Voluntary Carbon Standard

Project Description Template

19 November 2007

December 3rd, 2010

Table of Contents

List of Tables

List of Figures

List of Charts

List of Abbreviations

DSI: General Directorate of State Hydraulic Works
EIE: 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
EUAS: 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
TEIAS: Turkish Electricity Transmission Company
IPCC: Intergovernmental Panel on Climate Change

1 Description of Project:

1.1 Project title:

Grid connected electricity generation from renewable sources:
Uzuncayir 82.0 MW Hydroelectric Power Plant Project, Turkey
(Uzuncayir HEPP, hereafter)

Document Version: 06
Date of Completion: December 3rd, 2010

1.2 Type/Category of the project:

The subject project is not a grouped project. According to domestic regulations, with an installed capacity of 82.0 MWe the Uzuncayir 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 82.0 MWe 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.

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

The project is not a grouped project. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MW. Total installed capacity of the project is 82.0 MWe and the expected electricity generation is 322,000 MWH per annum. The first unit of the project was started to produce electricity on December 2nd, 2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced wit full capacity on 12/04/2010, after the commissioning of the last unit. 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. Therefore, the crediting period starts on December 2nd, 2009. The expected annual electricity output and the estimated emission reduction along the first ten year of crediting are given below.

The expected annual average emission reduction is 151,211 tonnes as stated in Table 1 According to the VCS 2007:1 Guidelines 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 1,000,000 tonnes and more than 5,000 tonnes.

Year	Electricity Output (MWh)	Combined Margin Emission Factor (tCO_2/MWh)	Baseline Emission Reduction (tCO_2)	Project Emissions (tCO_2)	Emission Reduction (tCO_2)
2009	8,528	0.5596	4,772	768	4,005
2010	283,772	0.5596	158,799	25,539	133,259
2011	322,000	0.5596	180,191	28,980	151,211
2012	322,000	0.5596	180,191	28,980	151,211
2013	322,000	0.5596	180,191	28,980	151,211
2014	322,000	0.5596	180,191	28,980	151,211
2015	322,000	0.5596	180,191	28,980	151,211
2016	322,000	0.5596	180,191	28,980	151,211
2017	322,000	0.5596	180,191	28,980	151,211
2018	322,000	0.5596	180,191	28,980	151,211

2019	296,416	0.5596	165,875	26,677	139,197
					1,486,151

Table 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 from reservoirs of hydro power plants are calculated with the formula mentioned in ACM0002/Version 11 as:

$$\mathrm{PE}_{\mathrm{HP},y} = \frac{EF_{\mathrm{Res}} \cdot TEG_y}{1000}$$

Where:
$PE_{HP,y}$ = 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).

The power density of the project activity 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} = 82,000,000
Cap_{BL} = 0 (Justification: The project is a new hydro power plant)
A_{PJ} = 13.43 km^2 (13,430,000)
A_{BL} =0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (82,000,000 – 0) / (13,430,000 – 0) = 6.119 W/m^2

Therefore;

PE_y and LE_y cannot be assumed to be 0. According to ACM0002 Version 11 if the PD is greater than 4 and less than 10 the project emission for hydro plants can be calculated as;

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

Where:
$PE_{HP,y}$ = 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).

Annual $PE_{HP,y}$ calculations can be found in the above Table I.

The theoretical annual average energy production of the facility is based on the water flow data which was collected by "General Directorate of State Hydraulic Works" of Turkey which is the primary executive state agency of Turkey for Nations overall water resources planning, managing, execution and operation and "General Directorate of Electrical Power Resources Survey and Development Administration (EIE)". The water flow data which has been collecting by the EIE AGIs (River Observation Station): Munzur Suyu – Melekbahce (EIE 2133), Munzur Cayi – Gediktasi (EIE 2147), Pulumur Cayi – Pah Koprusu (EIE – 2148) and Munzur Cayi – Miksisag (EIE 2149) were used to calculate the water amount the plant will be able to use. The annual average electricity production figure is based on the theoretical annual production figures with these historical annual water flows.

1.4 A brief description of the project:

Uzuncayir HEPP had originally been developed by DSI (State Water Works). The project's construction was started in 1993 by DSI. By 2005, the project was completed by only 93 percent and 99 percent in terms of investment completion ratio and construction completion ratio, excluding installation of electromechanical equipment, respectively. . However, with the change in government policies in the energy sector, it was decided that the project would be transferred to private sector as the government did not want to invest in the project anymore. Limak Insaat Sanayi and Ticaret A.S. (Limak[1] hereafter) won the tender which was held on 12/09/2006 and took over the project to complete construction works and install electromechanical equipments. In this tender, Limak promised to pay certain fees for water usage privileges and to pay off the amount which had been invested in the project by DSI so far.

Uzuncayir HEPP is located on Munzur river and it is 18 km away from Tunceli city center. The project will have a dam and a 13.4 km^2 reservoir. The project's installed capacity will be 82 MW.

The objective of the project is to generate electricity and supply it into the public grid. Uzuncayir 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 as discussed further below, this project is anticipated to fulfill VCS requirements and qualify for carbon finance. The project has not been rejected by another GHG program before.

There is no public funding available for the project.

[1] The license of the project was first provided to Limak Insaat Sanayi ve Ticaret A.S. in year 2007. But, the license was handed over to Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi which is another subsidiary of Limak Holding. Please see the Proof of title in Annex 2.

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 on February 5, 2009. Yet, in practice, Turkey will not commit to a cap on its greenhouse gas emissions and will not be a host for Clean Development Mechanism (CDM) or Joint Implementation (JI) projects until the end of 2012, because of its particular situation (Please see the final report of COP-7, Marrakesh)[2]. 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 Eastern Anatolia Region of Turkey, within the province of Tunceli. The project is on the Munzur River. The altitude is 845 m at power house location. There is not any Nature Park, Natural Site Area or Protected Area at the project location. On the other hand, although Munzur Nature Park is close to the project, none of the sections of the Munzur Nature Park is included in the project area. The project site had been vacant as the project is a new power unit and it did not replace an old plant.

The project is located between the latitudes 39° 06'-39° 58'and longitudes 39° 28'-39° 36'.

[2] http://ec.europa.eu/environment/climat/pdf/marrakech_report.pdf

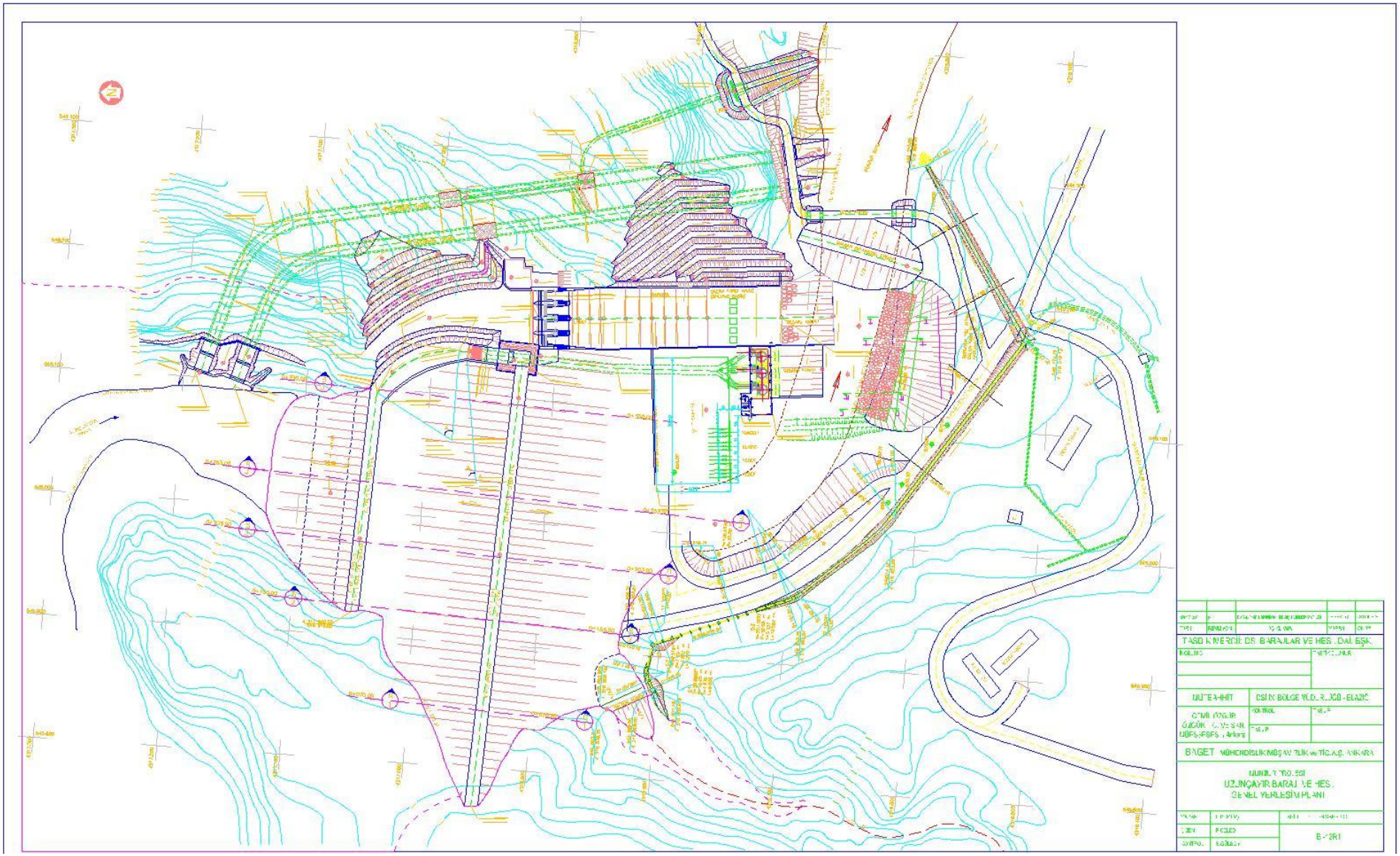

Figure 1: Site Layout

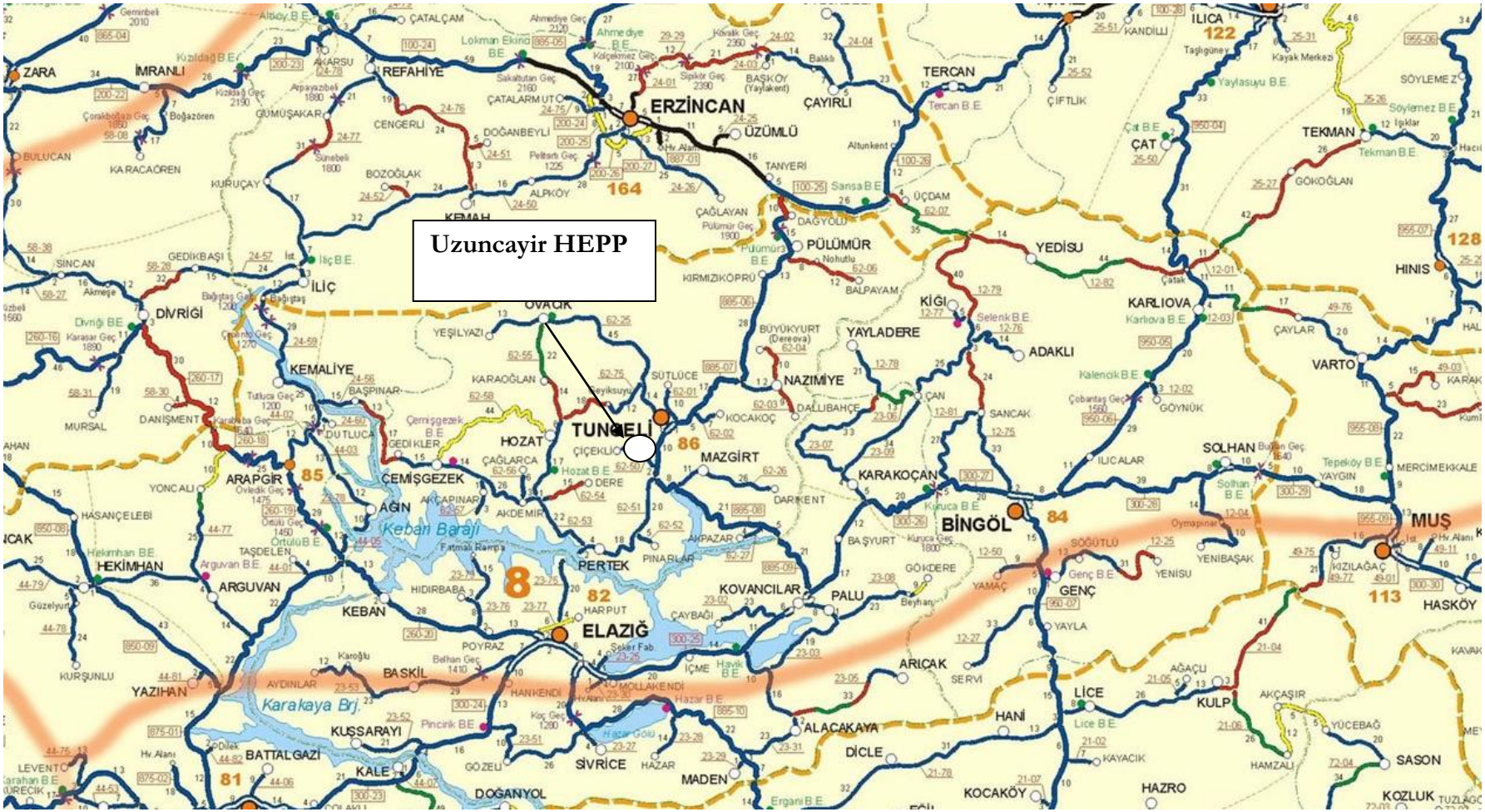

Figure 2: Project Location on Turkey Map

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

- Two derivation tunnels (398 meters and 468 meters)
- Two coffer dams
- One spill weir
- One rock-fill dam
- Power house with Francis type horizontal turbines;

In the power house, three horizontal shaft Francis turbines, each with 28 MWm (total capacity 84 MWm and 82 MWe) will be installed. . The efficiency of the turbines is 90.53%. There are three generators attached to the facility. Generators pursue power factor of 0,9 d/d, a frequency of 50 Hz and an output of 31 MVA.

1.6 Duration of the project activity/crediting period:

The project reached a financial closure in November 2007.

Starting date of the project activity is December 2nd, 2009, when the plant first commences electricity generation.. Therefore, the carbon crediting period and the monitoring starts with this commencement date. Therefore the first crediting period started on December 2nd, 2009 and will be completed by December 1st, 2019. The crediting of the project will be renewed for 10 years for the second time after the completion of the first period.

The expected life time of the project is, starting from January 2007, minimum 49 years which corresponds to the life time of the licence obtained from EMRA. However, the equipments may be renewed, as recommended by the supplier, 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:

The Uzundere HEPP project is originally a DSI (State Water Works) project. The project's construction started in 1993 by DSI (State Water Works). Until 2005, the project's completion ratios (except electromechanical installments) reached 93% in investment amount wise and 99% in physical installation wise. However, with the change in government policies in the energy field, the project was decided to be transferred to the private sector as the government did not want to invest in the project anymore. Limak won the tender (which was held on 12/09/2006) to take over the project and complete unfinished construction works and install electromechanical installments. In this tender, Limak promised to pay certain fees for water usage privileges and to pay back the amount which had been invested in the project so far. Therefore, prior to Limak's take-over of the project, the construction was stopped and no further installation or construction was being held in the project.

At the time of the takeover, the physical completion ratio of the project's construction was 99%. Therefore, the project owner almost had no initiative in the construction of the project (some of the construction was completed after the takeover). On the other hand, DSI had reported in the feasibility study of the project which was prepared in 1985 that the project would lead to the transfer of 3258 people, 92 mud brick houses, 20 concrete houses and 12 public buildings. It would also lead to relocation of 24 km road. However, all these reallocations were made by DSI in the past.

With its inappropriate climatic conditions farming is very limited in the region. Neither the livestock farming and nor the agriculture is developed in the region.

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 is fed by fossil fuel fired power plants. Uzuncayir 82.0 MW 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 plants.

The subject project will cause some GHG emissions during the operation as calculated in Section 1.3 of this document. The quantity of emissions created for the construction of the project is negligible according to ACM002 / Version 11.

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

Uzuncayir HEPP project entails the construction and operation of a 82.0 MW hydroelectric power plant. The plant consists of three turbines. The brand new turbines which will be used in the project will be supplied from Voit-Siemens. The turbines will be Francis type with horizontal axis. The net electricity production (delivered to the grid after the consumption in the plant) from the plant is estimated to be 322,000 MWh per annum. It is estimated that the plant will consume around 3.066 GWh per annum internally.

The Project was designed by Baget Mühendislik Müşavirlik Ve Ticaret A.Ş, Su-Yapı Mühendislik Müşavirlik A.Ş, Özmak Makine Ve Elektrik Sanayi A.Ş, Rona Makina Sanayi Ve Ticaret A.Ş under the supervision and control of DSI (Water State Works). All these companies have significant experience in the field of hydropower plant design, control and consultancy.

The technology used in the plant is a state-of-the-art technology with extensive automatization. In addition to this, the equipments which are used in the project are all first-hand equipments. There is no new technology which is expected to replace the plant's technology in the short run and the expected life of the equipment is around 20 years[4]. The project does not need extensive initial training and maintenance efforts in order to work as presumed during the project period. Necessary trainings to the plant staff will be provided by the supplier right after the installation of the electro mechanic equipments in line with the agreement between the project owner and the supplier.

The economic life of an HEPP in Turkey is assumed as 50 years[3]. However, it is recommended to renew the equipment in every 20 years[4].

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 Uzuncayir 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 (Law Number: 5346, Acceptance Date: 10.05.2005) and Environmental Law (Law Number: 2872, Ratification Date: 09.08.1983). [5, 6] Such laws include land use regulations, forest use permissions and environmental risk management regulations.

[3] http://ekutup.dpt.gov.tr/enerji/oik585.pdf (page 4.25)
[4] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26
[5] http://www.epdk.gov.tr/mevzuat/diger/yenilenebilir/yenilenebilir.doc
[6] http://www2.cevreorman.gov.tr/yasa/kanun.asp

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

There is no significant risk that could affect the GHG emission reduction capacity of the project substantially. However, there are some other risks that could affect the GHG emission reduction capacity of the project. First of all, decrease of rainfall in the region due to the climate change, could reduce the GHG emission reduction capacity[7]. However, recent studies show that region in which the plant will be commenced is one of the regions which can be least influenced in the country. [8] The other risk in the region stems from the fact that it is first degree earthquake zone which puts all infrastructure projects under remarkable risk. According to the earthquake map of Turkey which was prepared by Earthquake Research Center of Turkey (http://basariryapidenetim.com.tr/images/depremharita.gif) some part of Tunceli is in the 1. Degree risk zone while some regions of the city is in the 2. Degree risk zone.
But project design incorporates such risk.

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. The project is not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction. The purpose of the project is to generate electricity from hydropower without causing any GHG emissions.

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

There is no other form of environmental credit generated by the project because there is no such system within the host 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):

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

[7] On the climate change front, this is a risk which can be defined for all hydro projects as the rainfall is the first parameter which is affected from the climate change. The so told researches are based on some mathematical models which have some assumptions. Therefore given the fact that climate change itself is a scientific fact which has been researched more than the effect of climate change on a specific region we can assume that there is a greater risk of change in expected rainfall and therefore expected electricity production (either negatively or positively). Researches give only some hints that the regions's rainfall will not affected as much as other regions.

[8] Bernhard Lehner, Gregor Czisch, Sara Vassolo, Energy Policy 33 (2005) 839–855, Page 851

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

SUPPLIER DATA

Name	Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
Organizational category	Private Company
Address	Hafta Sokak No:9 GOP 06700 Ankara İSTANBUL-TURKEY
Main activities	Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi is a subsidiary of Limak Holding which is mainly involved with construction, tourism, energy, cement, food and aviation.
Contact	Ms. Tamer Ercomert +90 12 446 88 00 tercomert@limak.com.tr

Name	GAIA Carbon Finance (GAIA)
Organizational category	Private Company
Address	GAIA Finansal Danismanlik Hiz. Tic. Ltd. Sti Halaskargazi Cad. Zafe Sok. Manuel Apt. No:11/4 34371 Sisli 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- 224 04 50 gbayraktar@gaiacf.com

Table 2: Supplier Data

Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi whose contact details given above is a project participant. Gaia Carbon Finance whose contact details given above is not a project participant. Gaia is the consultant to the Limak who is the project participant and project owner. Gaia developed the PDD and baseline.

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 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. [9] 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 Uzuncayir 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 as it creates extra financing opportunity 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 and the industry is undeveloped. Although agriculture is not undertaken with advanced methods and the region is poor in agricultural land availability, agriculture is destined to be the main livelihood 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.

- The project pursues significant social benefits to the communities in the project area, such as:

    - Tunceli, where the project is located is one of the least developed cities of Turkey with its

[9] Hoffman, Scott L. The Law and Business of International Project Finance. Section 1-15. Cambridge Publications. August, 2007.
(http://books.google.com.tr/books?id=R52qp4xa_DYC&pg=PA5&lpg=PA5&dq=Hoffman,+Scott+L.+The+Law+and+Business+of+International+Project+Finance&source=bl&ots=IhBmOwdTSP&sig=lxXz6qoxllXVhyldASaN_lFRckc&hl=tr&ei=UpXySoGZMs2Y_Qamj8GhAw&sa=X&oi=book_result&ct=result&resnum=8&ved=0CCMQ6AEwBw#v=onepage&q=&f=false)

86,449 population in 2008 (representing 47% reduction compared to 1975)[10] . There are only 4 businesses which employ more than 10 workers in the city[11]. Although agriculture and animal husbandry are almost only income sources of the city, they are not developed enough. The unemployment rate in the city was 17.2%[12] (fourth highest in Turkey) in 2008. Although the city is reach in water resources, the production and consumption of fishery products are almost non-exist[13].

- Construction of Uzuncayir HEPP and operation of the plant resulted in extra employment in the local area where unemployment is a big socio-economic problem. The total amount of workers to be hired for the construction adds up to 250 where almost 95 percent of those workers are locals. The local workers will be given priority during the hiring for plant operation. The project plan foresees the hiring of 45 technical professionals during the operation of the plant. Priority will be given to local labor force and necessary trainings will be organized to improve vocational capacity of the candidates.

- Construction materials are, if possible, supplied through local resources.

- The project will provide a large reservoir area in which fishery products can be grown. This will also increase the fishery products consumption in the region. Local authorities are planning to encourage fish farm investments in the reservoir of the project.

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 11, named "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"[14] as approved by the CDM Executive Board. As it was referred in ACM0002 /Version 11, the baseline methodology was developed in line with "Tool to calculate the emission factor for an electricity system" .

Conservative options and data were selected during the implementation of the methodology. The baseline has developed by Gaia Carbon Finance whose contact details are given in the Section 1.15. The completion date of the baseline study is March 1st, 2010.

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

The choice of ***ACM0002 / Version 11*** is justified as the proposed project activity meets relevant applicability criteria:

- Uzuncayir 82.0 MW 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,

[10] http://www.tunceli.gov.tr/page.asp?id=42
[11] http://www.tunceli.gov.tr/page.asp?id=47
[12] http://www.milliyet.com.tr/default.aspx?aType=SonDakika&ArticleID=1176823
[13] http://www.tunceli.gov.tr/page.asp?id=47
[14] http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDAOV5K382HW0JR14GS7XYQUMCP

- The project activity results in a reservoir. But the power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 / Version 11, is less than 10 W/m^2 but more than 4 W/m^2 as calculated in section 1.3 "Estimated amount of emission reductions over the crediting period including project size" of this PDD,
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available as proved in section 2.4 "Description of how the baseline scenario is identified and description of the identified baseline scenario" of this PDD,
- 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.

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 11 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 8.0% per annum for the last three decades since 1975, which reflects one of the basic indicators of an emerging economy. Gross electricity demand in Turkey reached 198,085 GWh in 2008, which makes Turkey one of the ten largest markets for electricity among European countries. Even the devastating earthquake that hit Turkey in 1999, and the economic crisis in 2001, could not reverse this robust growth record. In 1999, consumption grew by 4.5% despite the decline in GDP by 5%. In 2001, Turkey's electricity consumption dropped only 1.1% whereas GDP shrank by 7.5%. Parallel to the gross demand, the net consumption figure reflects an average of 7.9% increase since 1975, reaching to 161,948 GWh in 2008. Although there has been significant improvements in the recent years, Turkey's per capita electricity consumption figure is 2,210 kWh (as of 2007), which is one of the lowest among European countries. [15] According to International Energy Agency (IEA) statistics, OECD average per capita electricity consumption is 8,477 kWh in 2007, which is an indicator of the growth potential in Turkey. [16] This figure has been 3,364 kWh among CEE countries.[17] Per capita consumption is expected to increase to 5,050 kWh by 2020 according to the MENR base case demand growth scenario, and with a projected annual population growth rate of 1.5%.

Supply Side:

Installed capacity and electricity generation in Turkey increased in line with consumption growth in recent decades. In 2008, electricity generation reached 198,418 GWh while imports stood at 789 GWh – 0.40% of total supply. Turkey became an importer in the mid-1970s, however, the share of imports in total supply never exceeded 3.6% for the last 20 years. The imports reached its peak as a portion of total supply in 1984 with 8%. By the end of 2008 the installed capacity of Turkey reached 41,817 MW, representing a CAGR of

[15] http://www.iea.org/stats/indicators.asp?COUNTRY_CODE=TR
[16] http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=28
[17] http://www.iea.org/Textbase/stats/indicators.asp?COUNTRY_CODE=33

8.0% since 1975. The rate of the increase in the capacity was well above 10% from 1970 to 1980. 48.2% of the installed capacity of 41,817 MW in 2008, was held by the State Generation Company EUAS, 9.2% by Affiliated Partnerships of EUAS, 0.6% Mobile Power Plants and the remaining 42.0% owned by autoproducers, Production companies, TOOR and ADÜAŞ. There is an increasing trend in favor of IPPs, switching away from the State Generation Company in the recent years. When we compare the breakdown of the installed capacity in 2000, we see that EUAS's contribution to the installed capacity was 80% whereas the IPPs' share was only 9%. This is a concrete indication of the trend of the generation in favor of independent producers. The contribution of thermal power has always been the dominant source in both the generation and the installed capacity. In 2008, thermal power plants accounted for the 66.0% of the installed capacity whereas the hydro power plants' contribution was 33.1%. This is one of the lowest figures since 1970. On the other hand geothermal and wind powered capacity is still negligible with 0,9%. The existing electricity grid in Turkey is an interconnected single entity which to a larger extend fed by fossil fuel fired power plants. (Chart 1)

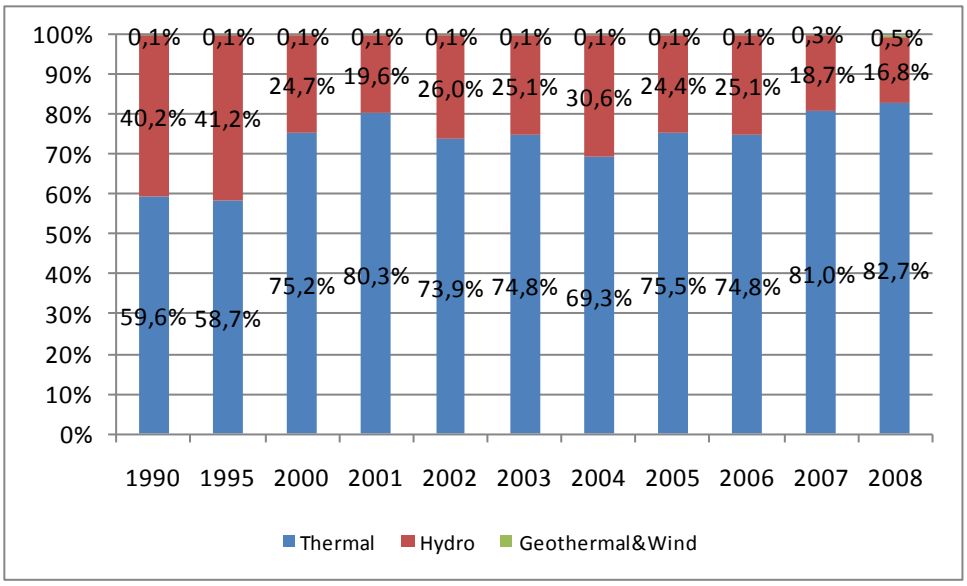

Chart 1: Electricity Production Fuel Type [18]

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

[18] http://www.teias.gov.tr/ist2007/3.xls

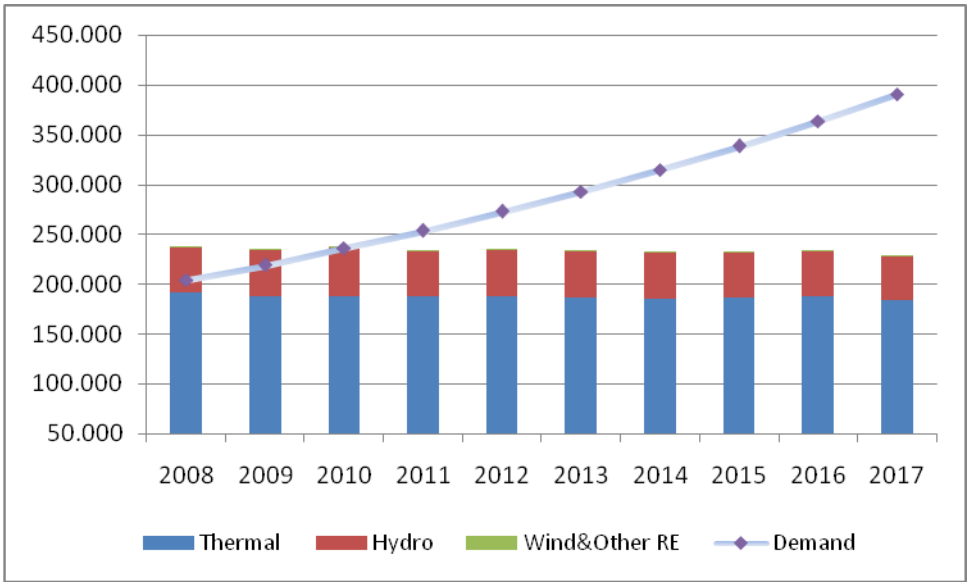

Chart 2: Electricity Supply and Demand Projections for Turkey [19]

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 (which authorizes 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[20] (**"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.[21]

- Renewable energy resources (**"RER"**) is not a brand-new topic, as the Electricity Market Law [22](**"EML"**), which was enacted in March 2001 and the Electricity Market License Regulation[23] (**"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[24], one of the short-term priorities identified for Turkey relates to "[s]tart alignment on the *acquis* on energy efficiency and renewable

19 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf

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

21 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.

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

23 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 January 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.

24 OJ 2006 L 22/34.

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 license 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 license holder, in the previous calendar year, and the total electrical energy offered for sale by all retail sale license holders in Turkey.

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

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

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

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

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

Licensing Regulation

Legal entities applying for Licenses 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 License 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 Licenses for that calendar year.

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

License guarantee

Since November 2007 EMRA has been requesting bid bonds and performance bonds for License applications. Bid bonds with an amount of 10,000 YTL (around Euro 5,000) 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 License, 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.

The project has a reservoir which has a surface area of 13.4 km^2 under normal operation conditions. Therefore, water reservoir of the project can be defined as a GHG source for this project. The project emission from this reservoir can be found in section 1.3.

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

The Uzuncayir Hydroelectric Power Plant Project entails the construction and operation of a 82.0 MWe hydroelectric power plant. The project consists of a hydro power plant with three turbines of 27.33 MWe each.

	Source	Gas	Included?	Justification
Baseline	Generation mix of electricity grid in Turkey	CO_2	Yes	CO_2 emission from fossil fuel fired power plant that are displaced due to project activity was taken into account.
		N_2O	No	Minor emission source as suggested by ACM0002, Version 11
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.
		N_2O	No	Minor emission source as suggested by ACM0002, Version 11
		CH_4	Yes	Main emission source as suggested by ACM0002, Version 11. As the power density of the project is less than 10 but higher than 4, CH_4 emissions of the reservoir is calculated and deducted from emission reductions.

Table 3: 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, Version 02 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.),[25] the Turkish transmission system is interconnected. There is an independent regional grid system neither in Tunceli nor in Eastern Anatolia Region.

In addition to this, since there is no DNA in the host country to delineate the project electricity system, the suggested criteria in "Tool to calculate the emission factor for an electricity system, Version 02" was used. 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.

[25] *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.*

As suggested in "Tool to calculate the emission factor for an electricity system, Version 02", "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 are no layered dispatch systems 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 11: *"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 11 is not chosen.

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 (Uzuncayir HEPP is not built)

Alternative 1: Construction of a thermal power plant with the same annual power output

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 realization. In addition, these projects use imported natural gas or coal, so they can be realized regardless of their geographic proximity to original coal or natural gas supply. Therefore, construction of a thermal plant fuelled with imported coal with the same annual electricity output is a realistic alternative.

Alternative 2: The proposed project activity undertaken without being registered as a VCS project activity.

As it was stated in ***Section 1.10.*** Alternative 2 is in compliance with legal and regulatory requirements. Therefore, Alternative 2) is a credible alternative.

Alternative 3: Construction of some other renewable energy plant with the same annual power output

The Eastern Anatolia region is not very rich of wind and very steep terrain does not allow for wind power plants. It can be seen in the REPA (Wind Energy Potential Map) of Tunceli, the areas which have enough potential for economically feasible wind farm investments are not very evident in the region. [26] As for the geothermal energy, this renewable energy source does not exist in this region of the country. [27] Therefore, at the project area, there is no geothermal source either. As a result, Alternative 3 for the region is eliminated.

Alternative 4: The same service of power supply is provided from the grid (Uzuncayir HEPP is not built)

As mentioned above, the Turkish Electricity Sector is heavily dependent on fossil fuel plants. According to a new bill that passed in 2001(Electricity Market Law, Law No: 4628, Enactment Date: 20/02/2001) [28], the public funding in energy investments have stopped. The new bill allows incentives for private sector participation in energy investments. In addition to rehabilitation of existing plants, new capacities to be added to meet the increasing demand require mass amount of investments. Because the public funding of energy investments is no more legitimate, new projects need to be accomplished by private sector. Yet, Limak cannot influence the future fuel mix in the energy market, but can only decide to invest on the project, because Limak has no influence on the domestic energy policy of the decision makers.

Under these circumstances, the realistic alternatives are 1, 2 and 4. Analyzing these three alternatives, it is seen that all scenarios are consistent with the baseline definition of ACM0002 / Version 11 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

As above mentioned all the alternatives available to the proposed Project that provide outputs or services comparable with the proposed VCS project activity are consistent with the mandatory laws and regulations.

Outcome of Sub-step 1b: The plausible and realistic alternatives are 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) and Alternative 4 (The same service of power supply is provided from the grid (Uzuncayir HEPP is not built)).

Based on the above analysis, the proposed project activity is not the only alternative amongst the project participants that is in compliance with mandatory regulations. Therefore, the proposed VCS project activity may be additional.

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

1. Electricity Market Law [29]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy[30]

[26] http://www.eie.gov.tr/duyurular/YEK/YEKrepa/TUNCELI-REPA.pdf
[27] http://web.deu.edu.tr/jenarum/index.php/turkyede-jeotermal
[28] http://www.epdk.gov.tr/mevzuat/kanun/elektrik/elektrik_piyasalari_kanunu.pdf
[29] Law number 4628, enactment date 03/03/2001, http://www.epdk.gov.tr/english/regulations/electricity.htm

3. Energy Efficiency Law[31]
4. Forest Law[32]
5. Environment Law[33]
6. Regulation on procedures and principles of signing the agreement of utilisation of water resources for the purpose of electricity production in the electricity market[34]
7. Regulation on Environmental Impact Assessment[35]

Step 2: Investment Analysis

The purpose of investment analysis is to determine whether the proposed project activity is economically or financially less attractive without carbon revenues than the remaining alternatives. To conduct the investment analysis, the following sub-steps are adhered to:

Sub-step 2a: Determine appropriate analysis method

The „*Tool for the Demonstration and Assessment of Additionality',* version 05.2, from EB39, lists three possible analysis methods:

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

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

Option II is only applicable to projects where alternatives should be similar investment projects in terms of generation capacity.

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

Benchmark Analysis is assessed to be appropriate (Option III).

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

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

Almost all bankers who have been asked for an opinion for the minimum IRR that is required for the approval of a similar project expressed some after tax IRR that is in the bandwidth of 16 to 18 percent[36].

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[30] Law number 5346, enactment date 18/05/2005, http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf
[31] Law number 5627, enactment date 02/05/2007, http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc
[32] Law number 6831, enactment date 31/08/1956. This will be made available to the DOE on request.
[33] Law number 2872. Published in Official Gazette No. 18132 on 11/08/"83. This will be made available to the DOE on request.
[34] National Gazette number 25150, 26/06/2003
[35] National Gazette number 26939, 17/07/2008
[36] E-mail correspondances can be prsented to DOE upon request

In the meanwhile a separate benchmark calculation was done to confirm bankers' statements mentioned above. The benchmark was calculated as follows: As the Turkish Eurobonds represent a risk-free rate, it must be increased by a suitable risk premium, which reflects the premium that investors demand for an average risk investment. The interest rate for Eurobond with longest duration of 30 years which is US900123AY60-17.03.2036 was 6.95% at the time of decision (End of April 2007, please see http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx for 30th of April 2007). However the maturity of this bond does not match with the investment duration which is 49 years. Therefore the yield of a synthetic bond with 49 years maturity at the time of decision was calculated using the yield curve derived from http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx was used. The details of the calculation can be found in a separate excel sheet provided to DOE. Please see Annex 7 to see the yield curve. According to this calculation the synthetic bond's yield should be around 7.58%.

According to Mr. Aswath Damodara, professor of Finance at the Stern School of Business at New York University[37], the suitable risk premium for Turkey can be estimated as 9.41% for the year 2006.

The IRR benchmark value is then calculated using the interest rate delivered from the Turkish Eurobonds rates, 7.85%, plus the risk premium, 9.41%. As explained hereunder:

$$Ce = Rf + \beta \times (Rm - Rf)$$

Where:

Parameter		Chosen Value	Source
Rf	Risk-free rate	7.58%	The yield of a synthetic bond with 49 years maturity at the time of decision was calculated using the yield curve derived from http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx was used. The details of the calculation can be found in a separate excel sheet provided to DOE. Please see Annex 7 to see the yield curve
β	Beta. Used to measure level of risk.	0.939	The average of energy companies traded in ISE 100 derived from one of the most prominent data provider Bloomberg. Please see Annex 8 for Betas of these companies
Rm-Rf	Market equity risk premium	9.41%	http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem07.xls
Rm	Expected market return	16.99%	-

Table 4: Benchmark Calculation

Rf	+	β	x	(	Rm	-	Rf	)	=	Ce
7.58%	+	0,939	x	(	16.99%	-	7.58%	)	=	16.41%

Therefore, a realistic equity benchmark IRR for this type of project should be greater than the base investment threshold (Turkish Eurobonds) plus a risk premium, which given the figures referenced, is greater than 16.41%.

IRR Calculation of the Project

IRR Calculation of the project is based on the feasibility study prepared for the Board of the Company dated April 2007. Aiming to show the effect of income from VERs for the financial performance of the project, two scenarios are presented in this section, one which excludes revenues from the sale of VERs

[37] Aswath Damodaran is a Professor of Finance at the Stern School of Business at New York University, where he teaches corporate finance and equity valuation. He also teaches on the TRIUM Global Executive MBA Program, an alliance of NYU Stern, the London School of Economics and HEC School of Management. Professor Damodaran is best known as author of several widely used academic and practitioner texts on Valuation, Corporate Finance, and Investment Management

and the second which includes the revenues from the sale of VERs. The assumptions used for this analysis are outlined as follows:

- The financial analysis is performed over the 49 year period from 2007 to 2056, this, therefore includes the investments made by the project owner between 2007 and 2010 and the operational costs along the lifetime of the project.
- The Equity IRR (Internal Rate of Return) of the project cash flow has been calculated.
- A tax rate of 20% is applied to the project in line with Turkish tax laws.
- The depreciation period of machinery and equipment was assumed as 35. years as the local law allows companies to depreciate machinery and equipment in 30 to 40 years (Please see http://www.alomaliye.com/2007/isa_yilmaz_amortismanlar.htm). In the meantime, the other fixed assets' (buildings etc) depreciation life is assumed as 50 years.
- Although it is stated in the energy production license of the facility that the expected average electricity production is 322,000,000 kWh, the annual power generation figure is assumed to be 318,000,000 kWh for the years between 2009 and 2018. This was due to the fact that the production figure in the license is an average figure which can not reflect the fact that the production figure will increase after the construction of another project at the source side of Uzuncayir HEPP. However, as it is assumed in the company presentation (presented to the board) page 27, after 2019 the production is assumed to be increased to 323,000,000 kWh with the construction of another HEPP at the source side of the project.
- The power purchase price for the project is assumed to be 5 Euro cent (6.5 USD cent) per kWh which is the minimum purchase guarantee offered by the State as an incentive to the investment (Please refer to Turkish Renewable Energy Law No: 5346 Article 6.c Ratified on 10 May 2005.)
- The revenues from VERs are excluded from scenario 1, and included in scenario 2. The volume of VERs generated by the project is calculated by multiplying the annual electricity output of the project by the emission factor. For sensitivity analysis, the revenues related to the sale of the VERs are applied by multiplying the volume of VERs by the $3, $4 and $5price. The VERs are generated and sold between 2010 and 2019 for ten years.

Results

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

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

As seen below, the project is not financially attractive in regular terms because the IRR of the project is estimated to be far less than benchmark expectations. Yet, the investor were appealed to subject project because of long term expectations such as a significant increase in energy prices due to increasing demand as well as an expectation of water flow increase and electricity production increase. Under regular assumptions, contribution of carbon finance does not make the project leap over a benchmark that is acceptable to the banks.

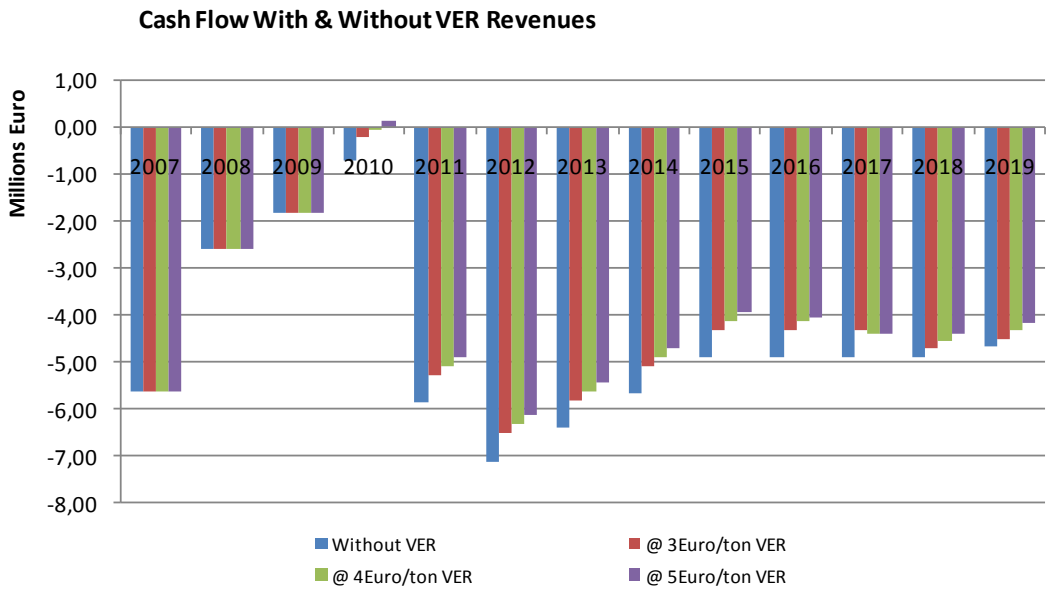

Chart 3: Project Cash Flow Comparison with and without VER

Below are the details of IRR estimations.

Capacity & Production																						
			2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
	Sensitivity Coeffecient																					
Energy Production (1000 Kwh/year)			**8.833**	**265.000**	**318.000**	**318.000**	**318.000**	**318.000**	**318.000**	**318.000**	**318.000**	**318.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**	**323.000**
Firm Energy (1000 KWh/year)		0,0%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seconder Energy (1000 KWh/year)		0,0%	8.833	265.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000
Sales Volume & Revenues																						
			2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Loss & Pilferage Rate			0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Sales Volume (1000 Kwh/year)			8.833	265.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000
Sales Prices (Eur/Kwh)	**Sensitivity Coeffecient**																					
Firm Energy		0,0%	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050
Seconder Energy		0,0%	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050
Price increase (%)			*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
Sales Revenues (Eur)			**441.667**	**13.250.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**
Firm Energy			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seconder Energy			441.667	13.250.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000
Cost of Goods Sold																						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
General production expenses	0	0	0	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018
Depreciation	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250
DSI Contribution (0,031 € per kWh)	0	0	273.833	8.215.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000
Total (Eur/year)	**2.202.003**	**2.862.343**	**3.601.277**	**12.802.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.445.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**	**14.600.268**
(Eur /Kwh)			0,408	0,048	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045
Working Capital																						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Days of Receivables			20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Receivables			24.537	736.111	883.333	883.333	883.333	883.333	883.333	883.333	883.333	883.333	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222
DSI Payable			273.833	8.215.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000
Costs of Goods Sold & Operating Expenses Calculation Details																						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
General Production Expenses			0	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018
Costs of Goods Sold & Operating Expenses Calculation Details																						
			2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
VAT Reserve			2.914.131	2.834.631	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VAT to be refundable			79.500	2.385.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000
VAT to be refunded		0	79.500	2.385.000	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investment Details (Eur)																						
	2007	**2008**	**2009**	**2010**	**Total**	**Weight**	**Sensitivity Coeffecient**					**Original Investment Amount**								**Weight**		
Equipment	4.998.571	11.663.331	13.329.521	3.332.380	**33.323.804**	54%	0,0%					**33.323.804**	4.998.571	11.663.331	13.329.521	3.332.380				58%		
Construction	3.034.552	11.448.563	8.708.044	911.162	**24.102.321**	39%	0,0%					**24.102.321**	3.034.552	11.448.563	8.708.044	911.162				42%		
Others (Comissions&Interest)	3.343	1.402.619	3.368.990		**4.774.952**							**0**										
Total Investment Amount	**8.036.465**	**24.514.513**	**25.406.556**	**4.243.543**	**62.201.077**	**100%**						**57.426.125**	100%									

Depreciation																					
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Depreciation of New Investment																						
Equipment																						
Depreciation period (years)	35																					
Balance @ beginning	0	4.855.754	16.043.031	28.515.655	30.895.927	29.943.818	28.991.709	28.039.601	27.087.492	26.135.383	25.183.274	24.231.166	23.279.057	22.326.948	21.374.840	20.422.731	19.470.622	18.518.514	17.566.405	16.614.296	15.662.188	14.710.079
Additions	4.998.571	11.663.331	13.329.521	3.332.380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	142.816	476.054	856.898	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109
Balance @ end	4.855.754	16.043.031	28.515.655	30.895.927	29.943.818	28.991.709	28.039.601	27.087.492	26.135.383	25.183.274	24.231.166	23.279.057	22.326.948	21.374.840	20.422.731	19.470.622	18.518.514	17.566.405	16.614.296	15.662.188	14.710.079	13.757.970
Construction																						
Depreciation period (years)	49																					
Balance @ beginning	0	2.972.622	14.032.153	22.266.909	22.686.187	22.194.303	21.702.419	21.210.535	20.718.651	20.226.766	19.734.882	19.242.998	18.751.114	18.259.230	17.767.346	17.275.462	16.783.578	16.291.694	15.799.809	15.307.925	14.816.041	14.324.157
Additions	3.034.552	11.448.563	8.708.044	911.162	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	61.930	389.031	473.289	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884
Balance @ end	2.972.622	14.032.153	22.266.909	22.686.187	22.194.303	21.702.419	21.210.535	20.718.651	20.226.766	19.734.882	19.242.998	18.751.114	18.259.230	17.767.346	17.275.462	16.783.578	16.291.694	15.799.809	15.307.925	14.816.041	14.324.157	13.832.273
Amount To be Paid to DSI	97.865.581																					
Depreciation period (years)	49																					
Balance @ beginning	0	95.868.324	93.871.068	91.873.811	89.876.554	87.879.297	85.882.041	83.884.784	81.887.527	79.890.270	77.893.014	75.895.757	73.898.500	71.901.243	69.903.987	67.906.730	65.909.473	63.912.216	61.914.959	59.917.703	57.920.446	55.923.189
Additions	97.865.581	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257
Balance @ end	95.868.324	93.871.068	91.873.811	89.876.554	87.879.297	85.882.041	83.884.784	81.887.527	79.890.270	77.893.014	75.895.757	73.898.500	71.901.243	69.903.987	67.906.730	65.909.473	63.912.216	61.914.959	59.917.703	57.920.446	55.923.189	53.925.932
Total	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250

Income Statement (Eur)																						
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Net Revenue	**0**	**0**	**521.167**	**15.635.000**	**16.349.631**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**15.900.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**	**16.150.000**
Net Sales	0	0	441.667	13.250.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000
VAT Refunded	0	0	79.500	2.385.000	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VER Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost of Sales	-2.202.003	-2.862.343	-3.601.277	-12.802.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268	-14.600.268
Gross Profit	**-2.202.003**	**-2.862.343**	**-3.080.110**	**2.832.732**	**1.904.363**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**
EBITDA	**0**	**0**	**247.333**	**6.273.982**	**5.345.613**	**4.895.982**	**4.895.982**	**4.895.982**	**4.895.982**	**4.895.982**	**4.895.982**	**4.895.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**	**4.990.982**
EBITDA Margin	*0%*	*0%*	*56%*	*47%*	*34%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*	*31%*
Financing income / (expense), net				-3.509.965	-2.679.604	-1.965.043	-1.250.482	-535.921	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Income /(Expenses)- net				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income before Tax	**-2.202.003**	**-2.862.343**	**-3.080.110**	**-677.233**	**-775.240**	**-510.310**	**204.251**	**918.812**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**	**1.549.732**
Taxation on income				0	0	0	0	0	0	0	0	0	0	0	-296.790	-309.946	-309.946	-309.946	-309.946	-309.946	-309.946	-309.946
Deferred Taxation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income before Monetary Gain / (Loss)	**-2.202.003**	**-2.862.343**	**-3.080.110**	**-677.233**	**-775.240**	**-510.310**	**204.251**	**918.812**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.549.732**	**1.549.732**	**1.252.942**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**
Monetary gain/(loss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income for the period	**-2.202.003**	**-2.862.343**	**-3.080.110**	**-677.233**	**-775.240**	**-510.310**	**204.251**	**918.812**	**1.454.732**	**1.454.732**	**1.454.732**	**1.454.732**	**1.549.732**	**1.549.732**	**1.252.942**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**	**1.239.786**

Cash Flow Statement (Eur)																						
	31.12.2007	31.12.2008	31.12.2009	31.12.2010	31.12.2011	31.12.2012	31.12.2013	31.12.2014	31.12.2015	31.12.2016	31.12.2017	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022	31.12.2023	31.12.2024	31.12.2025	31.12.2026	31.12.2027	31.12.2028
Net Income	-2.202.003	-2.862.343	-3.080.110	-677.233	-775.240	-510.310	204.251	918.812	1.454.732	1.454.732	1.454.732	1.454.732	1.549.732	1.549.732	1.252.942	1.239.786	1.239.786	1.239.786	1.239.786	1.239.786	1.239.786	1.239.786
Depreciation	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250
Working Capital Requirement																						
Change in Trade Receivables			-24.537	-711.574	-147.222	0	0	0	0	0	0	0	-13.889	0	0	0	0	0	0	0	0	0
Change in Trade Payables			273.833	7.941.167	1.643.000	0	0	0	0	0	0	0	155.000	0	0	0	0	0	0	0	0	0
Change In Other Assets			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change Liabilities			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investments	-8.036.465	-24.514.513	-25.406.556	-4.243.543	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity	5.606.150	2.570.236	2.331.914	652.707	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt - Loan	2.430.316	21.944.276	23.074.642	3.590.836	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt Repayments																						
Loan				-10.030.328	-10.030.328	-10.030.328	-10.030.328	-10.030.328	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI Payment	0	0	0	0	0	0	0	0	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	0	0	0	0
Cash Generated During the Year	0	0	496.630	-36.719	-5.868.541	-7.099.389	-6.384.828	-5.670.267	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.654.465	-4.795.576	-5.092.366	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
Cumulative Cash Generated	0	0	496.630	459.910	-5.408.631	-12.508.020	-18.892.848	-24.563.115	-29.453.691	-34.344.268	-39.234.844	-44.125.420	-48.779.885	-53.575.461	-58.667.828	-63.773.350	-68.878.873	-73.984.396	-69.303.360	-64.622.325	-59.941.289	-55.260.254
Cash Flow to Equity	-5.606.150	-2.570.236	-1.835.284	-689.426	-5.868.541	-7.099.389	-6.384.828	-5.670.267	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.654.465	-4.795.576	-5.092.366	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035

VER Revenues																					
Baseline EF	0,6140																				
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Expected CO_2 Reduction (tons)				162.710	195.252	195.252	195.252	195.252	195.252	195.252	195.252	195.252	198.322									
Default VER Price	0																					
Cash Flow with Different VER Prices (Euro)																						
0	-5.606.150	-2.570.236	-1.835.284	-689.426	-5.868.541	-7.099.389	-6.384.828	-5.670.267	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.654.465	-4.795.576	-5.092.366	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
3	-5.606.150	-2.570.236	-1.835.284	-201.296	-5.282.785	-6.513.633	-5.799.072	-5.084.511	-4.304.820	-4.304.820	-4.304.820	-4.706.606	-4.488.439	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
4	-5.606.150	-2.570.236	-1.835.284	-38.586	-5.087.533	-6.318.381	-5.603.820	-4.889.259	-4.109.568	-4.109.568	-4.409.151	-4.556.716	-4.329.781	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
5	-5.606.150	-2.570.236	-1.835.284	124.124	-4.892.281	-6.123.129	-5.408.568	-4.694.007	-3.914.316	-4.033.596	-4.400.515	-4.400.515	-4.171.124	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
IRR Calculation without VER																						
IRR - 49 Years (License duration)		2,3%																				
IRR Calculation with VER																						
IRR - 49 years (License Duration)																						
@ 3Eur/ton VER		2,5%																				
@ 4Eur/ton VER		2,6%																				
@ 5Eur/ton VER		2,7%																				

Table 5: Project Cash Flow Details of IRR Calculation

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

1. Parameters required for calculation of key financial indicators

According to the financial feasibility study of the proposed project, the parameters required for the calculation of key financial indicators are in Table 6.

Parameter	Value
Installed capacity (MW)	82.0
Grid connected output (MWh)[38]	From 2009 to 2018 318,000 From 2019 Onwards 323,000
Capital investment (Euro)	62,201,077
Income tax rate (%)	20.0
Expected tariff (€/MWh)	5 €/MWh
Expected VER price (Euro/tCO2e)	3-5
O&M (€/year)	1,146,088
Project lifetime (years)	49.0
Benchmark rate (%)	16.41

Table 6: Basic Parameters for Financial Analysis

2. Results of the Financial Analysis

Table 7 includes the results of the financial analysis for the Project, at the time that the decision to go ahead was made, both with and without VER financing. The IRR of the Project without VER financing was lower than the applicable benchmark rate of return. This therefore indicates that in comparison to alternative investments, the Project was financially unattractive in the absence of VER financing.

	Without VER	@ 3 €/ton VER	@ 4 €/ton VER	@ 5 €/ton VER
Equity IRR (%)	2,3%	2,5%	2,6%	2,7%

Table 7: Summary of Project investment analysis without and with VER financing

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

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

Table 7 distinguishes the equity IRR with and without carbon revenues. Without the additional income to the project developer resulting from VER sales, the Equity IRR is only 2.3%, which is lower than the financial benchmark. Thus, the proposed project is not financially attractive.

Taking VER revenues into consideration, the Equity IRR increases to 2.7% (with 5 €/ton VER price).

While the IRR with VERs remains lower than the financial benchmark of 16.41%, the Project Developer will also benefit from the following intangible benefits that VERs provide:

[38] The expected electricity production is expected to increase after 2019 with the construction of another HEPP at the source side of Uzuncayir HEPP. Please also note that these figures are different from the expected energy production figure mentioned in the license as the license mentions an expected average figure.

- A third party technical review of project documents will give extra confidence to both investors and financiers.

- Enhanced corporate green image of the project developer through its contribution to a clean source of electricity and the diversification of electricity sources in Turkey, which broadens stakeholder confidence.

Sub-step 2d: Sensitivity Analysis

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

The sensitivity in the investment amount was applied to the investment items which represent equal or above 20% of the total investment amount as suggested by "Tool for the demonstration and assessment of additionality (Version 05.2)."

	IRR Sensitivity with Investment Costs				
Change in %	**-10%**	**-5%**	**0%**	**5%**	**10%**
Without VER	2,25%	2,25%	2,24%	2,24%	2,23%
IRR @3 €/ton VER	2,52%	2,52%	2,51%	2,51%	2,50%
IRR @4 €/ton VER	2,62%	2,61%	2,60%	2,60%	2,59%
IRR @5 €/ton VER	2,71%	2,71%	2,70%	2,69%	2,69%

Table 8: Sensitivity to Variation in Investment Costs

Variation on energy production was also applied in a bandwidth of +10% and –10% on the secondary energy production which reflects the volatility in calculations. Please note that "primary" part of the production reflects the electricity production which is 90% guaranteed amount. Therefore no sensitivity was applied to this part.

	IRR Sensitivity with Electricity Production				
Change in %	**-10%**	**-5%**	**0%**	**5%**	**10%**
Without VER	1,33%	1,79%	2,24%	2,70%	3,17%
IRR @3 €/ton VER	1,54%	2,03%	2,51%	3,01%	3,51%
IRR @4 €/ton VER	1,62%	2,11%	2,60%	3,11%	3,63%
IRR @5 €/ton VER	1,69%	2,19%	2,70%	3,22%	3,75%

Table 9: Sensitivity to Variation in Energy Production

Due to the fact that the feed in tariff price is fixed in Turkey, the unit energy price is not considered to be an exogenous variable. However, sensitivity stemming from increasing price was also applied to see the effect of price changes.

	IRR Sensitivity with Electricity Price				
Change in %	**-10%**	**-5%**	**0%**	**5%**	**10%**
Without VER	na	na	2,24%	3,38%	4,53%
IRR @3 €/ton VER	na	na	2,51%	3,69%	4,90%
IRR @4 €/ton VER	na	na	2,60%	3,80%	5,03%
IRR @5 €/ton VER	na	na	2,70%	3,91%	5,16%

Table 10: Sensitivity to Variation in Energy Production

The above sensitivity analysis reveals the fact that no alternative scenario without VER revenues can make the project pass the benchmark IRR expectation which is in 16% to 18% range. Therefore, the project is still financially not attractive.

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 subject 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 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 because of limited technical knowledge and experience of the project owners. Hence, most of the projects are presumed to be feasible but not bankable because combined with uncertainty about the future national policy on renewable energy, currency risks and opportunity costs, the banks cannot fully confide in 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 reduction 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.

Other Barriers

Security Sensitive Investment Region and Transportation Problems

The region itself where the project is located presents specific barriers as the region is a highly sensitive area in terms of security.[39],[40] The project has many risks because of the security problems and also the transportation difficulties related to the security problems. The president of TUSIAD which is the largest employer organization in Turkey declares that making investment in South East Anatolia Region (where the project is located) is very difficult[41] due to security issues and the insufficient infrastructure. In addition, the Minister of Industry and Trade also confirms this statement in one of his interview and says that the investors can only "gropingly" enters the East and south East regions of the country because of the

[39] http://www.aa.com.tr/tr/tuncelide-polis-karakoluna-saldiri.html
[40] http://www.haberturk.com/yasam/haber/511897-tuncelide-karakola-saldiri
[41] http://www.referansgazetesi.com/haber.aspx?HBR_KOD=141443

security problems and lack of infrastructure.[42] . The Minister gives marble reserves in the region as an example as these reserves can not be utilized due to security problems. [43]

Due to security issues Tuncel was managed under state of emergency rules for 15 years.[44] Although the state of emergency was lifted in 2002 the security problems in Tunceli still continue. In 2010, 35 terrorist incidents have occurred in Tunceli according to the General Staff of Turkish Army records.[45] In the neighbor provinces (Elazig, Bingol and Erzincan) the total number of terrorist incidents is 27. In addition, overall number of terrorist incidents in East and south East Anatolia was 508 only in 2010. All these facts show that the region in which the project is located is not secure for such an investment.

On the other hand, when the other hydroelectric projects are considered, it can be seen that there is not any other comparable project as far as the technology and size are concerned. In Tunceli and its neighboring cities (which are Elazig, Erzincan and Bingol) there are 9 comparable projects. However, only one project is close to completion other than Uzuncayir HEPP. However this project (Konaktepe HEPP) is owned by public.[46] Therefore, the Project proves to be the only private project with a reservoir which is close to completion.

Also, the security problems in the area exacerbates with the fact that the project location is away from the city centre where the security problems are lesser. All these factors make investors to take difficult investment decisions in the region. Despite all handicaps, the owner of the company decided to realize this investment by taking the security risk. As mentioned above, the project is the largest infrastructure investment realized by private sector in Tunceli.

In addition to this, the closest port is 361 km (Trabzon) and the closest airport to the project area is 120 km (from Elazig) away. The Tunceli-Elazig road is also a security sensitive area in which many security problems such as armed and bombing attacks have been occurred.[47] Because of these security and transportation problems, the project experiences significant barriers in transportation of machinery and equipments for the construction and the power plant itself[48]. In addition, the transportation and accommodation of experts during the design, construction and the operation phases is a significant challenge for the project as there is only one small hotel in the city of Tunceli. Therefore, any possible equipment malfunction in the future may cause long delays in operation due to both security and insufficient social infrastructure issues. Long process for delivery of equipment and difficulty in reaching maintenance services increase the risk of underperformance for the project.

In the light of all these issues, it can be said that the company has many security and transportation problems, because of the lack of security and infrastructure in the region.

Outcome of Sub-step 3a: Based on the above analysis, there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity is not registered as a VCS activity.

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 project is located away from access points to the country which leads extra problems in transportation of imported equipments whereas usually locations of thermal power plants are near sea or large pipelines as large coal fire plants in Turkey

[42] http://www.hurriyet.com.tr/ekonomi/15210810.asp
[43] http://www.hurriyet.com.tr/ekonomi/15210810.asp
[44] http://www.habervitrini.com/haber.asp?id=60205
[45] http://www.tsk.tr/HABERLER_ve_OLAYLAR/5_Bolucu_Teror_Orgutuyle_Mucadele/bolucu_teror_orgutuyle_mucadele_2010.htm
[46] http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm
[47] http://www.8sutun.com/haberdetay.asp?tarih=08.09.2010&Newsid=11350&Categoryid=7
[48] http://www.e-hayat.net/dogu-anadolu-bolgesi/

uses imported coals and natural gas fired plants are using imported natural gas which is transported via pipelines. The location is also security sensitive therefore the project carries extra risks compared other projects located in other regions of Turkey.

In conclusion, 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 may be additional.

Step 4: Common Practice Analysis

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

Hydro energy production is heavily dependent on the amount of water coming to the facility which is in return in relation to meteorological and regional conditions. Therefore, Uzuncayir project should be compared with hydro projects with similar installed capacity in the same region. Analyzing similar activities in the region that means the same city where the subject project is located, it is seen that there are various hydro projects of all sizes. However, only 1 project[49] is similar to the subject project in terms of project size: Tatar HEPP 131.16 MW which is also owned by Limak. This project is also planned to benefit from carbon revenues. Yet, the project has a very different structure compared to Uzuncayir as Limak is involved with the project development from the start of the project whereas Uzuncayir was taken over from DSI in the middle of the project.

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

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

Table 11: Number of HEPP facilities completed over a certain completion ratio

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

[49] http://www.epdk.gov.tr/lisans/elektrik/proje/yenilenebilir.xls
[50] http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm *(Accessed on 3 September 2009)*

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

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

As it was demonstrated in ***Sub-step 4b***, there are no similar activities occurring concurrently. This could be explained because of the serious barriers that this kind of projects must overcome in order to be financially attractive to investors.

Therefore, nowadays, the VCS-VER project activity is the most suitable solution to increase the project's financial attractiveness and raising it to a reasonable level.

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

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 11 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 11 to Uzuncayir HEPP is justified because;

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- Uzuncayir 82.0 MW 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 results in a reservoir. The power density of the power plant, as per definitions given in the Project Emissions section of ACM0002 / Version 11, is less than 10 W/m^2 but greater than 4 W/m^2 as calculated in section 1.3 "Estimated amount of emission reductions over the crediting period including project size" of this PDD,

- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available as proved in section 2.4 "Description of how the baseline scenario is identified and description of the identified baseline scenario" of this PDD, 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:

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed Project within the crediting period is complete, consistent, clear and accurate.

All relevant baseline emission factors are defined ex-ante. Please see the baseline estimations –Section 2.4- for Operating and Build Margin estimations. Hence, the only information to be monitored during the project activity 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. Uzuncayir HEPP is a new power unit which did not replace a fossil fuel plant on the project site.

All the data will be collected and stored by Limak not only during the crediting period but also two years after the last issuance of VERs to Uzuncayir 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 11, any time the crediting period is renewed.

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. EGfacility,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. $EF_{grid,CM,y}$	Combined margin CO2 emision factor for grid connected power generation in year *y*	As per the "Tool to calculate the emission factor for an electricity system"	tCO2 / MWh	c	Calculated once for any crediting period	100%	Electronic and paper	Calculated once for any crediting period
3. $FC_{i,y}$	Turkey's Gross Electricity Generated by primary ebergy source for the five most recent years	As per the "Tool to calculate the emission factor for an electricity system"	Ton (m3 for Natural Gas)	c	Calculated once for any crediting period	100%	Electronic and paper	Calculated once for any crediting period
4.$NCV_{i,y}$	Net Calorific Value of Fossil Fuel Type	As per the "Tool to calculate the emission factor for an electricity system"	TJ/Ton (TJ/m3 for Natural Gas)	c	Calculated once for any crediting period	100%	Electronic and paper	Calculated once for any crediting period
5. CapPJ	Installed capacity of project activity after implementation	Project site	W	m	Yearly	100%	Electronic and paper	Data will be obtained from the digital displays on the equipments
6. APJ	Area of the reservoir measured in the surface of the water, after implementation of project activity, when reservoir is full	Project site	m2	c	Yearly	100%	Electronic and paper	Data will be obtained from the yearly readings

Table 13: Data To Be Monitored and Monitoring Process

The monitoring will be performed in-house by the project proponent:

1. *Electrical Engineers* will undertake the specific actions required by the monitoring plan, i.e. they will measure the electricity generation, the electricity supplied to the Turkish grid by the power plant, the electricity imports and the amount of fuel consumed, if fuel is consumed.
2. *Mechanical Engineers* will ensure that all the instrumentations and devices to perform the monitoring are working properly.
3. *Accounting Manager* will be in charge of providing the electricity sales receipts to the Operations Manager of the plant.
4. *Operations Manager* will be the VER coordinator. He will be in charge of:
   a) Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
   b) Communicating and coordinating the monitoring tasks of all business units.
   c) Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of the data obtained from the electrical engineers and the accounting manager. He will also record this operation properly to be able to provide it to the DOE during the verification process.
   d) Calculating and report the emission reductions, and
   e) Organizing in-house seminars to inform and train the company staff to the monitoring procedures.

Please refer to *Figure 3* where the site organizational chart is presented.

In order to verify the generated units of emission reductions, the VER coordinator, (Operation Manager) will prepare an annual Report of Vigilance of the Project, in which the following important aspects will be included:

- Year
- Net electricity supplied by the project activity to the grid (in MWh)
- Annual gross electricity generation(in MWh)
- Annual electricity consumption (in MWh)
- Calculation of the emissions reductions: ERs per year (in tCO_2e/yr) produced from the activity of the project

After the proposed Project is registered and begins its operations, the monitoring report will be submitted at the end of every year for the verification of DOE. The report will cover the monitoring of grid-connected power generation, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

Data will be recorded for each crediting period and maintained at least 2 years after its end. The company will establish a dedicated maintenance system to ensure the data availability for the required period.

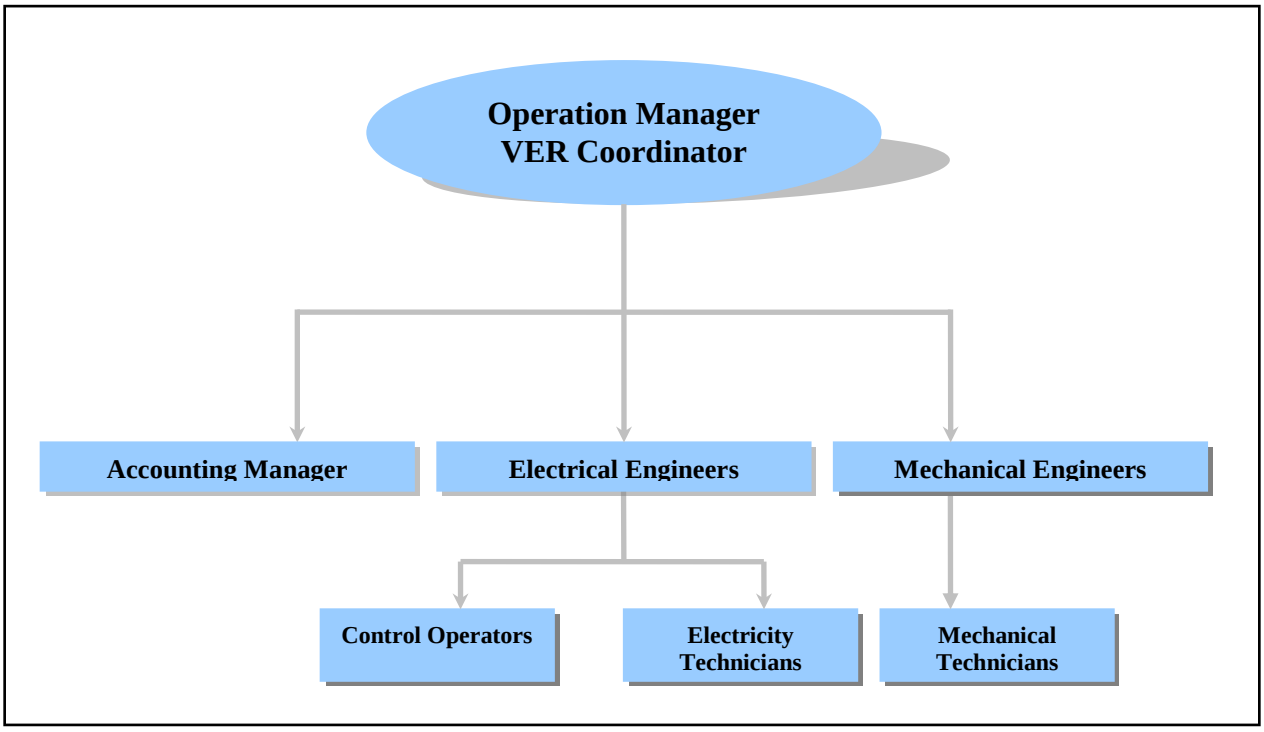


Figure 3*:* Site Organizational Chart

Measuring

The Electrical Engineers will obtain the readings from the meters, will report them in the spreadsheet (please refer to *Figure 4*) for measurement control and will store the data discharged from the meters electronically.

The project owner had not completed the selection process of the electricity measuring equipment but the so-told equipment should be in line with the EMRA requirements. The recalibration of these equipments will be done in line with the equipment requirements but re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years. [51]

[51] http://www.mevzuat.adalet.gov.tr/html/21179.html

Besides, in order to measure the electricity production figure of the plant accurately, there will be two sets of meters in the power house. One is the main meter for measuring and the other is the check meter for control. Both of these meters are metering the energy in two directions (consumption and production). If there is a measuring difference between these two meters and one of the parties (TEIAS or the company) requests for calibration of the meters, in this case, the meters will be calibrated without waiting for the periodic calibration date. (TEIAS System Usage Agreement, Art 3, B./2./b))[52] This calibration process is done by another third party under the control of TEIAS. The company is not responsible for calibration of the meters in Turkey according to the local standards.

On the other hand, the emission reductions will be calculated according to the measurements of the main electricity meter, since the electricity production invoices are made out based on this meter. During the each monitoring period, the invoices will be presented to the DOE, together with the calculation details.

The Electrical Engineers will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter's reading and calibration and reading's recording, adjustment and reporting. If new personnel are hired, they will have to follow up a training program and will be trained in the specific skills required to carry out the Monitoring Plan.

Uzuncayir Run-of-River-Hydroelectric Power Plant

	MEASUREMENT AND CONTROL			VERs CALCULATION		
Year :	2010					
A	B	C	D	E	F	G
Month	Electricity generation data received from Monthly Measurement Records (MWh)	Electricity consumption data received from Monthly Measurement Records (MWh)	Net electricity delivered to the grid (MWh) (D=B-C)	Kalkandere electricity delivered to the gird (MWh) (data validated) (D)*	Emission factor ex-ante (tCO_2/MWh)	Emission reductions (tCO_2) E x F
January				0,00	0,5596	0
February				0,00	0,5596	0
March				0,00	0,5596	0
April				0,00	0,5596	0
May				0,00	0,5596	0
June				0,00	0,5596	0
July				0,00	0,5596	0
August				0,00	0,5596	0
September				0,00	0,5596	0
October				0,00	0,5596	0
November				0,00	0,5596	0
December				0,00	0,5596	0
TOTAL	0,00	0,00	0,00	0,00	0,560	0

* The monthly electricity generation is also to be cross-checked with the SCADA records

Figure 4: Spreadsheet dedicated to emission reductions monitoring

[52] www.teias.gov.tr/sistemkullanim1.doc

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

Data Parameter	**$EG_{facility,y}$**
Data Unit	MWh
Description	Quantity of net electricity delivered to the grid
Source of Data	Monthly Electricity Meter Reading Records
Measurement Procedures (if any)	MWh
Value applied	322,000 MWh
Monitoring Frequency	Continuous measurement and at least monthly recording
QA / QC Procedures	Double check with the grid operators
Any comment	N/A

Data Parameter	**CapPJ**
Data Unit	MW
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
Value applied	82.0 MW
Monitoring Frequency	Yearly
QA / QC Procedures	Supplier information on the related equipment and existence of the equipment will be checked
Any comment	N/A

Data Parameter	**APJ**
Data Unit	m2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir if full
Source of Data	Project site
Measurement Procedures (if any)	Pre-calculated area figures in relation to the depth of the reservoir will be used. The chart showing the relation between the depth and surfae area can be found in Annex 7.
Value applied	13,400,000 m^2
Monitoring Frequency	Yearly
QA / QC Procedures	The depth readings will be done on daily basis from
Any comment	N/A

Data Parameter	**$EF_{grid,CM,y}$**
Data Unit	tCO2 / MWh
Description	Combined margin CO_2 emision factor for grid connected power generation in year *y* calculated using the latest version of "Tool to calculate the emission factor for an electricity system"
Source of Data	As per the "Tool to calculate the emission factor for an electricity system"
Measurement Procedures (if any)	As per the "Tool to calculate the emission factor for an electricity system"
Value applied	0.5596
Monitoring Frequency	Once for each crediting period
QA / QC Procedures	As per the "Tool to calculate the emission factor for an electricity system"
Any comment	N/A

Data Parameter	**$FC_{i,y}$**
Data Unit	Ton (m3 for Natural Gas)
Description	Amount of fossil fuel type *i* consumed in the project electricity system
Source of Data	Turkish Electricity Transmision Company - TEIAS http://www.teias.gov.tr/istatistik2008/43.xls http://www.teias.gov.tr/istatistik2008/44.xls
Measurement Procedures (if any)	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring Frequency	Once for each crediting period
QA / QC Procedures	As per the "Tool to calculate the emission factor for an electricity system"
Any comment	N/A

Data Parameter	$NCV_{i,y}$
Data Unit	TJ/Ton (TJ/m3 for Natural Gas)
Description	Net calorific value of Fossil Fuel Type
Source of Data	Turkish Electricity Transmision Company - TEIAS http://www.teias.gov.tr/istatistik2008/45.xls http://www.teias.gov.tr/istatistik2008/46.xls
Measurement Procedures (if any)	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring Frequency	Once for each crediting period
QA / QC Procedures	As per the "Tool to calculate the emission factor for an electricity system"
Any comment	N/A

Table 14: 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.
Combined margin CO2 emision factor for grid connected power generation in year *y*	Low	Combined margin CO2 emission factor for grid connected power generation in year y is calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated.
Turkey's Gross Electricity Generated by primary energy source for the five most recent years	Low	Turkey's Gross Electricity Generated by primary energy source for the five most recent years is calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated.
Net Calorific Values of Fossil Fuel Types	Low	Net Calorific Values of Fossil Fuel Types are calculated according to the methodology and validated by the DOE. For each crediting period, the data is recalculated.
Installed capacity of the project after the implementation	Low	The installed capacity of the project is equal to the total installed capacities of the equipment implemented at the beginning of the project's life. The installed capacity will be monitoredfrom supplier's documents related to the equipment.
Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full	Medium	The measuring will be based on the project design calculations where the reservoir area is calculated in relation to the water level in the reservoir. The graph showing the relation can be found in Annex 6.

Table 15: Quality Control of Monitoring

The first data to be monitored is the amount of electricity fed into the grid. There will be two meters attached to the power plant for measurement of the generated electricity. One of the meters is main meter and the other is control meter. The role of the second meter is to check if the main meter measures the generated electricity accurately. In all calculations, the main meter's measurements are used. The generated electricity will be measured continuously and reported on a monthly basis. The plant manager of Uzuncayir HEPP will be responsible for providing the measurement records which show the monthly electricity generation of the company.

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. The reservoir area is expected to be topped when the water flow is peaked. The area can be calculated by making coordinate readings around the border of the reservoir. The coordinate readings will be done when the water flow is at its highest level. Before the measurement of the coordinates, GPS device will be calibrated according to its calibration menu.

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

The management of Limak 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

4 GHG Emission Reductions:

4.1 Explanation of methodological choice:

The baseline for the project was established through the official methodology of ACM0002 / Version 11, named "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"[53] 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:

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

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

Where:

BE_y	Baseline emissions in year y (tCO_2)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y(MWh/yr)

[53] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

$EF_{grid,CM,y}$ Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the *"Tool to calculate the emission factor for an electricity system"*

Calculation of $EG_{PJ,y}$

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

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

Where:

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

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

Calculation of $EF_{grid,CM,y}$

According to the *"Tool to calculate the emission factor for an electricity system"*, Project participants shall apply the following six steps:

STEP 1.Identify the relevant electric power system.
STEP 2.Select an operating margin (OM) method.
STEP 3. Calculate the operating margin emission factor according to the selected method.
STEP 4. Identify the cohort of power units to be included in the build margin (BM).
STEP 5.Calculate the build margin emission factor.
STEP 6.Calculate the combined margin (CM) emissions factor.

STEP 1: Identify the relevant electricity system

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

In the project's case "the project electricity system" and "the connected system" are same. As also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.), the Turkish transmission system is interconnected. There is an independent regional grid system neither in Rize nor in Black Sea Region.

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

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

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

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

STEP 2: Choose whether to include 0ff-grid power plants in the project electricity system

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

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

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

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

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

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

All in all, option C of "Simple OM" method was adopted as "the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system" is the only available data in the host country.

Simple OM option C method is eligible when low cost and/or must run resources constitute, as an average of the five most recent years, less than 50 percent of the total generation for the grid. Nevertheless, the only relevant low operating cost and must run resource in Turkey is hydropower because the share of all other renewable resources is close to nil and therefore can be assumed negligible. The share of all non-hydro renewable resources in the entire electricity generation is 0.5 percent for the years between 2003 and 2008. There is no example of coal being used as must-run and nuclear energy is not practiced in Turkey.

As depicted in Table 20[54] the share of low-cost/must run resources were never higher than 50 percent in the last five years.

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

	2003	2004	2005	2006	2007	2008
Turkey's Gross Electiricity Production (GWh)	140.581	150.698	161.956	176.300	191.558	198.418
Electricity Production From Hydro (GWh)	35.330	46.084	39.561	44.244	35.851	33.270
Share (%)	25,1%	30,6%	24,4%	25,1%	18,7%	16,8%

Table 16*:* Share of hydroelectric production in Turkey, 2003 – 2008[55]

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

The Simple Operating Margin Emission Factor ($EF_{OM, y}$) is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO_2 /MWh) of all generating power plants serving the system, not including low-cost/must run power plants/units as determined by the Baseline Methodology.

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

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

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

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/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)
$EFCO_2$,i,y	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/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

In order to calculate the emission amounts from each fuel types, emission factors from IPCC website were used.[56] Three sets of emission factors were identified as minimum, medium and maximum values. To be conservative side, the minimum values are used in the OM calculations.

55 http://www.teias.gov.tr/istatistik2008/32(75-08).xls

[56] http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef_s1.php

	kg CO_2/GJ			Default Carbon Oxidation Factor
	min	mid	max	
hard coal	92,8	96,1	100,0	1,0
lignite	90,9	101,0	115,0	1,0
fuel oil	75,5	77,4	78,8	1,0
diesel oil	72,6	74,1	74,8	1,0
natural gas	54,3	56,1	58,3	1,0
lpg	61,6	63,1	65,6	1,0
naphta	69,3	73,3	76,3	1,0

Table 17: Emission factors from IPCC

Turkey's GHG Emissions Inventories for year 2006 and 2007 are announced by Turkish Statistical Institute (TUIK). However, to be on the conservative side, CO_2 emissions figures from electricity production are not taken from these announced figures, as the calculation method is not known and these figures are a bit higher than the calculated figures. [57, 58, 59] As a result, for years 2006, 2007 and 2008, the CO_2 emissions are calculated with the IPCC minimum values:
All in all;

	2006	2007	2008
CO_2 Emmission from Electricity Production (tons)	83.173.585	98.352.660	104.062.368

Table 18: CO_2 Emission of Turkey from Electricity Production

The calculation of net electricity production is demonstrated below. [60] 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 23 shows the overall gross/net relation where the estimated net electricity production from thermal resources were calculated by using the same relation.

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

Table 19: 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.

[57] http://www.tuik.gov.tr/PreHaberBultenleri.do?id=1996
[58] http://www.tuik.gov.tr/PreHaberBultenleri.do?id=4078
[59] http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=488
60 http://www.teias.gov.tr/istatistik2008/30(84-08).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. Based on the Simple Operating Margin Emission Factor formula, $EF_{OM,y}$ values for last three years are calculated as follows:

	2006	2007	2008
OM (MWh/tCO_2)	0,657	0,663	0,664

Table 20: OM Emission Factor for 2006 – 2008

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

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

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

As the weighted average of the figures between 2006 and 2008 is computed, the OM emission factor is 0,6615 tCO2 / MWh.

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

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

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

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

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

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

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

STEP 6: Calculate the build margin emission factor

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

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

Where:

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

There is no available CO_2 emission data for the power units included in the BM calculation. The available data for on plant basis is the name, type, installed capacity and annual electricity production figures of these facilities. However, there is no available data for the electricity production figures of some small facilities, most probably because these projects are included in the "Other Projects". Therefore, annual electricity productions of these facilities were calculated with the following formula unless the exact production figures are reached. The data used in the BM calculation is provided from the Turkey's Capacity Projection Reports published in years: 2009[61], 2008[62], 2007[63], 2006[64] and 2005[65].

$EG_{m,y}$= 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). Within the context of the calculation in this document, higher the efficiency figure means lower the CO_2 emissions (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).

Therefore, in the calculation of the $EF_{grid, BM, y}$, first $EF_{EL,m,y}$ values are calculated by using the formula (4) as suggested in the tool. Also, to calculate the $EF_{EL,m,y}$ values, the default efficiency figures listed under the "Appendix-1: Default efficiency factors for power plants" are used.

61 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf

62 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf

63 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf

64 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf

65 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202005.pdf

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

Table 21: Default Efficiency Factors for power plants (Appendix 1 of the tool)

As seen in the table above, the efficiency figures of coal, oil and natural gas, for different generation technologies, are given in the tool. In Turkey, the generation technologies for natural gas and oil is "Combined cycle" and for coal "Subcritical". Since the default values for lpg and naphta are not given in the tool, to be on the conservative side, the efficiency factors of these fuel types are assumed as 60% (equal to the highest efficiency figure / Efficiency figure for Natural Gas-Combined Cycle).

As a result, in line with the tool, the efficiency factors for each fuel type are assumed as presented in the table below:

Fuel Type	Generation Technology	Efficiency Factor
hard coal	Coal - Subcritical	39%
lignite	Coal - Subcritical	39%
fuel oil	Oil - Combined Cycle	46%
diesel oil	Oil - Combined Cycle	46%
natural gas	Natural Gas - Combined Cycle	60%
lpg	Natural Gas - Combined Cycle	60%
naphta	Natural Gas - Combined Cycle	60%

Table 22: Efficiency Factors used for BM Emission Factor Calculation

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. To be on the conservative side, minimum emission factors were used in the calculation.

Electric Efficiency Rates

Default efficiency factors given in the tool. (Please see table 25)
Equivalent Electricity Generation

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

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

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

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

The computations display a weighted Build Margin emission factor of 0.4576 tCO_2 / MWh..

STEP 7: Calculate the combined margin emissions factor

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor. The ACM0002 / Version 11 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: "Tool to calculate the emission factor for an electricity system, Version 02" for w_{OM} and w_{BM} for activities other than wind and solar power generation projects are 0.5 and 0.5, respectively.

$EF_{grid,\,CM,\,y}$ = 0.6615 x 0.5 + 0.4576 x 0.5

Therefore resulting $EF_{grid,CM,y}$ is 0.5596 tCO_2/MWh

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

According to the ACM0002, the generic equation for the calculation of emission reduction is:

$$ER_y = BE_y - PE_y$$

Where:

ER_y Emission reductions for the year y (tCO_2)
BE_y Baseline emissions for the year y (tCO_2)
PE_y Project emission for the year y (tCO_2)

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 not a geothermal power plant and also does not consume fossil fuels..

On the other hand, ACM0002 Version 11 suggests that project proponents shall account for CH4 and CO2 emissions for the reservoir.

The Project emissions are calculated with the formula mentioned in ACM0002 / Version11 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).

The power density of the project activity 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 = 82,000,000 W
CapBL = 0 (Justification: The project is a new hydro power plant)

APJ = 13,400,000 m²
ABL = 0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (82,000,000 – 0)/(13,400,000 – 0) = 6.119 W/m2

Therefore;

PE_y can not be assumed to be 0. According to ACM0002 Version 11 if the PD is greater than 4 and less than 10 the project emission for hydro plants can be calculated as;

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

Where:
$PE_{HP,y}$ = 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).

Therefore;

$PE_{HP,y}$ = 322,000,000*90/1000 = 28,980 tCO_2e/year

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

Accordingly the baseline emissions BE_y are calculated as following:

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

Where:

BEy Baseline emissions (tCO2e)
EGy Annual electricity supplied by the project to the grid (MWh)
EGbaseline 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.
EFgrid, CM, y Baseline emission factor (tCO2e/MWh)
Y Refers to a given year

EG_y = 322,000,000 MWh/year

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

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

BE_y = 0.5596 x (322,000,000 – 0) = 180,191tCO_2e

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

Under ***Section Error! Reference source not found.,*** the emission reductions (ER_y) and **project emissions (PE_y)** are calculated in line with the methodology. As a result, using thethese ER_y and PE_y values emission reductions are calculated.

The following table shows the ex-ante emission reductions calculations:

Total installed capacity	82,000
Net electricity delivered to the grid (EG_y)	322,000 MWh
Baseline emission factor (Combined Margin) of Turkish grid (EF_y) **$EF_y = W_{OM} * EF_{OM,y} + W_{BM} * EF_{BM,y}$**	0.6615 x 0.5 + 0.4576 x 0.5= 0,5596 tCO_2/MWh
Baseline emissions (BE_y)	tCO_2/year 322,000 * 0,5596 = 180,191 tCO_2/year
Project emissions (PE_y)	28,980 tCO_2/year
Leakage emissions (LE_y)	0 tCO_2/year
Emission reduction (ER_y)	151,211 tCO_2/year

Table 23: Ex-ante emission reductions calculations[66].

5 Environmental Impact:

The project was approved to be implemented in year 1985, way before the EIA concept was born, with the construction to be completed by the State Water Works (DSI, a public body responsible with water project development and application). Hence, the project preparation phase never included an EIA process. When the project owner took over the project in 2007, 99 percent of the construction had already been completed without an EIA and the project owner was exempt from conducting an EIA because their only duty was to reengineer the equipment design and finish the installation.

The project has no trans-boundary environmental and social impacts.

6 Stakeholders' comments:

Since Limak did not undertake the construction of the project, the company did not hold an official stakeholder participation meeting. However, the project managers had been open to face to face communications with local people in order to solve any problem that the project had caused. The ongoing communication is undertaken through stakeholder visits to the site or direct contact via telephone. For this purpose:

1- One of the religiously important visit point was moved to a higher location in order to save the location from remaining under the reservoir water.
2- The project provided some construction materials to surrounding villages for their infrastructure needs.
3- The project is planning to construct some recreational activity centers around the reservoir.

7 Schedule:

A feasibility study for the project was originally finalized in 1985 prepared by State Water Works (DSI). However, the construction of the project was initiated by DSI in 1993. Until 2005 99% of the construction of the project was completed by DSI. However, with the change in government policies towards energy production, the remaining investment could not be done by the state. The project was overtaken by Limak after the tender which was held on 12.09.2006. EMRA granted an electricity production license for the name of Limak in January 2007. Limak officially undertook the facility in April 2007 and re-started the

[66] Transmission & distribution losses are neglected in the emission reduction calculations as required by the methodology.

construction. The first unit of the project started electricity generation on December 2nd, 2009. The second unit was commenced on January 28th, 2010 and last, the project was fully commissioned on April 12th, 2010.

Events and action	Date
First Feasibility Report By DSI	1985
Construction Tender By DSI	November 26th 1993
Transfer Tender	September 12th 2006
Feasibility amendment report	October 2006
License Issuance	January 11th 2007
First VER consideration	April 2007
Official facility takeover	April 2007
Last EIA is not required decision	April 22nd 2010
Contract signature for electromechanical equipments	September 2007
First contacts with PDD consultants	June 2008
Contract with a PDD consultant	March 2010
Contact with a DOE	January 2010
Start of PDD elaboration	April 2010
Start of VER validation	April 2010
Commissioning of the first unit of the project	December 2009
Commissioning of the second unit of the project	January 2010
Fully commissioning of the power plant	April 2010
Project start date	January 2010
1 st Monitoring and Reporting	December 2010
2 nd Monitoring and Reporting	December 2011
3 rd Monitoring and Reporting	December 2012
4 th Monitoring and Reporting	December 2013
5th Monitoring and Reporting	December 2014
6 th Monitoring and Reporting	December 2015
7 th Monitoring and Reporting	December 2016
8th Monitoring and Reporting	December 2017
9th Monitoring and Reporting	December 2018
10th Monitoring and Reporting	December 2019

Table 24: Project's schedule

8 Ownership:

8.1 Proof of Title:

Please see Annex 2 for license.

The ownership of the emission reductions will be Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
All the equipments in the project are owned by Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi

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 Uzuncayir HEPP is located at Munzur River. The project is located within the province of Tunceli and it is situated in a valley. It will be constructed with the aim of utilization of river for electric energy production. According to the current Turkish legislation, the construction, operation and location of Uzuncayir HEPP should conform to the environmental protection law and standards. The laws and ordinances to which it should correspond are:

Turkey's environmental legislation[67]

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 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.

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

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 Behaviors

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[68], 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).

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.

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

ANNEX 2

Proof of Title

The document below explains that this license is provided to Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketifor operating of Uzuncayir HEPP project which is installed in Tunceli province for 45 years 4 months and 16 days duration, starting from 26/08/2010, in accordance with Energy Market Law and the Decision of Energy Market Regulatory Authority (Date: 26/08/2010, Number: 2728-1) (This license is provided to the company by getting through the license given to Limak İnşaat Sanayi ve Ticaret A.S. with 1054-2 numbered and 01/07/2007 dated decision)

T.C. ENERJİ PİYASASI
DÜZENLEME KURUMU

ÜRETİM LİSANSI

Lisans No : EÜ/2728-2/1686

Tarih : 26/08/2010

Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır.

Bu Lisans, **Limak Yatırım, Enerji Üretim İşletme Hizmetleri ve İnşaat Anonim Şirketi**'ne, Tunceli İli'nde kurulu olan **Uzunçayır Hidroelektrik Santralı** üretim tesisinde 26/08/2010 tarihinden itibaren 45 yıl 4 ay 16 gün süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 26/08/2010 tarihli ve 2728-1 sayılı Kararı ile verilmiştir. (Bu lisans, Limak İnşaat Sanayi ve Ticaret Anonim Şirketi'ne verilen 11/01/2007 tarihli ve EÜ/1054-2/771 numaralı üretim lisansı sonlandırılarak eskisinin devamı mahiyetinde verilmiştir.)

Hasan KÖKTAŞ
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	2008	2002	2003	2004	2005	2006	2007	2008
		GJ	GJ	GJ	GJ	GJ			CO_2 Emissions (t CO_2)						
EUAS															
	hard coal	19.201	18.585	16.500	19.933	23.316	25.393	23.086	1.717.819	1.662.756	1.476.216	1.783.371	2.086.031	2.271.822	2.065.429
	lignite	262.738	208.875	200.912	227.624	293.357	358.729	393.748	23.891.683	18.993.724	18.269.595	20.698.587	26.675.886	32.620.443	35.804.782
	fuel oil	23.044	12.766	9.906	14.763	16.684	28.860	39.666	1.740.601	964.225	748.231	1.115.073	1.260.228	2.179.863	2.996.086
	diesel oil	3.437	515	1.168	1.197	2.294	2.152	3.580	249.553	37.387	84.805	86.933	166.571	156.236	259.887
	natural gas	170.168	84.377	51.108	74.500	110.318	170.189	199.895	9.234.466	4.578.836	2.773.475	4.042.862	5.986.590	9.235.602	10.847.612
Autoproducers															
	hard coal	4.099	3.592	3.555	3.308		109.066	116.376	366.713	321.389	318.018	295.917	0	9.757.784	10.411.799
	imported coal	12.799	55.751	82.597	87.856	100.211			1.145.088	4.987.894	7.389.695	7.860.167	8.965.549	0	0
	lignite	12.975	14.574	15.592	17.178	58.050	61.291	59.377	1.179.850	1.325.285	1.417.800	1.562.093	5.278.678	5.573.355	5.399.367
	fuel oil	76.953	79.658	70.171	50.949	49.856	54.052	43.894	5.812.546	6.016.839	5.300.232	3.848.361	3.765.821	4.082.697	3.315.491
	diesel oil	50	63	46	21	331	13	1.980	3.648	4.559	3.344	1.520	24.013	912	143.774
	lpg	440	33	582	595	0	0	0	27.080	2.063	35.849	36.623	0	0	0
	naphta	9.852	10.580	9.198	3.676	590	494	473	682.712	733.197	637.449	254.748	40.910	34.237	32.786
	natural gas	124.176	121.409	147.886	110.561	520.164	579.872	591.649	6.738.634	6.588.452	8.025.288	5.999.768	28.227.558	31.467.710	32.106.834
Production companies															
	imported coal						0	0	0	0	0	0	0	0	0
	fuel oil	0	1.440	4.660	7.155	0	0	0	0	108.788	351.978	540.459	0	0	0
	diesel oil	21	4	0	0	0	0	0	1.520	304	0	0	0	0	0
	naphta	0	0	0	71	0	0	0	0	0	0	4.932	0	0	0
	natural gas	127.333	263.320	292.804	402.557	0	0	0	6.909.946	14.289.521	15.889.489	21.845.407	0	0	0
Mobile															
	fuel oil	27.344	20.787	11.062	7.586	3.668	6.829	2.717	2.065.383	1.570.146	835.514	573.032	277.029	515.792	205.242
	diesel oil	670	0	0	0	0	0	0	48.634	0	0	0	0	0	0
TOOR															
	lignite	42.161	42.860	38.967	42.048	0	0	0	3.833.847	3.897.427	3.543.358	3.823.568	0	0	0
	fuel oil	356	251	188	197	0	0	0	26.881	18.975	14.231	14.863	0	0	0
	diesel oil	38	29	21	0	0	0	0	2.736	2.128	1.520	0	0	0	0
		917.855	939.472	956.922	1.071.775	1.178.840	1.396.938	1.476.442	65.679.338	66.103.896	67.116.088	74.388.283	82.754.865	97.896.453	103.589.089

	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/tur_2008_crf_21aug.zip
Please see TUR-2008-2006-v1.1xls, sheet Table 1 A(b), column N

ANNEX 4

Recently Commissioned Power Plants

2008

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficiency	BM Emission Factor tCO2/MWh	CO_2 (tons)
MB Şeker Nişasta San. A.Ş. (Sultanhanı)	N.GAS	ANG	8,80	2008	60,0	54,3	0,20	44,9%	0,43	26,1
AKSA ENERJI (Antalya)	N.GAS	ANG	183,80	2008	1.290,0	54,3	0,20	44,9%	0,43	560,3
AKSA ENERJI (Manisa)	N.GAS	ANG	52,38	2008	370,0	54,3	0,20	44,9%	0,43	160,7
ANTALYA ENERJİ (ilave)	N.GAS	ANG	17,46	2008	122,3	54,3	0,20	44,9%	0,43	53,1
ATAÇ İNŞAAT SAN. A.S.B. (ANTALYTA)	N.GAS	ANG	5,40	2008	37,0	54,3	0,20	44,9%	0,43	16,1
BAHÇIVAN GIDA (LÜLEBURGAZ)	N.GAS	ANG	1,17	2008	8,0	54,3	0,20	44,9%	0,43	3,5
CAN ENERJİ (Çorlu - Tekirdağ) (İlave)	N.GAS	ANG	52,38	2008	304,2	54,3	0,20	44,9%	0,43	132,1
FOUR SEASONS OTEL (ATİK PASHA TUR	N.GAS	ANG	1,17	2008	7,0	54,3	0,20	44,9%	0,43	3,0
FRITOLAY GIDA San. Ve TİC. A.Ş. (İlave)	N.GAS	ANG	0,60	2008	4,0	54,3	0,20	44,9%	0,43	1,7
ITC-KA Enerji Üretim A.Ş. (Mamak((İlave)	ENEW.+WASTES	AR	14,13	2008	107,0	-	-	na	-	0,0
KARKEY (SİLOPİ-5) (154kV) (İlave)	F.OIL	AF	14,78	2008	103,2	75,5	0,27	21,6%	1,26	130,0
MELİKE TEKSTİL (GAZİANTEP)	N.GAS	ANG	1,58	2008	11,0	54,3	0,20	44,9%	0,43	4,8
MİSİS APRE TEKSTİL BOYA EN. SAN.	N.GAS	ANG	2,00	2008	14,0	54,3	0,20	44,9%	0,43	6,1
MODERN ENERJI (LİLEBURGAZ)	N.GAS	ANG	13,40	2008	94,1	54,3	0,20	44,9%	0,43	40,9
ORTADOĞU ENERJİ (ODA YERİ) (Eyip/İST.)	ENEW.+WASTES	AR	2,83	2008	22,0	-	-	na	-	0,0
POLAT TURZ. (POLAT RENAISSANCE	N.GAS	ANG	1,60	2008	11,0	54,3	0,20	44,9%	0,43	4,8
SARAYKÖY JEOTERMAL (Denizli)	GEOTHERMAL	AH	6,85	2008	50,0	-	-	na	-	0,0
YILDIZ SUNTA (Uzunçiftlik-Köseköy)(Düzelt)	N.GAS	ANG	22,63	2008	146,5	54,3	0,20	44,9%	0,43	63,6
SÖNMEZ Elektrik (İlave)	N.GAS	ANG	8,73	2008	67,3	54,3	0,20	44,9%	0,43	29,2
ALP ELEKTRİK TINAZTEPE / ANTALYA	HYDRO	AH	7,69	2008	29,0	-	-	na	-	0,0
CANSU ELEKTRİK (Murgul/Artvin)	HYDRO	AH	9,18	2008	47,0	-	-	na	-	0,0
ÇELDERE ELK. (ÇALDERE HES)	HYDRO	AH	8,74	2008	35,0	-	-	na	-	0,0
DAREN HES ELEKTRİK	HYDRO	AH	49,70	2008	182,0	-	-	na	-	0,0
DEĞİRMENÜSTÜ EN. (Kahramanmaraş)	HYDRO	AH	25,70	2008	69,0	-	-	na	-	0,0
GÖZEDE HES (TEMSA ELEKTRİK) Bursa	HYDRO	AH	2,40	2008	10,0	-	-	na	-	0,0
H.G.M. Enerji (KEKLİCEK HES)	HYDRO	AH	8,67	2008	18,0	-	-	na	-	0,0
HAMZALI HES (TURKON MNG ELEKTRİK)	HYDRO	AH	16,70	2008	117,0	-	-	na	-	0,0
HİDRO KNT. (YUKARI MANAHOZ Reg. Ve Hes)	HYDRO	AH	22,40	2008	79,0	-	-	na	-	0,0
İÇ-EN ELK. (ÇALKIŞLA REG. Ve HES)	HYDRO	AH	7,66	2008	18,0	-	-	na	-	0,0
KALEN ENERJİ (KALEN II Reg. Ve Hes)	HYDRO	AH	15,65	2008	50,0	-	-	na	-	0,0
MARAŞ ENERJİ (FIRNIS Reg. Ve HES)	HYDRO	AH	7,22	2008	36,0	-	-	na	-	0,0
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	HYDRO	AH	21,04	2008	96,0	-	-	na	-	0,0
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	HYDRO	AH	21,58	2008	108,0	-	-	na	-	0,0
TORUL	HYDRO	EH	105,60	2008	322,0	-	-	na	-	0,0
YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	HYDRO	AH	0,82	2008	5,0	-	-	na	-	0,0
ZORLU ENERJİ (MERCAN)	HYDRO	AH	1,28	2008	4,9	-	-	na	-	0,0
BAKİ ELEKTRİK ŞAMLI RÜZGAR	WIND	AR	21,00	2008	104,0	-	-	na	-	0,0
DATÇA RES	WIND	AR	8,10	2008	24,0	-	-	na	-	0,0
ERTÜRK ELEKTRİK Çatalca RES	WIND	AR	60,00	2008	210,0	-	-	na	-	0,0
INNORES ELEKTRİK Yuntdağ RÜZG. (Aliağa)	WIND	AR	42,50	2008	161,0	-	-	na	-	0,0
LODOS RES (Taşoluk)	WIND	AR	24,00	2008	85,0	-	-	na	-	0,0
SAYALAR RÜZGAR	WIND	AR	30,60	2008	97,0	-	-	na	-	0,0
SEBENOBA (Deniz Elk.)	WIND	AR	31,20	2008	100,0	-	-	na	-	0,0

2007

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficiency	BM Emission Factor tCO2/MWh	CO_2 (tons)
HABAŞ (Aliağa - İlave)	N.GAS	ANG	9,10	2007	72,8	54,3	0,20	44,9%	0,43	31,6
MODERN ENERJI	N.GAS	ANG	5,20	2007	38,7	54,3	0,20	44,9%	0,43	16,8
ARENKO	N.GAS	ANG	0,10	2007	0,8	54,3	0,20	44,9%	0,43	0,3
ALTINMARKA GIDA	N.GAS	ANG	0,10	2007	0,8	54,3	0,20	44,9%	0,43	0,3
TEKBOY ENERJI	N.GAS	ANG	0,10	2007	0,7	54,3	0,20	44,9%	0,43	0,3
VELSAN AKRILIK	N.GAS	ANG	0,10	2007	0,6	54,3	0,20	44,9%	0,43	0,3
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kadıköy	N.GAS	ANG	0,50	2007	4,0	54,3	0,20	44,9%	0,43	1,7
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kozyatağı	N.GAS	ANG	0,60	2007	5,0	54,3	0,20	44,9%	0,43	2,2
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Bursa	N.GAS	ANG	1,30	2007	11,0	54,3	0,20	44,9%	0,43	4,8
AKATEKS	N.GAS	ANG	1,80	2007	14,0	54,3	0,20	44,9%	0,43	6,1
FLOKSER TEKSTIL / Poliser Tesisi	N.GAS	ANG	2,10	2007	17,0	54,3	0,20	44,9%	0,43	7,4
FLOKSER TEKSTIL / Süetser Tesisi	N.GAS	ANG	2,10	2007	17,0	54,3	0,20	44,9%	0,43	7,4
FRITOLAY GIDA	N.GAS	ANG	0,50	2007	4,0	54,3	0,20	44,9%	0,43	1,7
KIVANÇ TEKSTİL	N.GAS	ANG	3,90	2007	33,0	54,3	0,20	44,9%	0,43	14,3
KİL-KAN Kil San. Ve Tic	N.GAS	ANG	3,20	2007	25,0	54,3	0,20	44,9%	0,43	10,9
SÜPERBOY BOYA SAN.	N.GAS	ANG	1,00	2007	8,0	54,3	0,20	44,9%	0,43	3,5
SWISS OTEL	N.GAS	ANG	1,60	2007	11,0	54,3	0,20	44,9%	0,43	4,8
TAV Esenboğa	N.GAS	ANG	3,90	2007	33,0	54,3	0,20	44,9%	0,43	14,3
NUH ENERJİ-2	N.GAS	ANG	73,00	2007	514,0	54,3	0,20	44,9%	0,43	223,3
AKTEKS	F.OIL	AF	0,80	2007	5,4	75,5	0,27	21,6%	1,26	6,7
UŞAK ŞEKER	LIGNITE	AL	1,70	2007	10,1	90,9	0,33	27,2%	1,20	12,2
BOĞAZLIYAN ŞEKER	N.GAS+NAPHTHA	ANG	16,40	2007	101,7	54,3	0,20	44,9%	0,43	44,2
KARTONSAN	N.GAS+NAPHTHA	ANG	5,00	2007	40,0	54,3	0,20	44,9%	0,43	17,4
ESKİŞEHİR END. ENERJİ	N.GAS+NAPHTHA	ANG	3,50	2007	26,8	54,3	0,20	44,9%	0,43	11,6
ESKİŞEHİR ŞEKER	N.GAS+NAPHTHA	ANG	2,90	2007	18,0	54,3	0,20	44,9%	0,43	7,8
İGSAŞ	N.GAS+NAPHTHA	ANG	2,20	2007	15,2	54,3	0,20	44,9%	0,43	6,6
DESA	N.GAS+NAPHTHA	ANG	0,70	2007	5,6	54,3	0,20	44,9%	0,43	2,4
DENTAŞ	N.GAS+NAPHTHA	ANG	0,30	2007	2,3	54,3	0,20	44,9%	0,43	1,0
SÜPER FİLMCİLİK	N.GAS+NAPHTHA	ANG	0,10	2007	0,8	54,3	0,20	44,9%	0,43	0,3
ATAER ENERJİ	N.GAS+NAPHTHA	ANG	0,10	2007	0,6	54,3	0,20	44,9%	0,43	0,2
BİL ENERJİ	N.GAS+NAPHTHA	ANG	0,10	2007	0,7	54,3	0,20	44,9%	0,43	0,3
ITC-KA	ENEW.+WASTES	AR	1,40	2007	11,1	-	-	na	-	0,0
BIS ENERJİ Bursa ilave	N.GAS	ANG	43,00	2007	354,8	54,3	0,20	44,9%	0,43	154,1
ALİAĞA ÇAKMAKTEPE	N.GAS	ANG	34,80	2007	278,0	54,3	0,20	44,9%	0,43	120,8
BİS ENERJİ Bursa DÜZELTİLME	N.GAS	ANG	28,30	2007	233,5	54,3	0,20	44,9%	0,43	101,4
BIS ENERJİ Bursa ilave	N.GAS	ANG	48,00	2007	396,1	54,3	0,20	44,9%	0,43	172,0
BOSEN ENERJİ	N.GAS	ANG	142,80	2007	1.071,0	54,3	0,20	44,9%	0,43	465,2
SAYENERJİ ELEKTRİK	N.GAS	ANG	5,90	2007	47,0	54,3	0,20	44,9%	0,43	20,4
T ENERJİ ÜRETİM A.Ş.	N.GAS	ANG	1,60	2007	13,0	54,3	0,20	44,9%	0,43	5,6
ZORLU ENERJİ Kayseri	N.GAS	ANG	7,20	2007	55,0	54,3	0,20	44,9%	0,43	23,9
SİİRT	F.OIL	AF	25,60	2007	190,0	75,5	0,27	21,6%	1,26	239,4
MARDİN KIZILTEPE	F.OIL	AF	34,10	2007	250,0	75,5	0,27	21,6%	1,26	315,0
KAREN	F.OIL	AF	24,30	2007	180,0	75,5	0,27	21,6%	1,26	226,8
İDİL 2 (PS3 A-2)	F.OIL	AF	24,40	2007	180,0	75,5	0,27	21,6%	1,26	226,8
BORÇKA HES	HYDRO	EH	300,60	2007	1.039,0	-	-	na	-	0,0
TEKTUĞ (KEBAN DERESİ)	HYDRO	AH	5,00	2007	32,0	-	-	na	-	0,0
YPM Ener. Yat. A.Ş. Altıntepe Hidro	HYDRO	AH	4,00	2007	18,0	-	-	na	-	0,0
YPM Ener. Yat. A.Ş. Beypınar Hidro	HYDRO	AH	3,60	2007	18,0	-	-	na	-	0,0
YPM Ener. Yat. A.Ş. Konak Hidro	HYDRO	AH	4,00	2007	19,0	-	-	na	-	0,0
KURTEKS Tekstil (KARASU HES - Andırın)	HYDRO	AH	2,40	2007	19,0	-	-	na	-	0,0
IŞKUR TEKSTIL (SULEYMANLI HES)	HYDRO	AH	4,60	2007	18,0	-	-	na	-	0,0
ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta)	HYDRO	AH	6,30	2007	27,0	-	-	na	-	0,0
ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta) İlave	HYDRO	AH	6,30	2007	27,0	-	-	na	-	0,0
ANEMON EN: ELEK. ÜRETİM A.Ş.	WIND	AR	8,00	2007	24,2	-	-	na	-	0,0
ANEMON EN: ELEK. ÜRETİM A.Ş. İlave	WIND	AR	15,20	2007	46,0	-	-	na	-	0,0
ANEMON EN: ELEK. ÜRETİM A.Ş. İlave	WIND	AR	7,20	2007	21,8	-	-	na	-	0,0
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	WIND	AR	4,00	2007	12,9	-	-	na	-	0,0
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	WIND	AR	10,90	2007	35,1	-	-	na	-	0,0
DENİZ ELEK. ÜRETİM Ltd. Şti. (Karakurt)	WIND	AR	10,80	2007	28,0	-	-	na	-	0,0
MARE MMANASTIR RÜZGAR ENERJİ	WIND	AR	11,2	2007	36,9	-	-	na	-	0,0
MARE MMANASTIR RÜZGAR ENERJİ	WIND	AR	20,00	2007	65,8	-	-	na	-	0,0

2006

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficieny	BM Emission Factor tCO2/MWh	CO_2 (tons)
EKOTEN TEKSTİL GR-I	N.GAS	ANG	1,93	16.02.2006	14,0	54,3	0,20	44,9%	0,43	6,1
ERAK GİYİM GR-I	N.GAS	ANG	1,37	22.02.2006	10,0	54,3	0,20	44,9%	0,43	4,3
ALARKO ALTEK GR-III	N.GAS	ANG	21,89	23.02.2006	158,3	54,3	0,20	44,9%	0,43	68,8
AYDIN ÖRME GR-I	N.GAS	ANG	7,52	25.02.2006	60,0	54,3	0,20	44,9%	0,43	26,1
NUH ENERJİ-2 GR II	N.GAS	ANG	26,08	02.03.2006	180,1	54,3	0,20	44,9%	0,43	78,2
MARMARA ELEKTRİK (çorlu) GR-I	N.GAS	ANG	8,73	13.04.2006	63,0	54,3	0,20	44,9%	0,43	27,4
MARMARA PAMUK (Corlu) GR-I	N.GAS	ANG	8,73	13.04.2006	63,0	54,3	0,20	44,9%	0,43	27,4
ENTEK (Köseköy) GR IV	N.GAS	ANG	47,62	14.04.2006	391,3	54,3	0,20	44,9%	0,43	169,9
ELSE TEKSTİL (Çorlu) GR I-II	N.GAS	ANG	3,16	15.04.2006	25,0	54,3	0,20	44,9%	0,43	10,9
BARES IX GRUP	WIND	AR	13,50	20.04.2006	47,3	-	-	na	-	0,0
SÖNMEZ ELEKTRİK (Çorlu) GR I - II	N.GAS	ANG	17,46	03.05.2006	126,0	54,3	0,20	44,9%	0,43	54,7
DENİZLİ ÇİMENTO (DÜZELTME)	N.GAS	ANG	0,45	04.05.2006	3,2	54,3	0,20	44,9%	0,43	1,4
MENDERES ELEKTRİK GR I	GEOTHERMAL	AH	7,95	10.05.2006	56,0	-	-	na	-	0,0
KASTAMONU ENTEGRE BALIKSİR GR-I	N.GAS	ANG	7,52	24.05.2006	54,0	54,3	0,20	44,9%	0,43	23,5
BARES X. VE XX. GRUPLAR	WIND	AR	16,50	26.05.2006	57,8	-	-	na	-	0,0
BOZ ENERJİ GR-I	N.GAS	ANG	8,73	09.06.2006	70,0	54,3	0,20	44,9%	0,43	30,4
ADANA ATIK SU ARITMA TESİSİ	ENEW.+WASTES	AR	0,80	09.06.2006	6,0	-	-	na	-	0,0
AMYLUM NİŞASTA (ADANA)	N.GAS	ANG	14,25	09.06.2006	34,0	54,3	0,20	44,9%	0,43	14,8
ŞIK MAKAS (Çorlu) GR-I	N.GAS	ANG	1,58	22.06.2006	13,0	54,3	0,20	44,9%	0,43	5,6
ELBİSTAN B GR-III	LIGNITE	EL	360,00	23.06.2006	2.340,0	90,9	0,33	35,1%	0,93	2.180,9
ANTALYA ENERJİ GR I - II - III - IV	N.GAS	ANG	34,92	29.06.2006	245,0	54,3	0,20	44,9%	0,43	106,4
HAYAT TEM. VE SAĞLIK GR I - II	N.GAS	ANG	15,04	30.06.2006	108,0	54,3	0,20	44,9%	0,43	46,9
EKOLOJİK EN. (Kemerburgaz) GR I	ENEW.+WASTES	AR	0,98	31.07.2006	6,0	-	-	na	-	0,0
EROĞLU GİYİM (Çorlu) GR-I	N.GAS	ANG	1,17	01.08.2006	9,0	54,3	0,20	44,9%	0,43	3,9
CAM İŞ ELEKTRİK (Mersin) GR I	N.GAS	ANG	126,10	13.09.2006	1.008,0	54,3	0,20	44,9%	0,43	437,8
ELBİSTAN B GR II	LIGNITE	EL	360,00	17.09.2006	2.340,0	90,9	0,33	35,1%	0,93	2.180,9
YILDIZ ENT. AĞAÇ (Kocaeli) GR I	N.GAS	ANG	6,18	21.09.2006	40,0	54,3	0,20	44,9%	0,43	17,4
ÇERKEZKÖY ENERJİ GR I	N.GAS	ANG	49,16	06.10.2006	390,0	54,3	0,20	44,9%	0,43	169,4
ENTEK (Köseköy) GR V	N.GAS	ANG	37,00	03.11.2006	304,0	54,3	0,20	44,9%	0,43	132,0
ITC-KA EN. MAMAK TOP.M. GR I-II-III	ENEW.+WASTES	AR	4,24	03.11.2006	30,0	-	-	na	-	0,0
ELBİSTAN B GRUP IV	LIGNITE	EL	360,00	13.11.2006	2.340,0	90,9	0,33	35,1%	0,93	2.180,9
MARE MANASTIR RÜZGAR (X GRUP)	WIND	AR	8,00	08.12.2006	25,0	-	-	na	-	0,0
ÇIRAĞAN SARAYI GR I	N.GAS	ANG	1,32	01.12.2006	11,0	54,3	0,20	44,9%	0,43	4,8
ERTÜRK ELEKTRİK Tepe RES GR I	WIND	AR	0,85	22.12.2006	2,0	-	-	na	-	0,0
AKMAYA (Lüleburgaz) GR I	N.GAS	ANG	6,91	23.12.2006	50,0	54,3	0,20	44,9%	0,43	21,7
BURGAZ (Lüleburgaz) GR I	N.GAS	ANG	6,91	23.12.2006	54,0	54,3	0,20	44,9%	0,43	23,5
SEYHAN I-II	HYDRO	EH	0,30	20.02.2006	1,7	-	-	na	-	0,0
ŞANLIURFA GR I-II	HYDRO	EH	51,80	01.03.2006	124,0	-	-	na	-	0,0
BEREKET ENERJİ GÖKYAR HES 3 Grup	HYDRO	AH	11,62	05.05.2006	43,3	-	-	na	-	0,0
MOLU EN. Zamantı Bahçelik GR I - II	HYDRO	AH	4,22	31.05.2006	16,7	-	-	na	-	0,0
SU ENERJİ BALIKESİR GR I - II	HYDRO	AH	4,60	27.06.2006	20,7	-	-	na	-	0,0
BEREKET EN. MENTAŞ REG. GR I - II	HYDRO	AH	26,60	31.07.2006	108,7	-	-	na	-	0,0
EKİN (Başaran Hes) (Nazilli)	HYDRO	AH	0,60	11.08.2006	4,5	-	-	na	-	0,0
ERE (Sugözü Reg. Ve Kızıldüz HES)	HYDRO	AH	15,43	08.09.2006	31,6	-	-	na	-	0,0
ERE (AKSU REG. VE ŞAHMALLAR HES)	HYDRO	AH	14,00	16.11.2006	26,7	-	-	na	-	0,0
TEKTUĞ (KALEALTI) GR I - II	HYDRO	AH	15,00	30.11.2006	52,0	-	-	na	-	0,0
BEREKET EN. MENTAŞ REG. GR III	HYDRO	AH	13,30	13.12.2006	54,4	-	-	na	-	0,0

2005

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficiency	BM Emission Factor tCO2/MWh	CO_2 (tons)
BOSEN GR-III	N.GAS	ANG	51,02	30.12.2005	372,8	54,3	0,20	44,9%	0,43	161,9
KARKEY (SİLOPİ-4) GR-V	F.OIL	AF	6,75	23.12.2005	51,9	75,5	0,27	21,6%	1,26	65,3
AKÇA ENERJİ GR-III	N.GAS+NAPHTHA	ANG	8,73	14.12.2005	65,5	54,3	0,20	44,9%	0,43	28,5
KAHRAMANMARAŞ KAĞIT GR-I	IMPORTED COAL	AHC	6,00	08.12.2005	45,0	88,7	0,32	44,1%	0,72	32,6
PAK GIDA	N.GAS	ANG	5,67	07.12.2005	45,0	54,3	0,20	44,9%	0,43	19,5
KORUMA KLOR GR I-II-III	N.GAS	ANG	9,60	03.12.2005	77,0	54,3	0,20	44,9%	0,43	33,4
İÇDAŞ ÇELİK GR-I	IMPORTED COAL	AHC	135,00	30.11.2005	1.080,0	88,7	0,32	44,1%	0,72	782,4
KÜÇÜKÇALIK TEKSTİL GR I-II-III-IV	N.GAS	ANG	8,00	27.11.2005	64,0	54,3	0,20	44,9%	0,43	27,8
ZORLU ENERJİ YALOVA GR I-II	N.GAS	ANG	15,93	26.11.2005	122,0	54,3	0,20	44,9%	0,43	53,0
HABAŞ ALİAĞA GR-V	N.GAS	ANG	23,00	24.11.2005	184,0	54,3	0,20	44,9%	0,43	79,9
GRANİSER GRANİT GR-I	N.GAS	ANG	5,50	14.11.2005	42,0	54,3	0,20	44,9%	0,43	18,2
MOSB GR I-II-III-IV-V-VI-VII	N.GAS	ANG	84,83	11.11.2005	434,0	54,3	0,20	44,9%	0,43	188,5
AK ENERJİ(K.paşa) GR- III	N.GAS	ANG	40,00	09.11.2005	256,9	54,3	0,20	44,9%	0,43	111,6
ZORLU ENERJİ KAYSERİ GR-IV	N.GAS	ANG	38,63	26.10.2005	294,9	54,3	0,20	44,9%	0,43	128,1
ALTEK ALARKO GR I-II	N.GAS	ANG	60,10	14.10.2005	420,0	54,3	0,20	44,9%	0,43	182,4
AYKA TEKSTİL GR-I	N.GAS	ANG	5,50	24.09.2005	40,0	54,3	0,20	44,9%	0,43	17,4
HABAŞ ALİAĞA GR IV	N.GAS	ANG	44,62	21.09.2005	357,0	54,3	0,20	44,9%	0,43	155,0
EVYAP GR I-II	N.GAS	ANG	5,12	27.08.2005	30,0	54,3	0,20	44,9%	0,43	13,0
ÇEBİ ENERJİ BT	N.GAS	ANG	21,00	27.08.2005	164,7	54,3	0,20	44,9%	0,43	71,5
CAN ENERJİ GR-I	N.GAS	ANG	3,90	25.08.2005	28,0	54,3	0,20	44,9%	0,43	12,2
NOREN ENERJİ GR-I	N.GAS	ANG	8,73	24.08.2005	70,0	54,3	0,20	44,9%	0,43	30,4
ÇEBİ ENERJİ GT	N.GAS	ANG	43,37	23.08.2005	340,1	54,3	0,20	44,9%	0,43	147,7
YAMULA GRUP I-II	HYDRO	EH	100,00	31.07.2005	422,0	-	-	na	-	0,0
ZORLU ENERJİ KAYSERİ GR-I-II-III	N.GAS	ANG	149,87	22.07.2005	1.144,1	54,3	0,20	44,9%	0,43	496,9
BEREKET EN. (DALAMAN) GR XIII-XIV-XV	HYDRO	AH	7,50	15.07.2005	35,8	-	-	na	-	0,0
ETİ MAD.(BAN.ASİT)GR-I	ENEW.+WASTES	AR	11,50	15.07.2005	88,0	-	-	na	-	0,0
ZEYNEP GİYİM SAN. GR-I	N.GAS	ANG	1,17	07.07.2005	9,0	54,3	0,20	44,9%	0,43	3,9
KARKEY (SİLOPİ-4) GR-IV	F.OIL	AF	6,15	30.06.2005	47,2	75,5	0,27	21,6%	1,26	59,5
AKBAŞLAR GR-II(İZOLE)	N.GAS	ANG	9,00	24.06.2005	71,3	54,3	0,20	44,9%	0,43	31,0
MODERN ENERJİ (DG) GR-III	N.GAS	ANG	8,38	14.06.2005	61,1	54,3	0,20	44,9%	0,43	26,6
MODERN ENERJİ (DG+LPG) GR-II	N.GAS+LPG	ANG	7,68	13.06.2005	56,0	54,3	0,20	44,9%	0,43	24,3
MODERN ENERJİ (DG+LPG) GR-II (DÜZELTME	N.GAS+LPG	ANG	4,50	13.06.2005	32,8	54,3	0,20	44,9%	0,43	14,3
MURATLI GR I-II	HYDRO	EH	115,00	03.06.2005	444,0	-	-	na	-	0,0
HABAŞ ALİAĞA GR III	N.GAS	ANG	44,62	02.06.2005	356,9	54,3	0,20	44,9%	0,43	155,0
HAYAT KAĞIT GR-I	N.GAS	ANG	7,53	27.05.2005	56,0	54,3	0,20	44,9%	0,43	24,3
TEZCAN GALVANİZ GR I-II	N.GAS	ANG	3,66	27.05.2005	29,0	54,3	0,20	44,9%	0,43	12,6
YONGAPAN(KAST.ENTG) GR-II	N.GAS	ANG	5,20	25.05.2005	35,8	54,3	0,20	44,9%	0,43	15,6
NUH ENERJİ-2 GR I	N.GAS	ANG	46,95	24.05.2005	319,7	54,3	0,20	44,9%	0,43	138,9
İÇTAŞ ENERJİ (Yukarı Mercan) GR I-II	HYDRO	AH	14,19	22.05.2005	44,0	-	-	na	-	0,0
AK ENERJİ(K.paşa) GR I-II	N.GAS	ANG	87,20	30.04.2005	560,1	54,3	0,20	44,9%	0,43	243,3
TEKTUĞ (Kargılık) GR I-II	HYDRO	AH	23,90	25.04.2005	83,0	-	-	na	-	0,0
SUNJÜT(RES) GR I-II	WIND	AR	1,20	23.04.2005	2,0	-	-	na	-	0,0
KAREGE GR IV-V	N.GAS	ANG	18,06	07.04.2005	141,9	54,3	0,20	44,9%	0,43	61,6
BİS ENERJİ GR VII	N.GAS	ANG	43,70	18.03.2005	287,6	54,3	0,20	44,9%	0,43	124,9
ÇAN GR I (EÜAŞ)	LIGNITE	EL	160,00	15.03.2005	1.040,0	90,9	0,33	35,1%	0,93	969,3
ÇAN GR I (EÜAŞ)	LIGNITE	EL	160,00	15.02.2005	1.040,0	90,9	0,33	35,1%	0,93	969,3
ELBİSTAN-B GR I (EÜAŞ)	LIGNITE	EL	360,00	15.02.2005	2.340,0	90,9	0,33	35,1%	0,93	2.180,9
ENTEK ELK.A.Ş.KOÇ ÜNİ.GR I-II	N.GAS	ANG	2,33	07.02.2005	19,0	54,3	0,20	44,9%	0,43	8,3
BAYDEMİRLER GR IV-V-VI	N.GAS	ANG	6,21	04.02.2005	49,3	54,3	0,20	44,9%	0,43	21,4
MERCEDES BENZ TURK GR I-II-III-IV	N.GAS	ANG	8,28	04.02.2005	68,0	54,3	0,20	44,9%	0,43	29,5
METEM ENERJİ (Hacışıramat) GR I-II	N.GAS	ANG	7,83	29.01.2005	58,0	54,3	0,20	44,9%	0,43	25,2
METEM ENERJİ (Peliklik) GR I-II-III	N.GAS	ANG	11,75	29.01.2005	89,0	54,3	0,20	44,9%	0,43	38,7

2004

Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO_2 EF (ton/TJ)	tCO_2/MWh *	Facility Energy Efficiency	BM Emission Factor tCO2/MWh	CO_2 (tons)
ALTINMARKA GIDA GR I-II-III	N.GAS	ANG	3,60	17.12.2004	28,8	54,3	0,20	44,9%	0,43	12,5
KARKEY-II 3+3 DGM	FUEL-OIL	AF	54,30	12.11.2004	370,0	75,5	0,27	21,6%	1,26	466,3
STANDART PROFİL 3 GM	N.GAS	ANG	6,74	22.10.2004	49,2	54,3	0,20	44,9%	0,43	21,4
HABAŞ ALİAĞA GRUP I-II	N.GAS	ANG	89,23	08.10.2004	713,7	54,3	0,20	44,9%	0,43	310,0
AYEN OSTİM ENERJİ ÜRETİM(BT)	N.GAS	ANG	9,89	01.10.2004	84,0	54,3	0,20	44,9%	0,43	36,5
KOMBASSAN KAĞ. MATBAA GIDA	N.GAS	ANG	5,50	24.09.2004	35,7	54,3	0,20	44,9%	0,43	15,5
BEREKET EN.(Feslek Hes) Gr-1-2	HYDRO	AH	9,48	05.08.2004	41,0	-	-	na	-	0,0
ÇELİK ENERJİ ÜR.ŞTİ. 2 GM	N.GAS	ANG	2,42	09.07.2004	19,0	54,3	0,20	44,9%	0,43	8,3
BESLER GR-2, BT (5,2+7,5)	N.GAS	ANG	12,70	07.07.2004	95,3	54,3	0,20	44,9%	0,43	41,4
ŞAHİNLER ENERJİ 1 GM	N.GAS	ANG	3,20	29.06.2004	24,9	54,3	0,20	44,9%	0,43	10,8
ENERJİ-SA ADANA 1 BT	NAPHTA	AN	49,77	23.06.2004	373,3	69,3	0,25	32,5%	0,77	286,3
BİS ENERJİ 2 GT	N.GAS	ANG	73,04	16.06.2004	602,6	54,3	0,20	44,9%	0,43	261,8
AYEN OSTİM ENERJİ ÜRETİM	N.GAS	ANG	31,08	11.06.2004	264,1	54,3	0,20	44,9%	0,43	114,7
KOMBASSAN KAĞIT GIDA VE TEKS	N.GAS	ANG	5,50	09.06.2004	38,1	54,3	0,20	44,9%	0,43	16,5
GÜL ENERJİ GR-II	FUEL-OIL	AF	12,50	03.06.2004	93,8	75,5	0,27	21,6%	1,26	118,2
TEKBOY TEKSTİL 1 GM	N.GAS	ANG	2,25	18.05.2004	16,0	54,3	0,20	44,9%	0,43	6,9
ÇOLAKOĞLU(KAPASİTE ARTIRIMI)	IMPORTED COAL	AHC	45,00	05.05.2004	347,8	88,7	0,32	44,1%	0,72	252,0
İSKUR TEKSTİL(SÜLEYMANLI) GR I-II	HYDRO	AR	4,60	28.04.2004	17,9	-	-	na	-	0,0
ELTA ELK(DODURGA) GR-I-II-III-IV	HYDRO	AR	4,14	26.04.2004	12,3	-	-	na	-	0,0
TANRIVERDİ 4 GM	N.GAS	ANG	4,66	24.03.2004	38,7	54,3	0,20	44,9%	0,43	16,8
ERE(BİR KAPILI HES) GRUP-I	HYDRO	AR	48,50	11.03.2004	170,5	-	-	na	-	0,0
ATATEKS 2 GM	N.GAS	ANG	5,63	20.02.2004	45,0	54,3	0,20	44,9%	0,43	19,5
ENTEK GR-IV	N.GAS+NAPHTA	ANG	31,13	12.02.2004	233,5	54,3	0,20	44,9%	0,43	101,4
ANKARA D.G.(BAYMİNA) GR-I-II-III	N.GAS	ANG	798,00	08.01.2004	6.500,0	54,3	0,20	44,9%	0,43	2.823,3

ANNEX 5

EIA Requirement

The documents below explain that the project and quarries defined under the feasibility dated October 1987 are all exempt from EIA requirement in line with the regulation dated 23.06.1997 numbered 23087 and the regulation dated 16.12.2003 numbered 25318

29-NOV-2007 15:36 FROM DSI ETUD VE PLAN.D.BSK. TO 44688810 P.02/03

T.C.
ÇEVRE VE ORMAN BAKANLIĞI
Devlet Su İşleri Genel Müdürlüğü Etüd ve Plan Dairesi Başkanlığı

Sayı : B 18 1 DSI 0 10 16 00 / 130.Ç.02/ 13048

29 Kasım 2007

Konu : Uzunçayır Barajı ve HES Projesi
Malzeme Ocakları

LİMAK İNŞ. SAN. TİC. A.Ş.
Hafta Sokak No:9 G O.P./ANKARA

İLGİ : 26.11.2007 tarihli dilekçeniz.

İlgi dilekçenizde, Tunceli İli sınırları içerisinde yapımı devam eden Uzunçayır Barajı ve HES Projesinin inşasında kullanılacak yurtdışından temin edilecek malzemelere Yatırım Teşvik Belgesi alınması için tesisin ÇED Raporu gerektiğinden bahisle ÇED durumuyla ilgili bilgi talep edilmektedir.

Uzunçayır Baraj ve HES Projesine yönelik ÇED muafiyeti 2000 yılında, malzeme ocaklarına yönelik ÇED muafiyeti ise 2004 yılında alınmış olup yazımız ekinde tarafınıza sunulmaktadır.

Bilgilerinizi rica ederim.

Akif ÖZKALDI
Genel Müdür a.
Genel Müdür Yardımcısı

EK:
-ÇED muaf yazısı(1 sayfa)

DSİ Genel Müdürlüğü Etüd ve Plan Daire Bşk
İsmet İnönü Bulvarı 06100 Yücetepe ANKARA
Tel: (0312) 418 34 06 Faks: (0312) 417 13 78
Elektronik Ağ. www.dsi.gov.tr

Ayrıntılı Bilgi için irtibat.
Tel: (0312) 417 83 00

.

T.C. ÇEVRE VE ORMAN BAKANLIĞI
ÇEVRESEL ETKİ DEĞERLENDİRMESİ VE PLANLAMA GENEL MÜDÜRLÜĞÜ
Endüstriyel Yatırımlar ÇED Dairesi Başkanlığı

SAYI : B.18.0.ÇED.0.13.00.03/ 3376
KONU : Uzunçayır Barajı ve HES Projesi Malzeme Ocakları.

03 HAZİRAN 2004

29041

DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜNE

İLGİ: Devlet Su İşleri Genel Müdürlüğünün 10.05.2004 tarih ve B.15.1.DSİ.0.10.16.00/123.Ç.-2239 sayılı yazısı.

İlgide kayıtlı yazıda; Tunceli İli sınırları içerisinde yapımı devam eden Uzunçayır Barajı ve HES Projesi için gereken malzemenin temin edilmesi amacıyla 3 (üç) adet Geçirimsiz, 2 (iki) adet Geçirimli ve 5 (beş) adet de Kaya Malzemesi Ocağı olmak üzere 10 (adet) Malzeme Ocağının ÇED Yönetmeliğinin Geçici 3. maddesi kapsamında değerlendirilip değerlendirilemeyeceği hususunda görüş talep edilmektedir.

Uzunçayır Barajı ve HES Projesi 01.05.2000 tarihinde, 23.06.1997 tarih ve 23028 sayılı ÇED Yönetmeliği'nin Geçici 4. maddesi gereğince Yönetmelik kapsamı dışında değerlendirilmiştir.

İlgide kayıtlı yazı ve eklerinin incelenmesi neticesinde, 07.02.1993 tarihinden önce projeye dahil (entegre) olması nedeniyle, sözkonusu proje için gereken malzemenin temin edilmesi amacıyla açılması planlanan ve projenin Ekim 1987 tarihli "Doğal Yapı Gereçleri Raporu" bölümünde isim ve yerleri belirtilen 10 adet malzeme ocağı, sözkonusu baraj ve HES projesi ile birlikte, yürürlükte bulunan 16.12.2003 tarih ve 25318 sayılı ÇED Yönetmeliğinin Geçici 3. maddesi gereğince Yönetmelik kapsamı dışında değerlendirilmiştir.

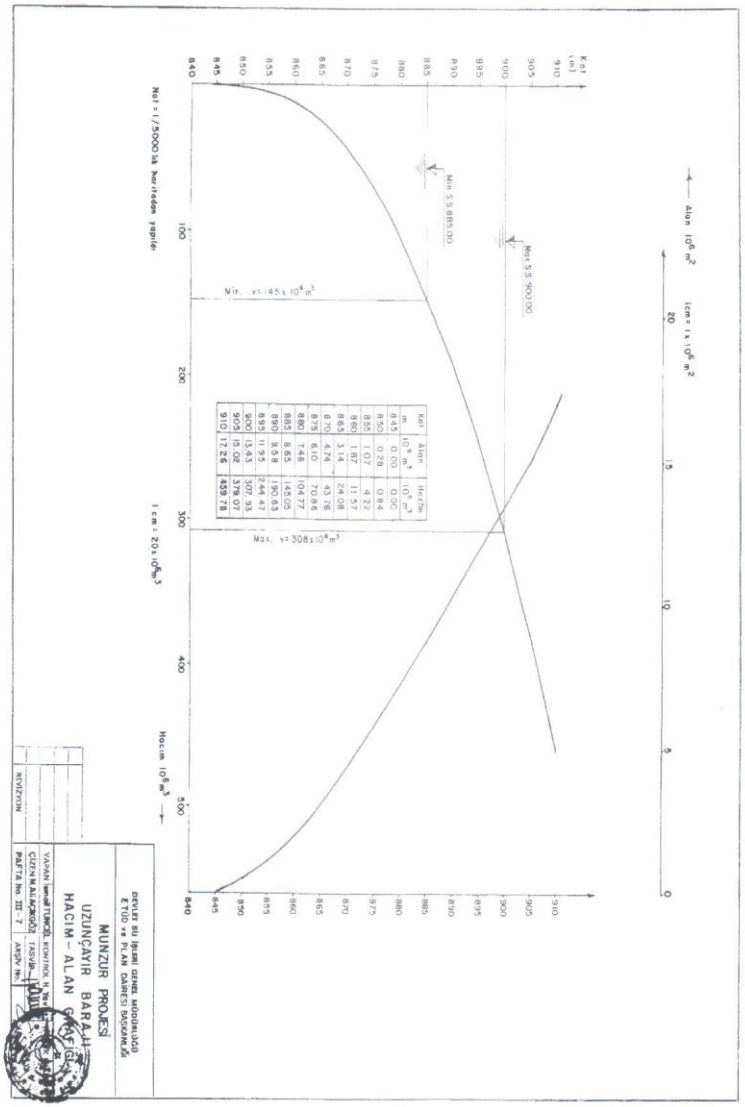
Bilgilerinizi ve gereğini rica ederim.

Osman TÜZÜN
Bakan a.
Genel Müdür

DAĞITIM:
- Tunceli Valiliği
  (İl Çevre ve Orman Müdürlüğü)
- Devlet Su İşleri Genel Müdürlüğü

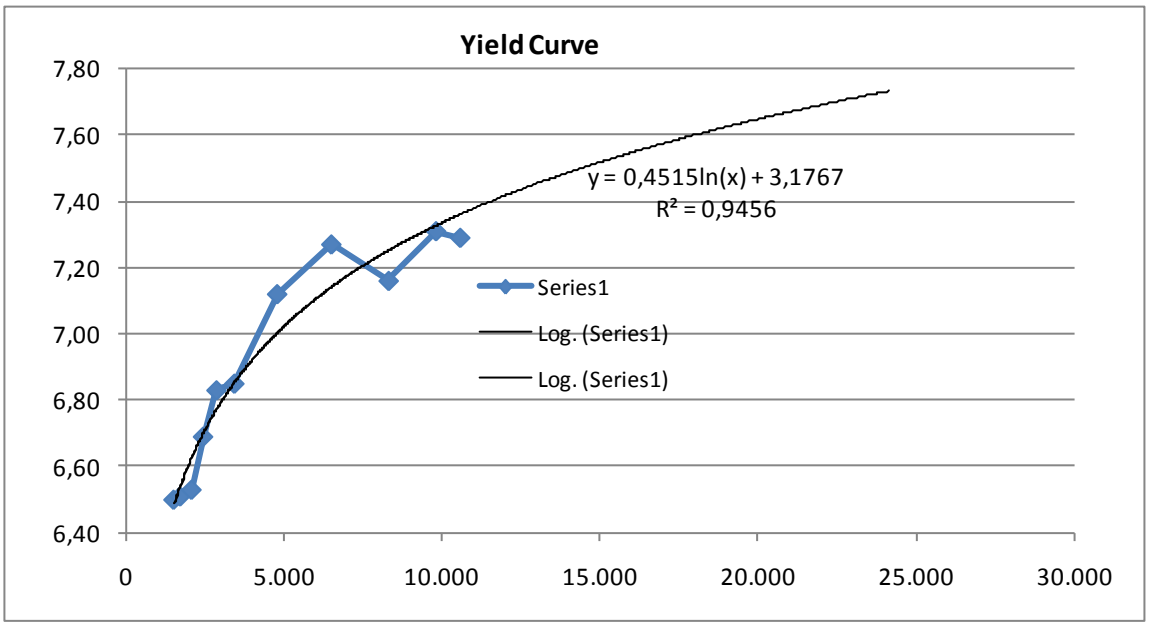
ANNEX 6

Reservoir Area in Relation to the Water Level



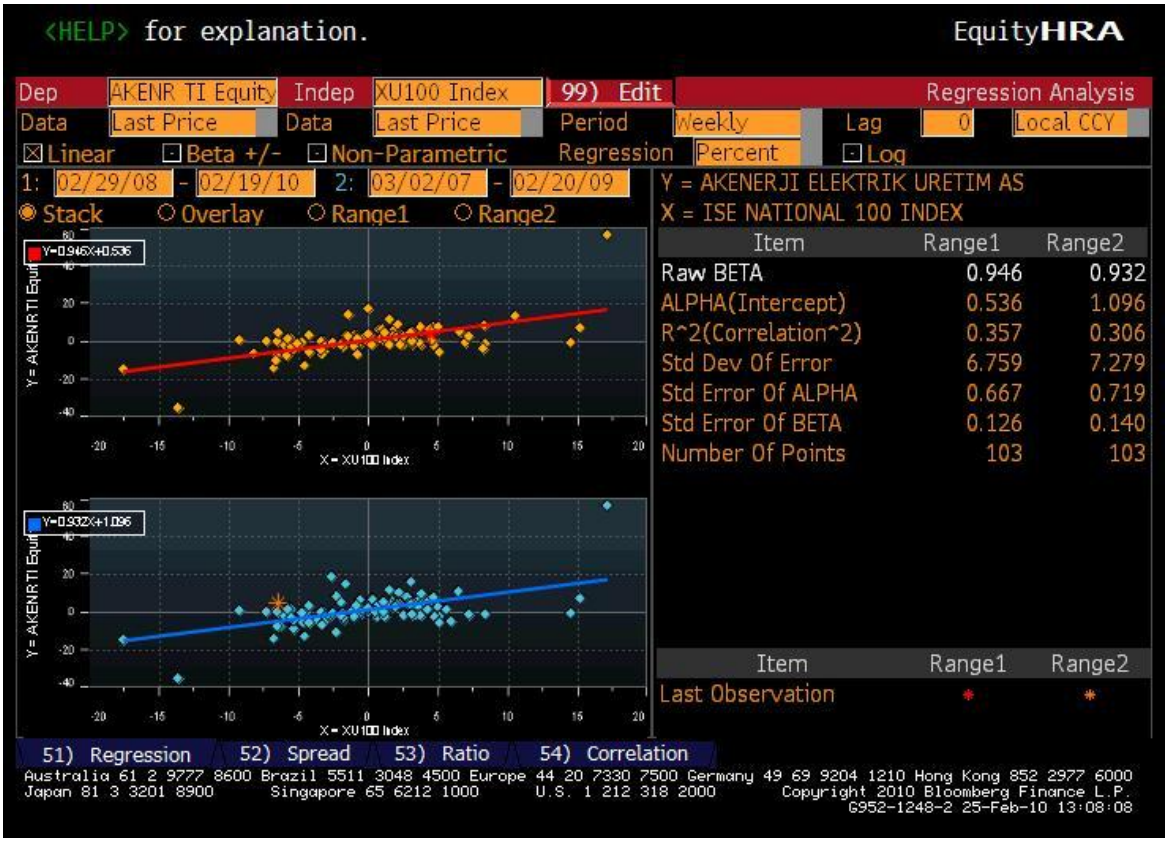
ANNEX 7

Yield curve



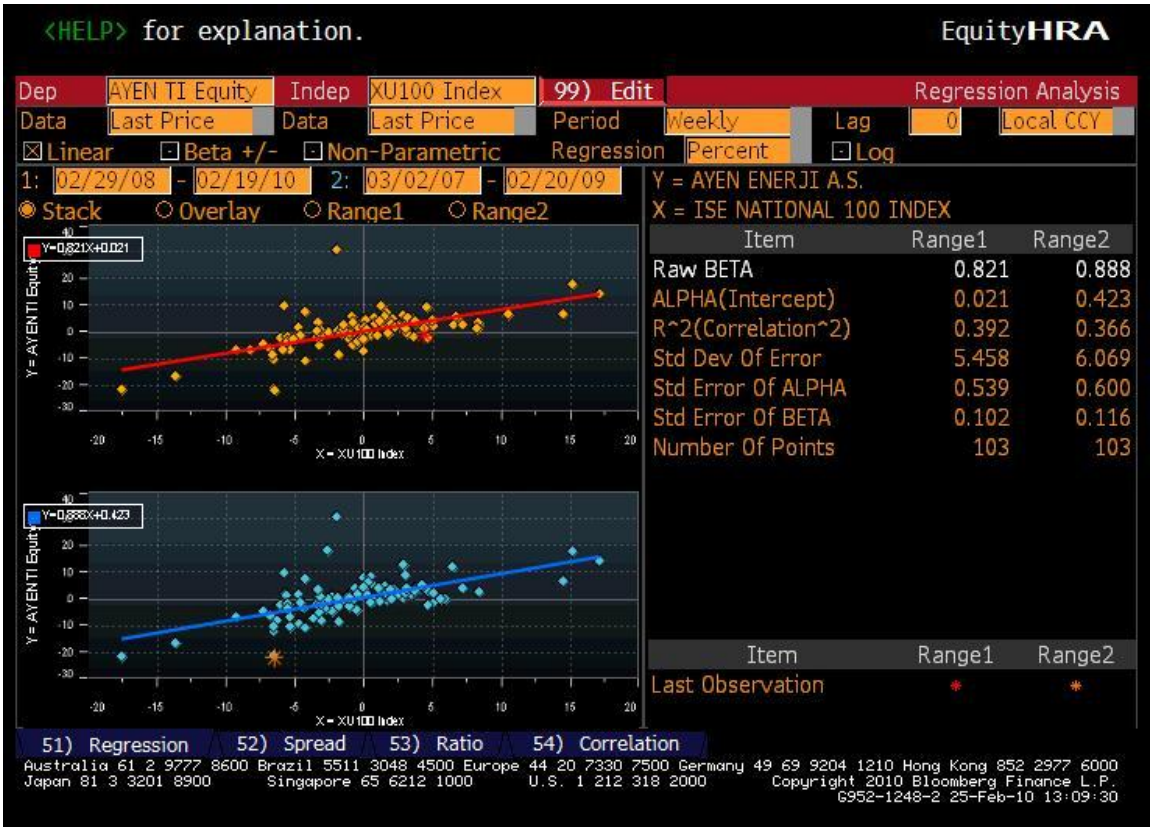
Beta Values of the energy companies traded in ISE 100 derived from Bloomberg:

AK ENERJI



AKSU ENERJI

AYEN



ZORLU ENERJI