. However, this extension shall not exceed 2 months, otherwise the AKCAY shall be obliged to further provide one return-ticket for each engineer or equivalent.

1. Supervision of Erection
2. Supervision of Start-Up & Commissioning, and Draft Tube & Spiral Case Embedded
3. Training for AKCAY personnel

   Detailed supervision program (including quantity and quality of the supervisors, working days and hours, number of trips etc.) shall be prepared and submitted by HANGZHOU YATAI to AKCAY upon request by AKCAY or latest before arrival of the first supervisor to the powerhouse, and the training shall be undertaken after PAC with the Ministry of Energy.
4. Within three (3) weeks at the latest after AKCAY's requirement in writing, supervisor (s) should be ready at job site. For each calendar day of delaying, 20% of man x day price of supervision shall be charged to HANGZHOU YATAI as penalty.
5. Supervisor (s) should sign on daily logbook which will be submitted for AKCAY's approval, as monthly check.
6. Supervisor (s) shall obey the rules of site management and shall not be able to leave jobsite without AKCAY's authorization that shall not be unreasonably withheld.
7. AKCAY may request the replacement of any supervisor if found unsatisfactory during site erection and commissioning.

8. AKCAY will bear the local transport, and accommodation with site conditions (with internet access), food and medical care costs of the supervisors.
9. At least one of the supervisors at site shall be capable of English language in working level in order to communicate AKCAY personnel.

4. PRICE OF CONTRACT

AKCAY shall pay to HANGZHOU YATAI for the scope of work stated in the Schedule of Prices, the following prices in US Dollars:

Equipment FOB Shanghai on board or deck + instruction on installation, testing and commissioning + spare parts: $3,450,000 (in words **US Dollars Three Million Four Hundred and Fifty Thousand only**).

The shipping freight including ocean insurance shall be paid by HANGZHOU YATAI or by AKCAY. If paid by HANGZHOU YATAI, the money required shall be sent to HANGZHOU YATAI one week before the shipping.

The break down of these prices is indicated in the Schedules of Prices.

All the prices are firm, including suitable packing for sea and land transportation and covering the deliveries on the board of vessel FOB Shanghai or other Chinese ports (freight and insurance paid by AKCAY).

The starting date (zero point) of the work under this Contract shall be the day after HANGZHOU YATAI's receipt of deposit USD100,000 from AKCAY as the Commencement Date

5. DUTY OF BOTH PARTIES

5.1 Duties of AKCAY;

a) Payment realization; the payments towards HANGZHOU YATAI shall be made in accordance with the payment conditions stipulated in this Contract.
b) Keep HANGZHOU YATAI regularly informed of work progress and notably of any difficulty that may be encountered by any aspects of the work.

5.2 Duties of HANGZHOU YATAI;

c) Send AKCAY the periodical progress reports or other documentary vouchers relating to the works included in the scope of works such as turbine, generator, governor, inlet valve, excitation device etc. for each month.