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

CONTENTS

Annexes

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

"Kavakçalı Small Scale Hydro Power Project, Turkey"

Document Version: 12
Date of completion: 10 February 2012

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

Pak Enerji Üretim Sanayi ve Ticaret A.Ş. (Pak Enerji) plans to invest into a Greenfield small scale hydro power plant project i.e. **Kavakçalı HPP (below than 15 MW)** which will generate electricity and feed it into the public grid. Kavakçalı HPP project shall be registered as a Voluntary Emission Reduction project in order to enable the project implementation by means of financial inflows coming from the credits sale. Because of its significant contribution to climate protection and to sustainable development in the region, this project is expected to fulfill the requirements of the Gold Standard.

The installed Capacity of Kavakçalı HPP is **8.90 MW_e** and annual energy yield is estimated to be **39,021 MWh**. Proposed project activity will generate electricity using renewable small-scale hydro energy and will transfer it to the national electricity system (grid).

The project will help Turkey to stimulate and commercialize the use of grid connected renewable energy technologies and markets. Furthermore, the project will demonstrate the viability of grid connected small scale hydro projects which can support improved energy security, improved air quality, alternative sustainable energy futures, improved local livelihoods and sustainable renewable energy industry development. The specific goals of the project are to:

- reduce greenhouse gas emissions in Turkey compared to the business-as-usual scenario;
- help to stimulate the growth of the small scale hydro power industry in Turkey;
- create local employment during the construction and the operation phase of the small hydro project;
- reduce other pollutants resulting from power generation industry in Turkey, compared to a business-as-usual scenario;
- help to reduce Turkeys increasing energy deficit;
- and differentiate the electricity generation mix and reduce import dependency.

The emission reductions will be generated by substituting electricity produced from the conventional mix representing electricity generation for the Turkish grid, which to a relevant extent depends on fossil fuels. The emission reductions will be calculated based on the Combined Margin (CM) emission factor.

Other than the objective of climate change mitigation through significant reduction in greenhouse gas (GHG) emissions, the project has been carried out to provide social and economical contribution to the region in a sustainable way. The benefits that will be gained by the realization of the project compared to the business-as-usual scenario can be summarized under four main indicators:

Environmental
In the absence of the project activity, an equivalent amount of electricity would have to be generated from the power plants connected to the grid, majority of which are based on fossil fuels. Thus the project is

replacing the anthropogenic emissions (CO_2, CH_4) and other pollutants (SO_X, NO_X, particulate matters) occurring from extraction, processing, transportation and burning of fossil fuels for power generation connected to the national grid. Also, by reduction in the consumption of these fuels, it contributes to conservation of water, soil, plant and animal ecosystems and transfers these natural resources and also the additional supply of these primary energy sources to the future generations.

Economical
The project will help to accelerate the growth of the small-scale hydropower industry and stimulate the designation and production of renewable energy technologies in Turkey. Other entrepreneurs irrespective of sector will be encouraged to invest in small-scale hydropower. It will assist to reduce Turkey's increasing energy deficit and diversify the electricity generation mix while reducing import dependency. Rural development will be maintained in the areas around the project site by providing infrastructural investments to these remote villages.

Social
The project will enhance local employment during the construction and the operation phase of the small scale hydro project and result in alleviation of poverty and unemployment by increased job opportunities in a diversified range from engineers to simple workers in the vicinity of the project area. Construction materials for the foundations, cables and other auxiliary equipment will preferentially be sourced locally. Rural electrification will be more reliable, available and cost efficient thanks to the decreasing distances between the generation and consumption points.

Technological
Implementation of the proposed project will contribute to wider deployment of small scale hydro power technology on the local and national level. It will demonstrate the viability of grid connected small scale hydro projects, which will support improved energy security, alternative sustainable energy, and also renewable energy industry development.

The "do no harm assessment" table and "sustainable development" matrix in the Gold Standard Passport provide detail information about the project's contribution to sustainable development in the light of Local Stakeholder Consultation meeting results and Environmental Impact Assessment report. The results from the in-depth assessment of environmental and social impacts confirm the positive influence of the project on all the discussed domains.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey (host country)	Pak Enerji Üretim Sanayi ve Ticaret A.Ş. (Pak Enerji) (private)	No

Pak Enerji is private project developer and owner of the project.

The Republic of Turkey is the host country. Turkey ratified the Kyoto Protocol (on 5th February of 2009) and put in effect on 13th May 2009[1]. Turkish National Focal Point to the UNFCCC is the Ministry of Environment and Forestry[2].

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

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

A.4.1.1. Host Party(ies):

The host country is Republic of Turkey.

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

The project will be located in the South-West of Turkey. It is in Aegean Region of Turkey, within the borders of Muğla city, in Fethiye district at Namnam River.

A.4.1.3. City/Town/Community etc:

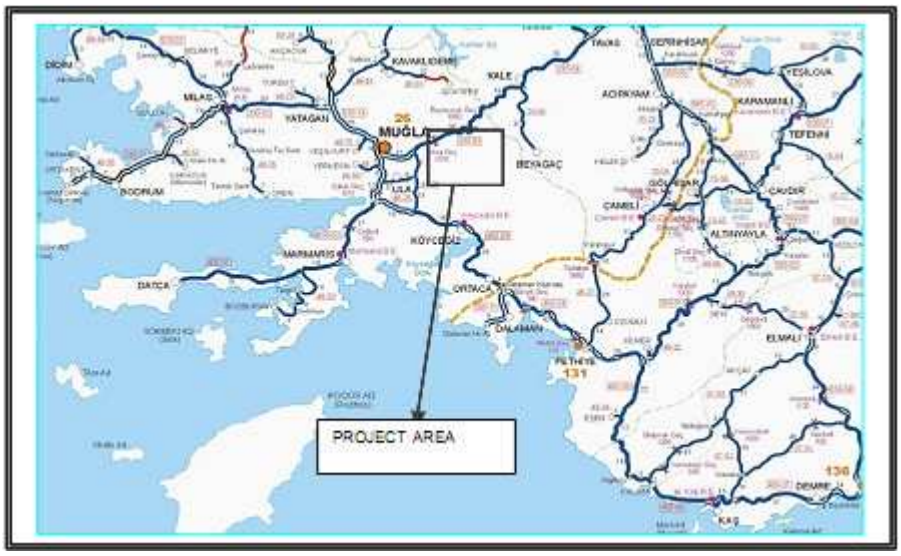
The project is within the borders of Muğla city.

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

The project site is located in Aegean Region of Turkey, within the borders of Muğla city, in Fethiye district. Location of the project is given below in the Map 1.

[1] See, Official Gazette: http://rega.basbakanlik.gov.tr/main.aspx?home=http://rega.basbakanlik.gov.tr/eskiler/2009/05/20090513.htm&main=http://rega.basbakanlik.gov.tr/eskiler/2009/05/20090513.htm (link in 'Milletlerarası Sözleşme' part)

[2] See, UNFCCC, list of the National Focal Points: http://maindb.unfccc.int/public/nfp.pl?mode=wim



Map 1: General Layout Plan of the project and location of main bodies

The geographical coordinates of the main bodies of the project activity are presented in the table below.

Table 1: Geographical coordinates of the two main project bodies

Bodies of the Project	Latitude (N)	Longitude (E)
Weir	37° 4' 47.1" N	28° 39' 13.7" E
Power Plant	37° 7' 24.1" N	28° 45' 21.8" E

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project type is *'Type (I): Renewable energy projects*' and project cateorgy is '*D.Electricity generation for a system'*.

The 8.90 MWe small scale Kavakçalı HPP will use potential energy of water to produce electricity and transmit to the national grid.
The project is located in a steep topography in dense forest. The weir is located in a deep valley and a service road has to be constructed for access of the workforce and for the construction machinery. The conveyance canal (11,880 m in length) runs through the right bank of the valley in a steep topography in a dense forest. The penstock is located also in forested terrain on a steep slope. The powerhouse is located approximately on the right bank of the Namnam river and a service road has to be constructed for access. Water resource of Kavakçalı HPP project is the Derindere River, upstream name of Namnam River. Derindere flows will be transmitted to the headpond by the power channel and then to the Kavakçalı HPP by the penstock for energy generation. The structures involved in the project are Kavakçalı Weir on Namnam River, at 956.0 m thalweg and 959.0 m crest elevation; 11,880 m long conveyance channel, headpond, 1,880 m long penstock and Kavakçalı HPP powerhouse on the right bank with 956.5 m turbine axis elevation.
The power generation comprises two Turbines. The type will be Pelton vertical axis with a nominal speed of 1000 rpm, which is the best fit for this head and flow rate. The unit discharge rate is 1.50 m^3/s. The energy, produced in Kavakçalı HPP shall be transmitted to Muğla DM switchyard through a transmission line. The line will be 30 km long and the type will be 31,5 kV 477 MCM. The total annual electricity production of the project activity is expected to be 39,021 MW/yr. The annual power generation will be 39,021 MWh/yr. The detail Technical Characteristics of Kavakçalı HPP are given Table 2 and Single Line Diagram is given in Figure 1.

Table 2 : Technical Characteristics of Kavakçalı HPP

Kavakçalı Weir	
Crest elevation	: 959 m
Crest Length	: 15.00 m
Type	: Tyrol
Thalweg elevation	: 956 m
Height From Thalweg	: 3.00 m
Q_{100} Design Flood	: 106.40 m^3/s
Water Intake	
Type	: Tyrol
Length of Tyrol Trashrack	: 15.00 m
Settling Pond	
Length	: 60.00 m
Width	: 5.00 m
Number of Chambers	: 1
Power Channel	
Location	: Right bank
Section	: rectangular section
Length	: 11 880.00 m
Bottom Slope	: 0.0004
Headpond	
Location	: Right bank
Width	: 20.00 m
Length	: 18.00 m
Penstock	
Diameter	: 1.15
No.of Penstock	: 1
Length (aligned)	:1 880.00 m
Kavakçalı HPP	
Head Elevation	: 951.17 m (Headpond Normal Water Level)
Turbine Axis Elevation	: 516.21 m (for Q =3.00 m3/s) (Tailwater Level)
Gross Head	: 431.85 m (for QProject =3.00 m3/s)
Net Head	: 414.04 m (for QProject =3.00 m3/s)
Project (Max.) Discharge	: 3.00 m3/s
Turbine	
Type	: Pelton
Rotation (n)	: 1000 rpm
Number of Turbines	: 2
Unit Discharges	: 1.50 m^3/s
Unit Power	: 4.45 MWe
Installed Power	: 8.90 MWe
Generator	
Number of Generators	: 2
Power	: 6 056 kVA

Type	: synchronized
Power Factor	: 0.90/ 0.91
Frequency	: 50 Hz
Energy Generation	
Firm Energy	: 7.413 GWh
Secondary Energy	: 36.876 GWh
Total Energy	: 39.021 GWh

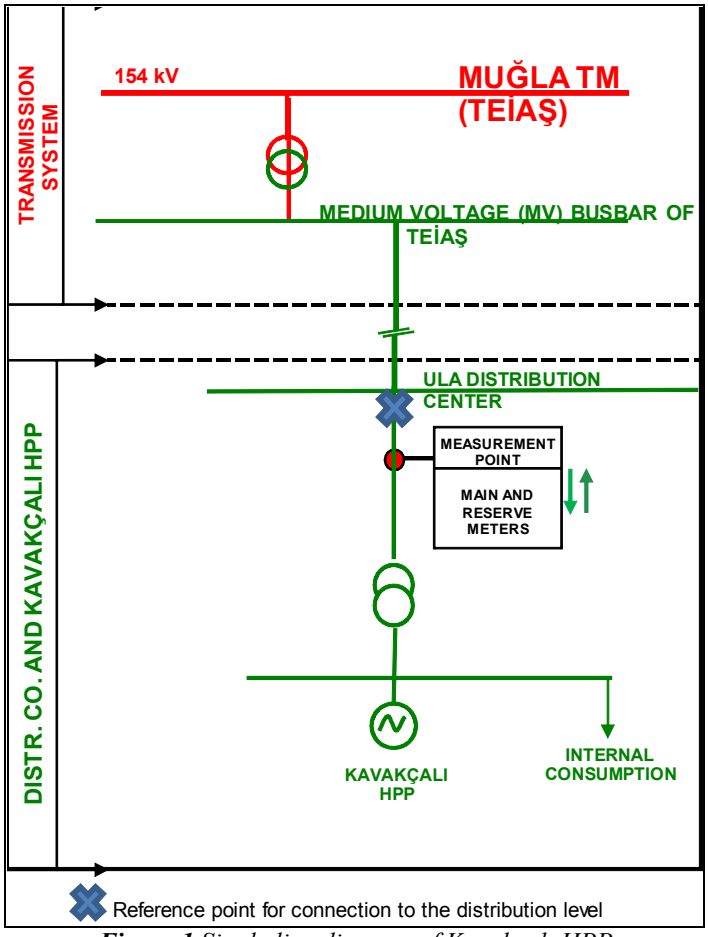


Figure 1 *Single line diagram of Kavakçalı HPP*

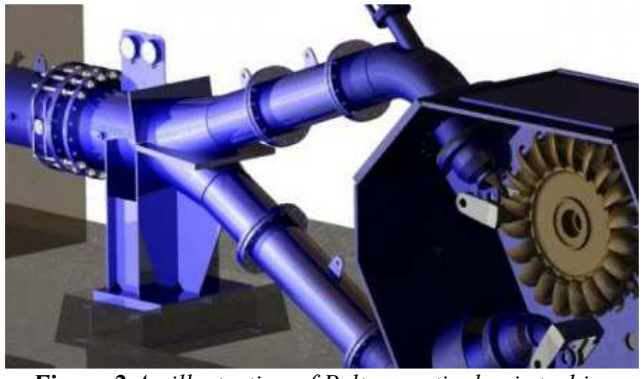


Figure 2 *An illustration of Pelton vertical axis turbine*

Harnessing the hydro energy to generate electricity with electromechanical equipments (turbine and generator systems) is reliable and proven technology and being widely used in the world. Therefore, environmentally safe and sound technology and know-how is being applied by the project activity interalia technology transfer.

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

Table 3: Estimated amount of emission reductions over the crediting period

Years	**Annual estimation of emission reductions [tCO_2e]**
2013*	17,890
2014	21,468
2015	21,468
2016	21,468
2017	21,468
2018	21,468
2019	21,468
2020**	4,294
Total emission reductions (tonnes of CO_2 e)	**150,992**
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	21,468

* 10 months of operation
** 2 months of operation

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

The project activity does not receive any public funding or Official Development Assistance (ODA) funding.

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

Following the '*Determining the Occurrence of Debundling*' decision tree in '*Compendium of guidance on the debundling for SSC project activities*'[3] (which is referred by Appendix C of the simplified modalities and procedures for the small-scale CDM project activities), since proposed project activity is the first emission reduction (VER) project of proposed project participant Pak Enerji Üretim Sanayi ve Ticaret A.Ş., there is not any registered Small Scale CDM (or VER) project activity of proposed project participant and therefore the proposed Small Scale project activity is not deemed to be a debundled component of a large project activity.

[3] See, http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17_v01.pdf (page 4)

SECTION B. Application of a baseline and monitoring methodology

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

Version 16 of 'AMS-I.D: Grid Connected Renewable Electricity Generation' is applied as baseline and monitoring methodology to the project activity.[4]

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

AMS-I .D methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)[5].

Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology::

- The project activity is implemented in an existing reservoir with no change in the volume of reservoir;
- The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2;
- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.

The choice of methodology AMS-I.D, Version 16, is justified as the project activity meets its applicability criteria:

- Kavakçalı HPP is a greenfield grid connected small-scale hydro power plant with 8.90 MW_e installed capacity. Installed capacity is below appropriate equivalent of limit for small-scale project activity, which is 15 MW_e for power generation activities[6]. According to approved feasibility report of the project, there is no extension plan and installed power will not exceed 15 MW[7].
- The project activity results in new reservoir and power density of the power plant is greater than 4 W/m^2 [8].

Hence, proposed project activity falls in '*Type (I): renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts (or an appropriate equivalent)'* and category '*D: Electricity generation for a system'*. AMS-I.D is the approved methodology for application to the projects, which falls in Type (I) and category (D).

B.3. Description of the project boundary:

[4] See, http://cdm.unfccc.int/methodologies/DB/Q3VOK1HPBFTLSP7ZXFMY8R8Y4BEVJX

[5] See http://cdm.unfccc.int/methodologies/DB/Q3VOK1HPBFTLSP7ZXFMY8R8Y4BEVJX (pg 1)

[6] See, http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf (page 2, paragraph 7-(b)).

[7] Kavakçalı Feasibility Report dated September 2009

[8] Please see Section B.6.3 for the calculations.

According to methodology AMS-I.D version 16, the project boundary encompasses the physical, geographical site of the renewable generation source.

B.4. Description of baseline and its development:

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

The electricity delivered to the grid is mainly provided from thermal power plants and comparatively smaller share of renewable resources. Historically, tremendously increasing electricity demand of the nation has been provided by building thermal power plants. In the absence of the proposed project activity, the same amount of electricity is required to be supplied via existing power plants or via new thermal power plants.

The baseline emissions are the products of electrical energy baseline $EG_{BL,y}$ expressed in kWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

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

Where,

BE_y : Baseline Emissions in year y; tCO_2

$EG_{BL,y}$: Energy baseline in year y, kWh

EF_{CO2} : CO_2 Emission Factor in year y; tCO_2e/kWh

The emission factor can be calculated in a transparent and conservative manner as follows:

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

Or

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Baseline considered is indeed the most conservative among the equally convincing baseline options, i.e. the other baseline approach mentioned in AMS I.D. (weighted average emissions of the current generation mix) does not lead to a lower grid emission factor than the combined margin approach considered in the PDD in accordance with the GS conservativeness principle. Emission factor becomes 0.5446 with weighted average method and 0.5502 with CM factor method. Since the difference (approximately 1%) is not material, grid factor calculation tool is used to calculate emission factor. Option (a) is chosen for the project activity. To describe the baseline and its development, long-term electricity demand and supply projections for Turkey are assessed.

Demand for electricity in Turkey is growing rapidly with average 5.72%[9] for previous ten years. TEİAŞ, who is responsible from the grid reliability has prepared an electricity demand projection for next ten years period (2009-2018) for Turkey and announced on June 2009, given in Table 4 and Figure 3, reflecting the continuation of current demand growth[10].

Table 4: Low and High Demand Projection Scenarios for Ten Years Period (TWh)

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

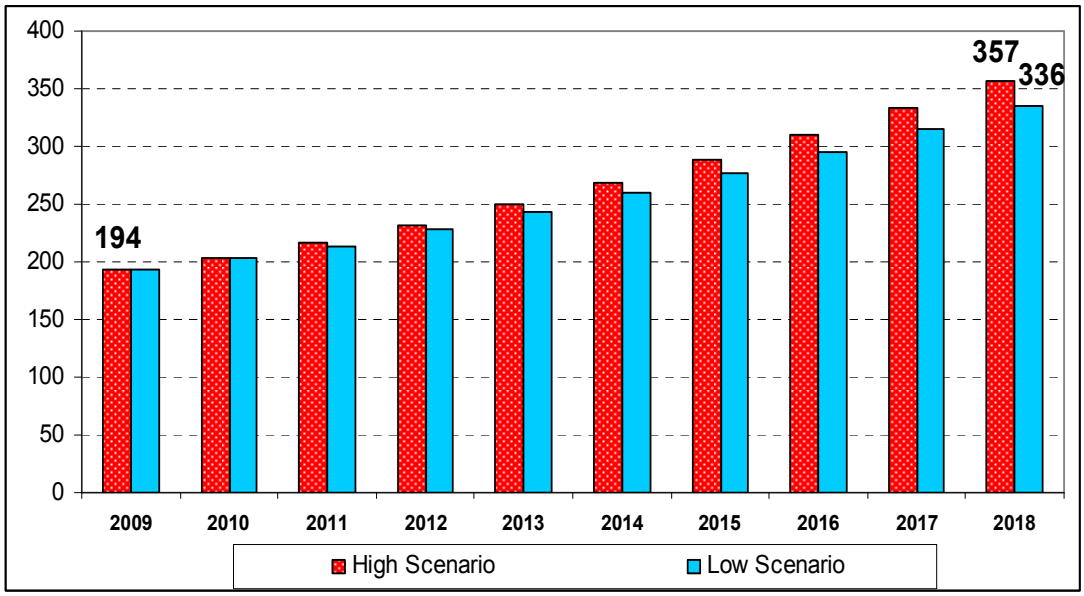


Figure 3 *Electricity Demand Projections for Ten Years*

In this projection, electricity supplies are also forecasted taking into account all power plants, which are operational, under construction and newly licensed. Generation projection based on project generation is given in Table 5:

Table 5: Projection of Total Generation Capacity by Fuel Types (TWh)

YEARS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	SHARE IN 2018 (%)
LIGNITE	52.6	52.4	52.5	52.5	52.6	52.5	52.4	52.5	52.5	52.6	*16.7%*
HARDCOAL	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	*1.0%*
IMPORTED COAL	12.1	12.7	14.4	19.9	28.2	31.7	32.0	32.6	32.2	32.3	*10.2%*
NATURAL GAS	110.3	111.9	114.6	125.9	139.0	137.9	138.6	139.2	138.4	134.5	*42.7%*
GEOTHERMAL	0.4	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	*0.2%*
FUEL OIL	13.8	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	*3.9%*
DIESEL	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	*0.4%*

[9] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 4, Table 1)
[10] See Link in Footnote 7 (page 12-13, Table 4 for High and Table 5 for Low Scenarios)

OTHER	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	*0.5%*
THERMAL TOTAL	195.4	196.0	200.4	217.3	238.8	241.1	242.0	243.3	242.1	238.3	*75.7%*
BIOGAS+WASTE	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	*0.1%*
HYDRO	49.7	54.8	59.7	65.9	68.8	68.7	68.7	72.6	72.6	72.6	*23.0%*
WIND	1.6	2.4	3.2	3.7	3.7	3.7	3.7	3.7	3.7	3.7	*1.2%*
TOTAL	**246.9**	**253.5**	**263.6**	**287.3**	**311.6**	**313.9**	**314.8**	**320.0**	**318.8**	**315.0**	***100.0%***

It is clear from above table that at least for 10 years fossil fuels will be the main resource for electricity generation with 75.5% (Total Thermal – Geothermal) share in 2018. Natural Gas will continue to hold the dominance and total imported fuel will still constitutes significant share with 52.9%. However, non-hydro renewables constitutes only 1.5% (Geothermal+Biogas+Waste+Wind); hydro included renewables constitutes 24.5% of energy mix in 2018. This projection is consistent with continuing fossil fuel dependent characteristics of Turkish electricity sector, which is given in Figure 4. Fossil fuels are generally takes higher shares of Turkish electricity generation from 1970s and there is a clear increasing trend since the beginning of 1990s, which comes to 82.6% as the year of 2008.

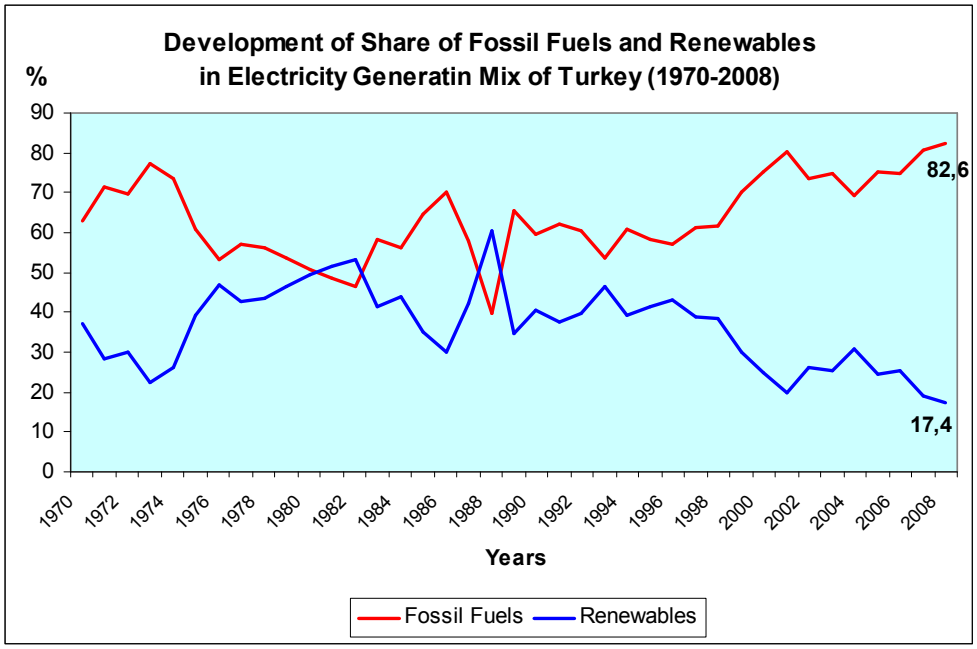


Figure 4: Development of Fossil Fuels and Renewables Shares in Turkish Electricity Mix (1970-2008)[11]

In the shed of above analysis for the baseline scenario (electricity delivered to the grid by general mix.) we can conclude that:

a) Energy demand in Turkey has been increasing with significant rates since ten years, and it is expected to continue at least for next ten years.

b) Even all operational plants, construction phase plants and licensed ones are taken into account lack of supply is projected after the year of 2014[12]. So, there is significant need for electricity generation investments to satisfy demand.

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

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

c) Fossil fuels will hold the dominance in generation mix for at least midterm period with 75% share. Hydro included renewables will remain low with 24.5% share and non-hydro energy contribution will stay negligible with only 1.5% of total share.

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

For the explanation of how and why the project activity leads to emission reductions that are additional to what would have occurred in the absence of the project activity "Tool for the demonstration and assessment of additionality version 05.2 "[13] (Tool), which defines a step-wise approach to be applied to the proposed project is used.

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

Sub-step 1a. Alternatives to the project activity

To identify the realistic and credible alternative scenario(s) for project participants, scenarios in the Tool are assessed:

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

This alternative is realistic and credible as 'Pak Enerji' may undertake project activity if he sees no risk for project and/or if the project turns out to be financially attractive without GS VER credit income. However, investments analyze shows that the project is not economically feasible without GS VER credit income. Detail information is given in Step-2c and 2d.

b) Other realistic and credible alternative scenario(s) to the proposed GS VER project activity scenario that deliver electricity with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology;

The project activity is power generation activity without any greenhouse gas emission harnessing the energy of the water. Being a private entity, 'Pak Enerji' doesn't have to invest power investments even proposed project activity. Also, since 'Pak Enerji' has licence only for hydropower investment for electricity generation, other project activities delivering same electricity is *not* realistic for project participant. Pak Enerji is a sub company of Akfen Holding and Akfen does not have any other type of energy project investment.[14]

c) Continuation of the current situation, i.e. Kavakçalı HPP is not built

The decision in favour or against a project investment depends on the expected revenues and risks, like for every other private investment. Investment decisions other than Kavakçalı HPP are independent from the question whether Kavakçalı HPP is built or not. This alternative is also realistic and credible.

According to baseline scenario, which is described in B.4, there is a need for energy investment to satisfy increasing demand and if the Kavakçalı HPP is not built, the same amount of energy will be supplied by other private investors to the grid. Forecasts shows that electricity supplied in the absence of Kavakçalı HPP

[13] See,, http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

[14] http://www.akfen.com.tr/223.aspx

will be mainly based on fossil fuels as the projections for the year of 2018 forecasts 75% share for fossil fuels in the energy mix.

Therefore, two realistic and credible alternative scenarios are identified for the project activity:

a) The proposed project activity undertaken without being registered as a GS VER project activity.

b) Continuation of the current situation, i.e. Kavakçalı HPP is not built.

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

Both alternatives are (building or not building the project activity) in compliance with the following identified applicable mandatory laws and regulations:

(1) Electricity Market Law[15]
(2) Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[16]
(3) Environment Law[17]
(4) Energy Efficiency Law[18]
(5) Forest Law[19]

The renewable Energy generation license for Kavakçalı HPP has been issued considering Electricity Law and Law in utilization of Renewable Energy Resources for the purpose of generating electricity energy. The proposed project is also within the scope of and in compliance with Energy Efficiency Law (Article 2 of Part One). Environment Law is also satisfied and it has been confirmed by Ministry of Environment that Kavakçalı HPP is exempted from Environmental Impact Assessment Regulation. Forest Law which specifies that forest areas can be allocated by Ministry of Environment and Forestry to institutions or individuals for energy plants if the project implementation serves common good for public. As in Turkey there is no applicable local regulations to HPP constructions the list above includes national regulation only.

Project Implementation Schedule and Early Consideration of VER

Table 6: Project Implementation Schedule and Early Consideration of VER

Date (DD/MM/YYYY)	Activity
25/08/2007	First Proposal Request from VER Consultants
01/09/2008	Initial Agreement with a VER Consultant
18/02/2009	Issuance of the Licence
September 2009	DSI Feasibility Report prepared by Coyne and Bellier
04/12/2009	Loan Proposal
04/03/2010	Initial construction contract (terminated)
05/05/2010	Financial Closure with Bank
20/05/2010	Holding of LSC Meeting
22/06/2010	Electromechanic Works Engineering, Procurement and Construction Contract
18/01/2011	Construction start date

[15] See: http://www.epdk.gov.tr/mevzuat/kanun/elektrik/elektrik_piyasalari_kanunu.pdf (Enactment Date:2001)
[16] See: http://www.epdk.gov.tr/mevzuat/diger/yenilenebilir/yenilenebilir.doc (Enactment Date: 2005)
[17] See: http://www2.cevreorman.gov.tr/yasa/k/2872.doc (Enactment Date: 1983)
[18] See: http://www.eie.gov.tr/duyurular/EV/EV_kanunu/EnVerKanunu_Temmuz2008.pdf
[19] See: http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=1.3.6831&sourceXmlSearch=&MevzuatIliski=0

According to Turkish regulations, to get necessary permits for further project implementation, granting generation license from Authority is required. Hence, issuance of license cannot be considered as 'Project Start Date' but a prerequisite to proceed for further project development activities. Date of construction contract (in this project the first construction contract terminated later on) shall be set as project-starting date (investment decision date) according to decision of EB41[20].

Above Implementation Schedule clearly shows that before starting to the project activity, 'Pak Enerji' started to analysis of revenue from VER credit sale, decided to get consultancy for VER development and signed contract with a carbon consultant (01/09/2008). However, due to problems with the initial carbon development consultant and financial crisis this agreement is terminated. But since carbon reduction revenue is essential for implementation of this project, 'Pak Enerji' later made agreement with FutureCamp Türkiye for carbon development and held LSC Meeting before the starting to physical construction on site.

Aforementioned schedule shows us that 'Pak Enerji' started considering VER from the beginning of the project implementation and VER revenue has decisive impact on decision of proceeding to the project.

In the following, the investment analysis is applied to clearly demonstrate that the project activity is unlikely to be financially/economically attractive without the revenue from the sale of VERs.

Step 2. Investment analysis

Sub-step 2a: Appropriate analysis method

With the help of the investment analysis it shall be demonstrated that the proposed project activity is not economically or financially feasible without the revenue from the sale of VERs. Therefore, the benchmark analysis shall be applied, as there is no alternative project activity for a comparison of the attractiveness of an investment.

Sub-step 2b: Option III: Benchmark analysis

As a common means to evaluate the attractiveness of investment projects and compare them with possible alternatives, the IRR (Internal Rate of Return) shall be used.

According to the Tool, benchmark for investment analysis can be driven from '*Estimates of the cost of financing and* ***required return on capital based on bankers views*** *and private equity investors/funds*'. As a banker view, according to Worldbank loan appraisal document[21], threshold equity IRR for small-scale hydropower investments (i.e. required returns of equity for small hydro power investors) in Turkey is 15%.

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

In the paragraph 11 of the 'Guidance on the Assessment of Investment Analysis'[22], it is stated that: 'Required/expected returns on equity are appropriate benchmarks for equity IRR'. Since, benchmark

[20] See: http://cdm.unfccc.int/EB/041/eb41rep.pdf (paragraph 67)

[21] Worldbank - Project Appraisal Document on a IBRD Loan and a Proposed Loan from Clean Technology Fund to TSKB and TKB with the Guarantee of Turkey, May 2009 (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2009/05/11/000333037_20090511030724/Rendered/PDF/468080PAD0P112101Official0Use0Only1.pdf page 80, paragraph 29 and page 81, Table 11.5)

[22] See, http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf (page 14)

identified in the Sub-step 2b is required/expected returns on equity, equity IRR (after tax) of the project activity shall be calculated for comparison.

Operational life time of the HPP is calculated based on the technical lifetime of the electromechanical equipment, as 37 years for Kavakçalı HPP by using the 'Tool to determine the remaining lifetime of equipment''[23]. In the tool it is said that lifetime for the Hydro Turbines is 150,000 hours. In order to determine operational life time of the HPP, annual power generation (44,289 MWh) is divided by installed capacity (10.869 MW) in order to find actual working hours of the plant. Then, technical life time of hydro turbines given in the tool (150,000 hrs) is divided by actual working hours (4384.382 hrs) in order to find technical life time of the plant in years. At the time of project decision date, only available and reliable document is Feasibility Report of Kavakcalı HPP, So in the calculation of equity IRR feasibility figures are used for Installed capacity and Annual Generation.

Table 7: Equity IRR input values

Item	Date	Value	Reference
CONSTRUCTION COST	September 2009	9,744,897 Eur	DSI Feasibility Report prepared by Coyne and Bellier
AKFEN CONSTRUCTION SHARE	March 2008	974,490 Eur	Agreement with Akfen
ELECTRICAL EQUIPMENTS	September 2009	2,753,128 Eur	DSI Feasibility Report prepared by Coyne and Bellier
TRANSMISSION LINE	September 2009	356,803 Eur	DSI Feasibility Report prepared by Coyne and Bellier
CONSULTANCY AND ENGINEERING WORKS	September 2009	739,153 Eur	DSI Feasibility Report prepared by Coyne and Bellier
EXPROPRIATION AND FORESTRY FEE	September 2009	237,839 Eur	DSI Feasibility Report prepared by Coyne and Bellier
CONTINGENCY	September 2009	1,928,224 Eur	DSI Feasibility Report prepared by Coyne and Bellier
VAT	---	2,516,658	Application Rate
Equity Share	04.12.2009	25%	Loan proposal
Loan Interest	04.12.2009	9%	Loan proposal
Loan term	04.12.2009	8 years	Loan proposal
Grace Period	04.12.2009	2.5 years	Loan proposal
Operational Years		37 years	Tool to determine the remaining lifetime of equipment
Electricity Selling Price	--	55.00 Eur/MWh	Feed-in-Tariff[24]
EUR/USD Exchange Rate	04.03.2010	1.3667	TCMB Rate
USD/TL Exchange Rate	04.03.2010	1.538	TCMB Rate
EUR/TL Exchange Rate	04.03.2010	2.102	TCMB Rate
Total Installed Power	September 2009	10.869 MW	Feasibility Report
Annual Gross Power Generation	September 2009	44,289 MWh/year	Feasibility Report

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

[23] See: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved, Page 4 of the Tool, Technical Life Time of Hydro Turbines.

[24] http://www.epdk.org.tr/documents/10157/98e55d9a-dde6-40f6-b239-934bd264bccb (Article 6-c))

and values used for the IRR calculation are available to DOE during validation. Equity IRR period is obtained by summing operational life time with construction period. The resulting equity IRR for 37 years is stated in below table:

Table 8: Equity IRR values (after tax) for project activity for Base Case Scenario

Period	IRR
39 years	8.69%

Without adding any risk premium to the benchmark, which is 15%, it does clearly exceed the resulting equity IRR, thus rendering the project activity economically unattractive.

Sub-step 2d: Sensitivity analysis

While the main parameter determining the income of the project is the electricity sales price, a variation of the accordant value shall demonstrate the reliability of the IRR calculation. Electricity price (EP) is varied with +/-10% from 55 €/MWh, which is the max feed-in-tariff value.

For Sensitivity Analysis, the investment amount, annual energy yield amount and operating cost parameters are varied with +/- 10%. The worst, base and best-case results for each parameter variation are given below, in Table 9. The sensitivity analysis confirms that the proposed project activity is unlikely to be economically attractive without the revenues from VERs as even the maximum IRR result for the best case scenario (8.69 %) is below the benchmark, which is 15% (after tax).

Table 9: IRR results according to different parameters (after tax)*

Parameter	Electricity Price			Investment Cost			Energy Yield			Construction Cost		
Variance	-10%	0%	10%	-10%	0%	10%	-10%	0%	10%	-10%	0%	10%
IRR	7.32%	8.69%	10.09%	10.00%	8.69%	7.64%	7.32%	8.69%	10.09%	9.51%	8.69%	7.98%

Parameter	Operating Cost		
Variance	-10%	0	10%
IRR	8.91%	8.69%	8.47%

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

Step 4: Common Practice Analysis

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

By the end of 2008, the latest year for which the official statistics are published by the time of PDD submission to DOE, breakdown of installed capacity of Turkey by Utilities and types are given in Table 10.

Table 10: Breakdown of Installed Capacity of Turkey by the end of 2008[25]

UTILITIES	TYPE	INSTALLED CAPACITY (MW)	TOTAL INSTALLED CAPACITY (MW)

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

EÜAŞ (State Power Generation Co.)	THERMAL	8,690.9	**20,146.8**
	HYDRO	11,455.9	
AFFILIATED PARTNERSHIP OF EÜAŞ	THERMAL	3,834.0	**3,834.0**
POWER PLANTS UNDER TRANSFER OF OPERATIONAL RIGHT (ToR) CONTRACT	THERMAL	620.0	**650.1**
	HYDRO	30.1	
MOBILE PLANTS	THERMAL	262.7	**262.7**
POWER PLANTS UNDER BUILT-OPERATE (BO) CONTRACT	THERMAL	6,101.8	**6,101.8**
POWER PLANTS UNDER BUILT-OPERATE-TRANSFER (BOT) CONTRACT	THERMAL	1.449.6	**2,449.0**
	WIND	17.4	
	HYDRO	982.0	
GENERATION COMPANIES (IPPs)	THERMAL	3,687.3	**4,839.6**
	WIND	345.1	
	HYDRO	*807.2*	
AUTOPRODUCERS	THERMAL	2,978.5	**3,533.2**
	WIND	1.2	
	HYDRO	553.5	
TOTAL INSTALLED CAPACITY	**THERMAL**	**27,624.9**	**41,817.2**
	WIND	**363.7**	
	HYDRO	**13,828.7**	

Kavakçalı HPP is a project of 'Pak Enerji', which is a generation company-granting license[26] from Electricity Market Regulatory Authority (EMRA) and will sell whole generated electricity to the market without any purchase guarantee.

Considering the utilities in Table 10, EÜAŞ and its affiliated companies are state owned power generation companies[27]; Mobile Plants are selling electricity to EUAŞ; ToR, BO and BOTs utilities are selling electricity to TETAŞ (State Electricity Wholesale Co.) with long-term purchase contracts[28]. Auto producers are private companies building utilities primarily for their own needs[29]. Hence power plants belonging to these companies cannot be considered similar projects with proposed project activity as they are state-owned companies or realized with different business models having long-term purchase guarantee with state-owned companies. Therefore, according to the business model parameter, only hydro power plants belonging to generation companies are identified **to be most likely to be similar** projects with Kavakçalı HPP.

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

Table 11: The hydro projects in operation belonging to IPPs as the end of 2008[30]

Plant No.	Name of HPP	Plant Location	Installed Power (MW)	Average Generation (GWh/year)	Firm Generation (GWh/year)

[26] Licence of 'Pak Enerji' for Kavakçalı HEPP is available to DOE.
[27] See, Website of EÜAŞ, http://www.euas.gov.tr/
[28] See, http://www.teias.gov.tr/eng/ApkProjection/CAPACITY%20PROJECTION%202008-2017.pdf (page 37)
[29] See, Licence Regulation: http://www.epdk.org.tr/english/regulations/electric/license/licensing.doc (page 3)
[30] See, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 93) and http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/verilenuretim.asp (for Location)

1	BEREKET (DENİZLİ)	DENİZLİ	3.70	12	12
2	BEREKET (DALAMAN)	MUĞLA	37.50	179	179
3	BEREKET (FESLEK)	AYDIN	9.50	41	25
4	BEREKET (GÖKYAR)	MUĞLA	11.60	43	23
5	BEREKET (MENTAŞ)	MUĞLA	39.90	163	140
6	AKKÖY ENERJİ (AKKÖY I HES)	GÜMÜŞHANE	101.90	408	263
7	DAREN HES (SEYRANTEPE)	TUNCELİ	49.70	182	161
8	ALP ELEKTRİK (TINAZTEPE)	ANTALYA	7.70	29	17
9	CANSU ELEKTRİK (ARTVİN)	ARTVİN	9.20	47	31
10[a)]	***ÇALDERE ELEKTRİK (DALAMAN)***	***MUĞLA***	***8.70***	***35***	***25***
11	DEĞİRMENÜSTÜ HES	KAHRAMANMARAŞ	25.70	69	40
12[b)]	***HAMZALI HES (TURKON MNG)***	***KIRIKKALE***	***16.70***	***117***	***66***
13	H.G.M. ENERJİ (KEKLİCEK)	MALATYA	8.70	18	11
14	HİDRO KONTROL (YUKARI MAHOZ)	TRABZON	22.40	79	45
15	İÇ-EN ELEKTRİK (ÇALKIŞLA)	ERZİNCAN	7.70	18	11
16	KALEN ENERJİ (KALEN II)	GİRESUN	15.70	50	28
17[c)]	***MARAŞ ENERJİ (FIRNIS)***	***KAHRAMANMARAŞ***	***7.20***	***36***	***23***
18	SARMAŞIK I HES (FETAŞ FETHİYE)	TRABZON	21.00	96	54
19	SARMAŞIK II HES (FETAŞ FETHİYE)	TRABZON	21.60	108	61
20	YEŞİL ENERJİ (TAYFUN HES)	KAHRAMANMARAŞ	0.80	5	4
21	MURGUL BAKIR	ARTVİN	4.60	8	8
22	TEMSA ELEKTRİK (GÖZEDE)	BURSA	2.40	10	6
23	EKİN ENERJİ (BAŞARAN HES)	AYDIN	0.60	5	0
24	ENERJİ-SA (BİRKAPILI)	MERSİN	48.50	171	17
25	ENERJİ-SA (AKSU-ŞAHMALLAR)	ANTALYA	14.00	45	7
26	ENERJİ-SA (SUGÖZÜ-KIZILDÜZ)	ANTALYA	15.40	55	8
27	EŞEN-II (GÖLTAŞ)	MUĞLA	43.40	170	0
28	ELTA (DODURGA)	DENİZLİ	4.10	12	12
29	İÇTAŞ YUKARI MERCAN	ERZİNCAN	14.20	44	20
30	İSKUR (SÜLEYMANLI HES)	KAHRAMANMARAŞ	4.60	18	4
31	KURTEKS Karasu Andırın Hes	KAHRAMANMARAŞ	2.40	19	19
32	MOLU ENERJİ (BAHÇELİK HES)	KAYSERİ	4.20	30	30
33	ÖZGÜR ELEK. K.MARAŞ Tahta HES	KAHRAMANMARAŞ	12.50	54	54
34	PAMUK (Toroslar)	MERSİN	23.30	112	28
35	SU ENERJİ (ÇAYGÖREN HES)	BALIKESİR	4.60	19	4
36[d)]	***TEKTUĞ-KARGILIK***	***KAHRAMANMARAŞ***	***23.90***	***83***	***19***
37[e)]	***TEKTUĞ-KALEALTI HES***	***OSMANİYE***	***15.00***	***52***	***11***
38	TEKTUĞ-KEBANDERESİ	ELAZIĞ	5.00	32	20
39	YAPISAN HACILAR	MALATYA	13.30	90	54
40	YPM ALTINTEPE HES	SİVAS	4.00	18	10
41	YPM BEYPINAR HES	SİVAS	3.60	18	9
42	YPM KONAK HES	SİVAS	4.00	19	10
43	BEYKÖY	ESKİŞEHİR	16.80	87	87
44	KUZGUN	ERZURUM	20.90	36	0
45	TERCAN	ERZİNCAN	15.00	51	28
46	ATAKÖY	TOKAT	5.50	8	8
47	ÇILDIR	KARS	15.40	30	20

48	İKİZDERE	RİZE	18.60	110	100
49	MERCAN	TUNCELİ	20.40	78	48
	TOTAL		**807.10**	**3,217**	**1,858**
	TOTAL of VER Projects		**71.50**	**323**	**144**
	TOTAL of Other Projects		**735.60**	**2,894**	**1,714**

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

There are a number of voluntary standards and registries to which project participants having carbon reduction projects can apply for registration. Identified VER projects listed above are only from VCS and Gold Standard registries which are widely preferred in Turkey. However, unlike CDM projects, having more than one registry for VER projects preventing the identification the whole VER applicants or registered projects.

Considering information on hand, from similar projects having 807.1 MW total installed capacity, total installed capacity of the projects which cannot be identified as VER projects is 735.6 MW, and share of these projects in total capacity of Turkey in 2008 is **1.76%**.

For hydro projects, rain regime is the most critical parameter as it directly affects the capacity factor of the power plant and feasibility of the investment. Aegean, Mediterranean and East Black Sea regions of Turkey are considered as vulnerable regions to climate change. In these regions, 100-400 mm/year decrease in precipitation[31] is expected. Therefore common practice analysis for hydro power plants in Turkey shall be done on regional basis. Kavakcalı HPP is in Mugla in Southern West Region. Hence, only projects in Southern West Region shall be considered for common practice analysis.

Other projects, which are in the same river basin and region with the proposed project, in Mugla, Denizli, Aydın, and Izmir cities and cannot be identified to be VER are: Bereket Denizli HPP (3.70 MW), Bereket Mugla (37.50 MW) , Bereket Feslek HPP (9.50 MW), Gokyar HPP (11.60 MW),Mentas HPP (39.90 MW), Caldere HPP (8.70 MW), Basaran HPP (0.60 MW), Esen II (43.40 MW) and Elta HPP (4.1 MW) (with No 1,2,3,4,5,10,23,27,28 respectively). Except Feslek and Gokyar HPP other ones cannot be considered as similar project since size of these projects are much bigger than proposed project (> 15 MW) or smaller than 5 MW. Also Caldere is registered under VCS.

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

Unlike other renewable technologies (such as wind, solar and biomass), for small hydro projects, mechanical equipment cost share in total investment is low with around 25%[32]. Hence, for a typical small-scale hydro project, site-specific costs (construction, connection to the grid) have dominant affect on feasibility of the project.

As comprehensively discussed and demonstrated in Sub-step 4a, only two projects (Feslek and Gokyar HPP) are identified to be similar with proposed project activity in terms of installed capacity. There is no

[31] http://www.artvin.edu.tr/karok3/IV.Cilt/%281532-1535%29.pdf; http://www.dmi.gov.tr/FILES/iklim/ECHAM5-A2.pdf
[32] See, http://www.kuleuven.be/ei/Public/publications/EIWP01-02.pdf (page 4)

transparent and publicly available data regarding investment analysis of these projects. In this sense, the proposed project is not similar with other two projects.

On the other hand, considering the very small share of the similar projects, comparing the total installed capacity, we can conclude that the proposed project activity is not common practice.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Stepwise approach of 'Tool to calculate the emission factor for an electricity system' version 02[33] is used to find this combined margin (emission coefficient) as described below:

Step 1: Identify the relevant electric power system

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

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

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

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

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

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

Step 3: Select an operating margin (OM) method

[33] See, http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf
[34] See, http://www.epdk.org.tr/english/regulations/electric/license/licensing.doc (page 21)
[35] See, http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu2008_2017.pdf (page 39)

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

Table 12: Share of Low Cost Resource (LCR) Production 2004-2008 (Production in GWh)[36]

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

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

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

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, or
- Ex post option: The year, in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

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

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

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

- data on net electricity generation a CO_2 emission factor of each power unit (Option A), or
- data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B).

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

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

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

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

Where:

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

For the calculation of the OM the consumption amount and heating values of the fuels for each sources used for the years 2006, 2007 and 2008, is taken from the TEİAŞ annual statistics, which holds data on annual fuel consumption by fuel types as well as electricity generation amounts by sources and electricity imports. All the data needed for the calculation, including the emission factors and net calorific values (NCVs), are provided in Annex 3. Total CO_2 emission due to electricity generation in Turkey for the years of 2006, 2007 and 2008 are given in Table 13.

Table 13: CO_2 emissions from electricity production 2006-2008 ($ktCO_2$)[37]

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

Table 14 presents the gross electricity production data by all the relevant energy sources. Low-cost/must run resources like hydro, wind, geothermal and biomass do not emit fossil CO_2 and thus are not taken into account in calculations.

Table 14: Gross electricity production by fossil energy sources 2006-2008 (GWh)

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

[37] For detail calculation see Annex 2

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

Table 15: Net/gross electricity production 2006-2008 (GWh)[38]

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

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

Table 16 shows the resulting net data for fossil fuel generation and adds electricity imports.

Table 16: Electricity supplied to the grid, relevant for OM (GWh)

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

Electricity import is added to the domestic supply in order to fulfill the Baseline Methodology requirements. Imports from connected electricity systems located in other countries are weighted with an emission factor of 0 (zero) tCO_2/MWh.

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

Table 17: Calculation of Weighted $EF_{grid,OMsimple,y}$ ($ktCO_2/GWh$)

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

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

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

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

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

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

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

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

Sample group for BM emission factor is given below table. The derivation of the values presented in Table 18 is contained in a separate excel file which is available for validation.

Table 18: Sample group generation for BM emission factor calculation (GWh)

Energy Source	2004	2005	2006	2007	2008	Total
Natural Gas	8,810.4	7,068.4	3,119.1	2,552.1	2,400.0	**23,950.5**
Lignite	0.0	4,420.0	7,020.0	0.0	0.0	**11,440.0**
Coal	337.5	1,125.0	0.0	0.0	0.0	**1,462.5**
Fuel Oil	789.2	99.1	0.0	800.0	103.2	**1,791.4**
Hydro	241.8	1,028.8	482.6	1,217.0	1,629.0	**4,599.2**
Renewables	0.0	87.4	453.1	11.0	167.8	**719.3**
TOTAL	**10,178.9**	**13,828.7**	**11,074.7**	**4,580.1**	**4,300.0**	**43,962.3**

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

Step 6:. Calculate the build margin emission factor

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} x EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \textbf{(2)}$$

Where:

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

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

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

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$EF_{CO2,m,i,y}$	=	Average CO_2 emission factor of fuel type i used in power unit m in year y (tCO_2/GJ)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit m in year y (%)
y	=	Three most recent years for which data is available at the time of submission of the PDD to the DOE for validation

BM emission factor calculation and resulted BM factor is given in the Table 19. For BM factor calculation, since no official emission factors for different fuel types are available, lower confidence default values of IPCC Guidelines are applied. Explanation of emission factor selection for each energy sources and references are given in B.6.2 part of the PDD.

Table 19: BM emission factor calculation using equation (2) and (3)

Energy Source	Sample Group Total Generation (GWh)	Effective CO_2 emission factor (tCO_2/TJ)	Average Efficiency ($\eta_{m,y}$)	CO2 Emission ($ktCO_2$)
Natural Gas	23,950.0	54.3	60.00%	7,802.9
Lignite	11,440.0	90.9	38.63%	9,691.0
Coal	1,462.5	89.5	41.50%	1,135.5
Fuel Oil	1,791.4	72.6	46.00%	1,017.8
Hydro	4,599.2	0.0	0.00%	0.0
Renewables	719.3	0.0	0.00%	0.0
Total	***43,962.3***			***19,647.2***
$EF_{grid,BM,y}$ (tCO_2/MWh)	**0.4469**			

Step 7: Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \qquad \textbf{(4)}$$

Where:

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

According to the Tool for hydro power generation project activities: $w_{OM} = 0.5$ and $w_{BM} = 0.5$ will be applied

Then:

$EF_{grid,CM,y}$ = 0.6534 tCO_2/MWh * 0.5 + 0.4469 tCO_2/MWh * 0.5 = 0.5502 tCO_2/MWh

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

Data / Parameter:	**Gross electricity generation**
Data unit:	**MWh**
Description:	Gross Electricity supplied to the grid by relevant sources (2006-2008)
Source of data used:	Turkish Electricity Transmission Company (TEIAS), Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (1940-2008) TEIAS, see: http://www.teias.gov.tr/istatistik2008/32(75-08).xls
Value applied:	See **Table 14**
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Any comment:	

Data / Parameter:	**Net electricity generation**
Data unit:	**MWh**
Description:	Net electricity fed into the grid. Used for the calculation of the net/gross relation (Including Import and Export figures)
Source of data used:	Turkish Electricity Transmission Company (TEIAS), Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2008) TEIAS, See http://www.teias.gov.tr/istatistik2008/30(84-08).xls
Value applied:	See **Table 15**
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is used to find relation between the gross and net electricity delivered to the grid by fossil fuel fired power plants (**Table 15**). Import and Export data is used to find total net electricity fed into the grid in the years of 2006, 2007 and 2008 (**Table 16**) TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Any comment:	

Data / Parameter:	**$HV_{i,y}$**
Data unit:	Mass or volume unit
Description:	Heating Values of fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data used:	Heating Values Of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/istatistik2008/46.xls
Value applied:	See **Table 20**
Justification of the	TEİAŞ is the national electricity transmission company, which makes available

choice of data or description of measurement methods and procedures actually applied :	the official data of all power plants in Turkey. There is no national NVC data in Turkey. However, TEİAŞ announces Heating values of fuels. This data is used to calculate annual NCVs for each fuel type.
Any comment:	

Data / Parameter:	**$FC_{i,y}$**
Data unit:	Mass or volume unit
Description:	Fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data used:	Annual Development of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/ist2007/43.xls
Value applied:	See **Table 21**
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Any comment:	

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	TJ/kton, TJ/million m^3
Description:	Net Calorific Value of fuel types in the years of 2006, 2007 and 2008
Source of data used:	Calculated by using HVi,y to FCi,y as Net Calorific Values of fuel types are not directly available in Turkey.
Value applied:	See **Table 22**
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEİAŞ is the national electricity transmission company, which makes available the official data of power plants in Turkey. Calculation of NCVs from national $HV_{i,y}$ and $FC_{i,y}$ data, **Table 20** and **Table 21**, preferred to default IPCC data as these are more reliable.
Any comment:	

Data / Parameter:	**Sample Group for BM emission factor**
Data unit:	Name of the plants, MW capacities, fuel types, annual electricity generations and dates of commissioning.
Description:	Most recent power plants which compromise 20% of total generation
Source of data used:	Annual Development of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities, TEIAS: For plants in 2004: http://www.teias.gov.tr/istat2004/7.xls For plants in 2005: http://www.teias.gov.tr/istatistik2005/7.xls For plants in 2006: http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu.pdf (page 76 and 77 for installed power of new plants, page 67-75 for generation amounts. For capacity additions,

	interpolation method is used for generation amounts) For plants in 2007: http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu2008_2017.pdf (page 121 and 122 for installed power of new plants, page 111-120 for generation amounts. For capacity additions, interpolation method is used for generation amounts) For plants in 2008: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 95 for plants and pages 82-94 for generation amounts. For capacity additions, interpolation method is used for generation amounts)
Value applied:	See **Table 18**, **Table 19** and **Table 24**
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Any comment:	

Data / Parameter:	$\mathbf{EF_i}$
Data unit:	tCO_2/GJ
Description:	Emission factor for fuel type *I*
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the IPCC Guidelines on National GHG Inventories. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value applied:	See **Table 19** and **Table 22**
Justification of the choice of data or description of measurement methods and procedures actually applied :	No plant specific and national emission factor data is available in Turkey. So, IPCC default data is used. For Fuel Oil Power Plants: 'Gas/Diesel Oil' data is used for conservativeness. For Coal Power Plants: In the 205th page of official document given in the link below, it is stated that Çolakoğlu and İçdaş utilizes 'Taşkömürü' (Hardcoal). And at the Table-2 in page 157 of the same document, Taşkömürü is dived in two groups: Bituminous and Antharcite. Since Sub-Bituminous Coal is under Brown Coal in the same table and since Other Bituminous Coal has lower EF than Anthracite in 1.4 of IPCC Guidelines, EF for 'Other Bituminous Coal' is used. See: http://www.dpt.gov.tr/DocObjects/Icerik/4225/Enerji_Hammaddeleri_(Linyit_Taskömuru-Jeotermal)
Any comment:	

Data / Parameter:	$\eta_{i,y}$
Data unit:	-
Description:	Average energy conversion efficiency of power unit m in year y
Source of data used:	TEİAŞ and Annex I of the "Tool to calculate the emission factor for an electricity system"
Value applied:	See **Table 19**
Justification of the choice of data or	For Lignite and Coal power plants, plants specific values are applied. There are two lignite power plant in Sample Group. These are Çan and Elbistan PPs. For

description of measurement methods and procedures actually applied :	efficiency factor of Çan PP is taken form presentation of Mr. Sefer Bütün (General Manager of EUAS, state production company) which is 'Thermal Power Plants and Environment'. This presentation is submitted to DOE. In the page 18 of the presentation, it is stated that the for pulverized lignite power plants the highest achieved electrical efficiency rate is 38%. So this rate is applied also for Elbistan-B PP. Weighted average of these efficiency rates which turns to be 38.63% is used for lignite power plants. For coal power plants, the highest efficiency rate for 'fluidized bed' technology which is 41.5% for PFBS is applied as coal PPs in the sample group (Çolakoğlu (Capacity Increment) and Çan Gr I-II) are utilizing fluidized bed type technology. For reference see: http://www.mimag-samko.com.tr/akiskan_yatakli_kazanlar.pdf (last paragraph of page 6) For Natural Gas and Oil plants efficiencies, default value given in the tool is applied: http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{(5)}$$

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).

$\boldsymbol{LE_y}$ is 0 as it is not considered according to ACM0002 (page 10).

Project emissions are calculated as follows:

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

Where:

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

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

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

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

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

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

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

As in the case of Kavakçalı project, there will be construction of one small weir. The new reservoir area created by this weir is 393.93 m^2. As the installed capacity of the project is 8,900 kW (8.90 MW), the power density of the project becomes 22,592.85 W/m^2 (8,900,000/393.93). According to the tool (page 7), for the projects having power density more than 10 W/m^2 threshold is zero. Hence, the project emission (PE_y) is zero.

Then:

$$ER_y = BE_y$$

Then:

$$ER_y = BE_y$$

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y}$ **(6)**

Where:

BE_y	=	Baseline emissions in year y (tCO_2/yr).
EG_y	=	Electricity supplied by the project activity to the grid (MWh).
$EG_{baseline}$	=	Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM}y$	=	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".

The project activity is the installation of a new grid-connected renewable power plant $EG_{baseline} = 0$ (ACM0002, Version 11, page 9, equation 8 and 9).

Then, emission reduction of the project activity becomes:

$ER_y = BE_y = EG_y \times EF_{grid,CM,}$ = 39,021 MWh/year x 0.5502 tCO2/MWh = 21,468 tCO_2/year

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

Year	Estimated project emissions [tCO_2]	Estimated baseline emissions [tCO_2]	Estimated leakage [tCO_2]	Estimated emission reductions [tCO_2]
2013*	0	20,375	0	20,375
2014	0	21,468	0	21,468
2015	0	21,468	0	21,468
2016	0	21,468	0	21,468
2017	0	21,468	0	21,468
2018	0	21,468	0	21,468
2019	0	21,468	0	21,468
2020**	0	4,294		4,294
Total	**0**	**150,992**	**0**	**150,992**

* 10 months of operation
** 2 months of operation

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Net electricity delivered to the grid
Source of data to be used:	The data from the Electricity Meters are the basis for the settlement notification of PMUM. Data are gathered electronically from the meters by TEIAS and stored

	in secured website of PMUM, which is accessible to project developer with a private password. For monitoring, the monthly settlement notification of PMUM shall be used as source of data..
Value of data	**39,021 MWh/year**
Description of measurement methods and procedures to be applied:	• Regarding the electricity meters: two meters will be placed (one main and one reserve) at the TEIAS substation. These meters are sealed by TEIAS and intervention by project proponent is not possible. The fact that two meters are installed in a redundant manner keeps the uncertainty level of the only parameter for baseline calculation low. High data quality of this parameter is not only in the interest of the emission reduction monitoring, but paramount for the business relation between the plant operator and the electricity buyer. • Measured hourly and readings monthly: On every month's last day, the production index will be taken from the main as well as the reserve meter: *"The meters included in the metering system configuration of the settlement aggregation entities registered on the names of the market participants shall be read monthly, within the first 4 (four) days of the month, by TEIAS and/or distribution licensees with participation of the market participant's representative and the meter reading values shall be submitted to PMUM.* *The PMUM shall monthly update the list of meters that need to be read as part of the settlement process to reflect new registrants and updates in existing registrations, and send them to TEIAS and the distribution licensees.* *The (a) energy withdrawn from the system in kWh, and (b) active energy supplied to the system in kWh for each settlement period of the related invoicing period shall be read from the registered meters."* • A protocol, which shows the measured data (including electricity amount supplied by the plant and received from the grid) will be signed from the HPP Staff and a responsible person from the Distribution Company. • This protocol will be sent to Ankara to Market Financial Settlement Center (PMUM in Turkish-PMUM is a governmental organization and is responsible for electricity market settlement). • PMUM checks the correctness of the protocol and prepares the invoice until 18th of the following month (PMUM invoices their services like electricity balancing and settlement operations) • In reference to the checked data from the protocol and the PMUM invoice, 'Pak Enerji' can prepare the invoice for the produced energy. • Since the meters are reading electricity supplied to the system and withdrawn from the system separately, the net electricity amount supplied to the grid will be calculated by electricity supplied minus electricity withdrawn. System losses are not taken into account. Thus with this procedure is monitored sufficient and no extra Monitoring has to

	be implemented. The above described measurement method follows Article 52 of the official regulation "Electricity Market Balancing And Settlement Regulation"[39]
QA/QC procedures to be applied:	Monthly internal protocol consisting daily electricity generation records which will be prepared by power plant technicians and signed by power plant manager will be used for cross checking of this parameter. According to the Article 2 of the 'Communiqué Regarding the Meters to be used in the Electricity Market '[40] (Communiqué): '*The meters to be used in the electricity market shall be compliant with the standards of Turkish Standards Institute or IEC and have obtained* ***"Type and System Approval" certificate from the Ministry of Trade and Industry.'*** Therefore, Ministry of Trade and Industry (Ministry) is responsible from control and calibration of the meters. In the feasibility report (page 1-6), power of the transformers are given as 15000 kVA. As it is bigger than 10 MVA, accuracy class of the meter is 0.5S, which is defined under the Article 11 of the Communiqué for meters in electricity market.[41] Paragraph b) of the Article 9 of the 'Regulation of Metering and Testing of Metering Systems'[42] (Regulation) of Ministry states that: ' *b) Periodic tests of meters of electricity, water, coal gas, natural gas and current and voltage transformers are done* ***every 10 years.'*** Therefore periodic calibration of the meters will be done every 10 years. Also according to Article 67 (page 20) of this regulation, the calibration shall be done in calibration stations which have been tested and approved by Ministry of Trade and Industry. Article 10-d) of Communiqué requires the meters shall be three phase four wire and Article 64 of Regulation clearly states how calibration shall be performed for this kind of meters. According to Article 3 of System Usage Agreement[43] done by 'Pak Enerji' and TEIAS; other than periodic tests, if a party alleges the meters are not working appropriately tests of the meters will be done by presence of both parties. If, after controls, it is seen that the meter is not working appropriately, the measurements of reserve meters are taken into account beginning from date both meters are reading the same (page 3, 2-c) As above mentioned, the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan.
Any comment:	

[39] See, http://www.epdk.org.tr/english/regulations/electric/balancing/balancing.doc (page 50)
[40] See, http://www.epdk.org.tr/english/regulations/electric/meters.doc, (page 6)
[41] http://www.epdk.org.tr/documents/10157/81c16fc9-7777-46d6-a1bf-15c5ac8795c7 page 3
[42] See, http://www.sanayi.gov.tr/download/osgm/olcu_aletleri_muayene_yonetmelik.zip (page 2)
[43] See, http://www.teias.gov.tr/sistemkullanim1.doc , (page 3, 2-b)

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after implementation of the project activity
Source of data to be used:	Project site
Measurement procedures (if any):	The installed capacity will be determined based on capacity labels on the equipments
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data to be used:	Project site
Measurement procedures (if any):	Measured from topographical surveys, maps, satellite pictures., etc.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

Monitoring methodology and plan as on page 9 and 10 of "Type AMS I.D. Grid connected renewable electricity generation" (Version 16) states that:

$EG_{facility,y}$ (Quantity of net electricity MWh/y supplied to the grid in year y) should be under *"continuous monitoring, hourly measurement and at least monthly recording. Measurements are undertaken using energy meters. Calibration should be undertaken as prescribed in the relevant paragraph of General Guidelines to SSC Methodologies. If applicable, measurement results shall be cross-checked with records for sold/purchased electricity (e.g., invoices/receipts). The net electricity export/supplied to a grid is the difference between the measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes."*

Furthermore, according to the general requirements stated in the Appendix B, "General Guidance to SSM CDM Methodologies"[44], Paragraph 12 the project participants shall:

- *"Electronically archive all data collected as part of monitoring for a period of 2 years from the end of the crediting period;*
- *Data variables that are most directly related to the emission reductions (e.g. quantity of the fuel inputs, the amount of heat or electricity produced, gas captured) should be measured continuously. Data*

[44] See, http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf (page 3)

elements that are generally constant and indirectly related to the emission reductions (e.g. Emission factors, Calorific Value, System Efficiencies) should be measured or calculated at least once in an year, unless detailed specifications are provided as part of the indicated methodology;

o *Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in 3 years;*

o *The measured data with high levels of uncertainty or without adequate calibration should be compared with location/national data and commercial data to ensure consistency;*

o *Wherever a statistical sample is proposed for monitoring, the sample should be representative of the population and should have a minimum level of confidence of one times the standard deviation (one sigma), unless detailed specifications are provided as part of the indicated methodology. "*

The actual emission reductions will be ex-post verified, based on the data collected during monitoring. Each monitoring period is planned as one year. At the end of each monitoring period:

- Installed capacity will be read from capacity labels on the equipments
- Reservoir area will be calculated with one of the methods given in Section B.7.1
- Annual net electricity generation will be calculated based on the monthly readings collected over the year as explained under Section B.7.1. Monthly PMUM settlement notifications will be cross-checked with monthly meter reading protocols. The records will be kept for a period of 2 years from the end of the crediting period. Calibration of the metering devices is under responsibility of TEIAS.
- The total amount of the net electricity of each period will be multiplied with the combined emission factor in order to find exact emission reductions. An excel sheet including the calculations will be provided.

B.7.2.1. Monitoring of the emissions in the project scenario and the baseline scenario

As the necessary baseline emission factors are all defined ex ante (Operating and Built Margin, see baseline description), the most important information to be monitored is the amount of electricity fed into the grid by Kavakçalı HPP. This value will be monitored continuously by redundant metering devices, one of them being the main one in the Kavakçalı HPP substation, which provides the data for the monthly invoicing to TEİAŞ or other buyers.

The collected data will be kept by 'Pak Enerji' during the crediting period and until two years after the last issuance of VERs for the Kavakçalı HPP project activity for that crediting period.

The proposed project activity does not lead to any project emissions. Power density of the project will be monitored by monitoring installed capacity ($\mathbf{Cap_{PJ}}$) and reservoir area ($\mathbf{A_{PJ}}$) of the project. Installed capacity will be checked from provisional acceptance documents, which would show any change in installed power. Reservoir area drawings will also be provided at the end of each crediting period.

Potential leakage emissions in the context of power sector projects are emissions arising due to activities such as power plant construction, fuel handling and land inundation. However, according to the methodology, those emission sources do not need to be taken into account.

Operational and Management Structure

As described above, the only relevant data that has to be monitored is the net electricity generation ($EG_{facility,y}$) per year. These data are subject to the accounting quality systems of both parties to the power purchase agreement, TEİAŞ and 'Pak Enerji'. The monthly meter reading documents (settlement notifications of PMUM) are stored by 'Pak Enerji' and TEIAS. The settlement notification, which is issued

by TEIAS and includes the meter reading data, is stored on a TEIAS file server and accessible for 'Pak Enerji' via a secured website (http://dgpys.teias.gov.tr/dgpys/). The meters themselves can always be read as plausibility check for verification. With this, no additional structures or processes have to be implemented to insure the availability and high quality of the necessary data for monitoring.

At the end of each monitoring period, which is planned to generally last one year, the data from the monthly settlement notifications will be added up to the yearly net electricity generation and multiplied with the combined margin emission factor with the help of an excel spreadsheet that also contains the combined margin calculation. Thus, the complete baseline approach is always transparent and traceable. For the elaboration and quality assurance of the monitoring report, FutureCamp Turkey, an expert in the project mechanisms who already supported in the project design, is assigned.

For the operation of Kavakçalı HPP, below hierarchy is planned.

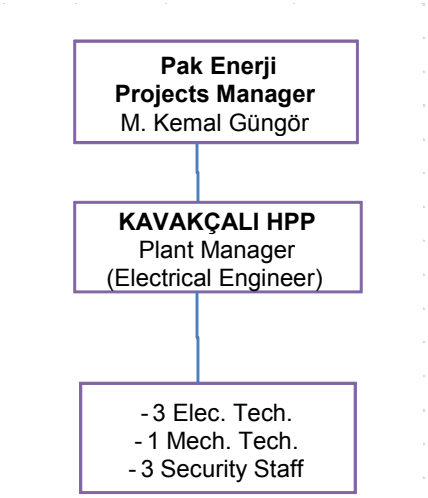


Figure 5 *Kavakçalı HPP Organization Chart*

Staff quantity given in above (total 8) subject to change as the project is not in operation yet. However, the number of staff will not be less than given quantity and hierarchy diagram may only be changed by adding additional sublevel categories.

'Pak Enerji' will keep all the data needed for the calculation of emission reductions during the crediting period and until two years after the last issuance of GS VERs for Kavakçalı HPP.

Because of the data acquisition and management and quality assurance procedures that are anyway in place, no additional procedures have to be established for the monitoring plan. Dedicated emergency procedures are not provided, as there is no possibility of overstating emission reductions due to emergency cases.

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

Date of completion: 27 September 2011 (Version 07)

Name of entity determining the baseline: FutureCamp İklim ve Enerji Ltd. Şti (FutureCamp Turkey - project consultant)
Tel : +90 312 481 21 42

CDM – Executive Board

Fax : +90 312 480 88 10
e-mail : info@futurecamp.com.tr
Contributor: Pak Enerji Üretim Sanayi ve Ticaret A.Ş.

FutureCamp Turkey is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

Starting date of the project activity is 04.03.2010, which is the construction contract date with Özdoğanlar-Acarlar Adi Ortaklığı (initial contract, which was terminated later).

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

Expected operational lifetime of the project activity is 37 years.

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

C.2.1. Renewable crediting period

The renewable crediting period selected for the project is three times of 7 years

C.2.1.1. Starting date of the first crediting period:

The first crediting period starts with commissioning of the plant expected to be in 01/03/2013.

C.2.1.2. Length of the first crediting period:

The length of the first crediting period is 7 years.

C.2.2. Fixed crediting period:

N/A

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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

For environmental impact assessment please refers to Annex 2 of the Gold Standard Passport.

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

There have not been identified any significant environmental impacts of the project. For environmental impact assessment please refers to Annex 2 of the Gold Standard Passport.

SECTION E. Stakeholders' comments

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

Detailed information regarding the stakeholder consultation and the stakeholders' comments is provided in the extra document Local Stakeholder Consultation (LSC) Report, which is also available to DOE

E.2. Summary of the comments received:

Detailed table with all stakeholder comments and the responses is provided in the Section B.5 of Stakeholder Consultation Report.

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

Detailed information regarding the stakeholder consultation and the stakeholders' comments is provided in the extra document Local Stakeholder Consultation (LSC) Report.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	**Pak Enerji Üretimi Sanayi ve Ticaret A.Ş. (Pak Enerji)**.
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City:	ANKARA
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Telephone:	0090 312 408 10 00
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E-Mail:	akfen@akfen.com.tr
URL:	
Represented by:	Mustafa Kemal GÜNGÖR
Title:	Project Manager
Salutation:	Mr.
Last Name:	GÜNGÖR
Middle Name:	Kemal
First Name:	Mustafa
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING
N.A.

Annex 3

BASELINE INFORMATION

Calculation of Total CO_2 from OM Power Plants:

Table 20: $HV_{i,y}$ (Heating Values for Fossil Fuels for Electricity Generation (TCal)

Energy Sources	2006	2007	2008
Hard Coal+Imported Coal	29,504	32,115	33,310
Lignite	83,932	100,320	108,227
Fuel Oil	16,769	21,434	20,607
Diesel Oil	627	517	1,328
LPG	0	0	0
Naphta	141	118	113
Natural Gas	150,588	179,149	189,057

Table 21: $FC_{i,y}$ (Fuel Consumptions for Fossil Fuels for Electricity Generation (million m^3 for Natural Gas and ton for others)

Energy Sources	2006	2007	2008
Hard Coal+Imported Coal	5,617,863	6,029,143	6,270,008
Lignite	50,583,810	61,223,821	66,374,120
Fuel Oil	1,746,370	2,250,686	2,173,371
Diesel Oil	61,501	50,233	131,206
LPG	33	0	0
Naphta	13,453	11,441	10,606
Natural Gas	17,034,548	20,457,793	21,607,635

1	**Tcal**	**=**	**4.1868**	**TJ**

Table 22: $NCV_{i,y}$ (Average Net Calorific Values for Fossil Fuels for Electricity Generation (TJ/million m^3 for Natural Gas and TJ/kton for others) and EF_i (Emission Factor of Fossil Fuels)

Energy Sources	NCVi 2006	NCVi 2007	NCVi 2008	EF_i
Hard Coal+Imported Coal	21.99	22.30	22.24	89.50
Lignite	6.95	6.86	6.83	90.90
Fuel Oil	40.20	39.87	39.70	72.60
Diesel Oil	42.68	43.09	42.38	72.60
LPG	0.00	0.00	0.00	61.60
Naphta	43.88	43.18	44.61	69.30
Natural Gas	37.01	36.66	36.63	54.30

Table 23: CO_2 Emission by each Fossil Fuels Types ($ktCO_2e$)

Energy Sources	2006	2007	2008
Hard Coal+Imported Coal	11,056	12,034	12,482
Lignite	31,943	38,180	41,189

Fuel Oil	5,097	6,515	6,264
Diesel Oil	191	157	404
Lpg	0	0	0
Naphta	41	34	33
Natural Gas	34,235	40,728	42,981
TOTAL	**82,562**	**97,649**	**103,352**

Identification of Sample Group

Table 24: Sample Group PPs for BM Emission Factor Calculation

Name of Power Plant	Capacity (MW)	Average Generation (GWh)	Fuel Type	Date of Operation
ANKARA D.G.(BAYMİNA) GR-I-II-III	798.0	6,500.0	N. Gas	08.01.2004
ENTEK GR-IV	31.1	255.7	N.GAS+NAPHTA	12.02.2004
ATATEKS 2 GM	5.6	45.0	N. Gas	20.02.2004
TANRIVERDİ 4 GM	4.7	38.7	N. Gas	24.03.2004
ÇOLAKOĞLUB(CAPACITY INCREMENT)	45.0	337.5	IMPORTED COAL	05.05.2004
TEKBOY TEKSTİL 1 GM	2.2	16.0	N. Gas	18.05.2004
GÜL ENERJİ GR-II	12.5	96.5	Fuel Oil	03.06.2004
KOMBASSAN KAĞIT GIDA VE TEKS	5.5	38.1	N. Gas	09.06.2004
AYEN OSTİM ENERJİ ÜRETİM	31.1	264.1	N. Gas	11.06.2004
BİS ENERJİ 2 GT	73.0	602.7	N. Gas	16.06.2004
ENERJİ-SA ADANA 1 BT	49.8	322.9	NAPHTA	23.06.2004
ŞAHİNLER ENERJİ 1 GM	3.2	22.2	N. Gas	29.06.2004
BESLER GR-2, BT (5,2+7,5)	12.7	97.7	N. Gas	07.07.2004
ÇELİK ENERJİ ÜR.ŞTİ. 2 GM	2.4	18.6	N. Gas	09.07.2004
KOMBASSAN KAĞ. MATBAA GIDA	5.5	35.7	N. Gas	24.09.2004
AYEN OSTİM ENERJİ ÜRETİM (BT)	9.9	84.0	N. Gas	01.10.2004
HABAŞ ALİAĞA GRUP I-II	89.2	713.9	N. Gas	08.10.2004
STANDART PROFİL 3 GM	6.7	49.2	N. Gas	22.10.2004
KARKEY-II 3+3 DGM	54.3	369.7	Fuel Oil	12.11.2004
ALTINMARKA GIDA GR I-II-III	3.6	28.8	N. Gas	17.12.2004
ERE (BİR KAPILI HES) GRUP-I	48.5	170.6	Hydro (Run of River)	11.03.2004
ELTA ELK (DODURGA) GR-I-II-III-IV	4.1	12.3	Hydro (Run of River)	26.04.2004
İSKUR TEKSTİL (SÜLEYMANLI) GR I-II	4.6	17.9	Hydro (Run of River)	28.04.2004
BEREKET EN. (Feslek Hes) Gr-1-2	9.5	41.0	Hydro (Run of River)	05.08.2004
ÇAN GR I	160.0	1,040.0	LIGNITE	15.02.2005
ÇAN GR II	160.0	1,040.0	LIGNITE	15.03.2005
ELBİSTAN-B GR I	360.0	2,340.0	LIGNITE	15.02.2005
AKBAŞLAR GR-II (Isolated)	8.8	73.0	N.GAS	24.06.2005
AKÇA ENERJİ GR-III	8.7	65.4	N.GAS+NAPHTHA	14.12.2005
AYKA TEKSTİL GR-I	5.5	40.0	N. Gas	24.09.2005

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

YAMULA GRUP I-II	100.0	422.0	Hydro (with Dam)	31.07.2005
SUNJÜT(RES) GR I-II	1.2	2.4	Wind	23.04.2005
EKOTEN TEKSTİL GR-I	1.9	14	N. Gas	16.02.2006
ERAK GİYİM GR-I	1.4	10.0	N. Gas	22.02.2006
ALARKO ALTEK GR-III	21.9	173.0	Steam	23.02.2006
AYDIN ÖRME GR-I	7.5	60.0	N. Gas	25.02.2006
NUH ENERJİ-2 GR-II	26.1	180.1	Steam	02.03.2006
MARMARA ELEKTRİK (Çorlu) GR-I	8.7	63.0	N. Gas	13.04.2006
MARMARA PAMUK(Çorlu) GR-I	8.7	63.0	N. Gas	13.04.2006
ENTEK (Köseköy) GR-IV	47.6	378.2	N. Gas	14.04.2006
ELSE TEKSTİL (Çorlu) GRI-II	3.2	25.0	N. Gas	15.04.2006
SÖNMEZ ELEKTRİK (Çorlu) GRI-II	17.5	126.0	N. Gas	03.05.2006
MENDERES ELEKTRİK GR-I	8.0	56.0	Geothermal	10.05.2006
KASTAMONU ENTEGRE (Balıkesir) GR-I	7.5	54.0	N. Gas	24.05.2006
BOZ ENERJİ GR-I	8.7	70.0	N. Gas	09.06.2006
ADANA ATIK SU ARITMA TESİSİ	0.8	6.0	Biogas	09.06.2006
AMYLUM NİŞASTA (ADANA)	14.3	34.0	N. Gas	09.06.2006
ŞIKMAKAS (Çorlu) GR-I	1.6	13.0	N. Gas	22.06.2006
ELBİSTAN B GR-III	360.0	2,340.0.	Lignite	23.06.2006
ANTALYA ENERJİ GR I-II-III-IV	34.9	245.0	N. Gas	29.06.2006
HAYAT TEM. VE SAĞLIK GR I-II	15.0	108.0	N. Gas	30.06.2006
EKOLOJİK EN. (Kemerburgaz) GR-I	1.0	6.0	Waste Heat	31.07.2006
EROĞLU GİYİM (Çorlu) GR-I	1.2	9.0	N. Gas	01.08.2006
CAM İŞ ELEKTRİK (Mersin) GR-I	126.1	1,008.0.	N. Gas	13.09.2006
ELBİSTAN B GR-II	360.0	2,340.0.	Lignite	17.09.2006
YILDIZ ENT. AĞAÇ (Kocaeli) GR-I	6.2	40.0	N. Gas	21.09.2006
ÇERKEZKÖY ENERJİ GR-I	49.2	390.0	N. Gas	06.10.2006
ENTEK (Köseköy) GR-V	37.0	293.9	N. Gas	03.11.2006
ITC-KA EN. MAMAK TOP.M. GR I-II-III	4.2	30.0	Waste Heat	03.11.2006
ELBİSTAN B GR-IV	360.0	2,340.0.	Lignite	13.11.2006
ÇIRAĞAN SARAYI GR-I	1.3	11.0	N. Gas	01.12.2006
ERTÜRK ELEKTRİK Tepe RES GR-I	0.9	2.0	Wind	22.12.2006
AKMAYA (Lüleburgaz) GR-I	6.9	50.0	N. Gas	23.12.2006
BURGAZ (Lüleburgaz) GR-I	6.9	54.0	N. Gas	23.12.2006
ŞANLIURFA GR I-II	51.8	124.0	Hydro (Run of River)	01.03.2006
BEREKET ENERJİ GÖKYAR HES 3 Grup	11.6	43.3	Hydro (Run of River)	05.05.2006
MOLU EN. Zamantı Bahçelik GR I-II	4.2	16.7	Hydro (Run of River)	31.05.2006
SU ENERJİ (Balıkesir) GR I-II	4.6	20.7	Hydro (Run of River)	27.06.2006
BEREKET EN. (Mentaş Reg) GR I-II	26.6	108.7	Hydro (Run of River)	31.07.2006
EKİN (Başaran Hes) (Nazilli)	0.6	4.5	Hydro (Run of River)	11.08.2006
ERE (Sugözü rg. Kızıldüz hes) GR I-II	15.4	31.6	Hydro (Run of River)	08.09.2006
ERE (AKSU REG. Ve ŞAHMALLAR HES) GR I-II	14.0	26.7	Hydro (Run of River)	16.11.2006
TEKTUĞ (Kalealtı) GR I-II	15.0	52.0	Hydro (Run of River)	30.11.2006

BEREKET EN. (Mentaş Reg) GR III	13.3	54.4	Hydro (Run of River)	13.12.2006
HABAŞ (ALİAĞA-ADDITION)	9.1	35.3	N. Gas	02.05.2007
MODERN ENERJİ	5.2	38.0	N. Gas	2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kadıköy Hast.)	0.5	4.0	N. Gas	19.06.2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kozyatağı Hast.)	0.6	5.0	N. Gas	23.10.2007
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Nilüfer/BURSA)	1.3	11.0	N. Gas	28.08.2007
AKATEKS Tekstil Sanayi ve Ticaret A.Ş.	1.8	14.0	N. Gas	30.07.2007
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)	2.1	17.0	N. Gas	03.12.2007
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)	2.1	17.0	N. Gas	03.12.2007
FRİTOLAY GIDA SAN.VE TİC. AŞ.	0.5	4.0	N. Gas	23.01.2007
KIVANÇ TEKSTİL SAN.ve TİC.A.Ş.	3.9	33.0	N. Gas	20.03.2007
KİL-SAN KİL SAN.VE TİC. A.Ş	3.2	25.0	N. Gas	19.02.2007
SÜPERBOY BOYA SAN.ve Tic.Ltd.Şti.	1.0	8.0	N. Gas	05.12.2007
SWİSS OTEL (Anadolu Japan Turizm A.Ş (İstanbul)	1.6	11.0	N. Gas	01.08.2007
TAV Esenboğa Yatırım Yapım ve İşetme AŞ.	3.9	33.0	N. Gas	19.09.2007
KARTONSAN	5.0	40.0	Liqued Fuel + N.Gas	2007
ESKİŞEHİR END. ENERJİ	3.5	26.8	Liqued Fuel + N.Gas	2007
İGSAŞ	2.2	15.2	Liqued Fuel + N.Gas	2007
İTC-KA Enerji Üretim Aş.(Mamak)(Addition)	1.4	11.0	Waste Heat	22.05.2007
BİS Enerji Üretim AŞ.(Bursa)(Addition)	43.0	354.8	N. Gas	30.05.2007
Aliağa Çakmaktepe Enerji A.Ş.(Aliağa/İZMİR)	34.8	278.0	N. Gas	13.09.2007
BİS Enerji Üretim AŞ.(Bursa)(Addition)	48.0	396.1	N. Gas	30.08.2007
BOSEN ENERJİ ELEKTRİK AŞ.	142.8	1,071.0.	N. Gas	18.01.2007
SAYENERJİ ELEKTRİK ÜRETİM AŞ. (Kayseri/OSB)	5.9	47.0	N. Gas	03.07.2007
T ENERJİ ÜRETİM AŞ.(İSTANBUL)	1.6	13.0	N. Gas	04.04.2007
ZORLU EN.Kayseri (1 GT Addition)	7.2	55.0	N. Gas	17.01.2007
SİİRT	25.6	190.0	Fuel Oil	2007
Mardin Kızıltepe	34.1	250.0	Fuel Oil	2007
KAREN	24.3	180.0	Fuel Oil	2007
İDİL 2 (PS3 A- 2)	24.4	180.0	Fuel Oil	2007
BORÇKA HES	300.6	1,039.0.	Hydro (With Dam)	27.02.2007
TEKTUĞ(Keban River)	5.0	32.0	Hydro (run of river)	08.05.2007
YPM Ener.Yat.AŞ.(Altıntepe Hydro)	4.0	18.0	Hydro (run of river)	06.06.2007
YPM Ener.Yat.AŞ.(Beypınar Hydro)	3.6	18.0	Hydro (run of river)	06.06.2007
YPM Ener.Yat.AŞ.(Konak Hydro)	4.0	19.0	Hydro (run of river)	19.07.2007
KARASU HES-Andırın	2.4	19.0	Hydro (run of river)	28.11.2007
İSKUR TEKSTİL (SÜLEYMANLI HES)	4.6	18.0	Hydro (run of river)	30.12.2007

ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)	6.3	27.0	Hydro (run of river)	03.05.2007
ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)(Addition)	6.3	27.0	Hydro (run of river)	24.05.2007
MB ŞEKER NİŞASTA SAN.A.Ş. (Sultanhanı)	8.8	60.0	Natural Gas	2008
AKSA ENERJİ (Antalya)	183.8	1,290.0	Natural Gas	2008
AKSA ENERJİ (Manisa)	52.4	370.0	Natural Gas	2008
ANTALYA ENERJİ (Addition)	17.5	122.3	Natural Gas	2008
ATAÇ İNŞAAT SAN. A.S.B. (ANTALYA)	5.4	37.0	Natural Gas	2008
BAHÇIVAN GIDA (LÜLEBURGAZ)	1.2	8.0	Natural Gas	2008
CAN ENERJİ (Çorlu - Tekirdağ) (Addition)	52.4	304.2	Natural Gas	2008
FOUR SEASONS OTEL (ATİK PASHA TUR. A.Ş.)	1.2	7.0	Natural Gas	2008
FRİTOLAY GIDA SAN.VE TİC. AŞ. (Addition)	0.1	4.0	Natural Gas	2008
ITC-KA Enerji Üretim Aş.(Mamak)(Addition)	14.1	95.8	Waste	2008
KARKEY (SİLOPİ-5) (154 kV) (Addition)	14.8	103.2	Fuel Oil	2008
MELİKE TEKSTİL (GAZİANTEP)	1.6	11.0	Natural Gas	2008
MİSİS APRE TEKSTİL BOYA EN. SAN.	2.0	14.0	Natural Gas	2008
MODERN ENERJİ (LÜLEBURGAZ)	13.4	94.1	Natural Gas	2008
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	2.8	22.0	Waste	2008
POLAT TURZ. (POLAT RENAISSANCE İST. OT.)	1.6	11.0	Natural Gas	2008
SARAYKÖY JEOTERMAL (Denizli)	6.9	50.0	Geothermal	2008
SÖNMEZ Elektrik (Addition)	8.7	67.3	Natural Gas	2008
AKKÖY ENERJİ (AKKÖY I HES)	101.9	408.0	Hydro (with Dam)	2008
ALP ELEKTRİK (TINAZTEPE) ANTALYA	7.7	29.0	Hydro (run of river)	2008
CANSU ELEKTRİK (MURGUL/ARTVİN)	9.2	47.0	Hydro (run of river)	2008
ÇALDERE ELEKT. (ÇALDERE HES) Dalaman - MUĞLA	8.7	35.0	Hydro (run of river)	2008
DAREN HES ELKT. (SEYRANTEPE BARAJI VE HES)	49.7	182.0	Hydro (With Dam)	2008
DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	25.7	69.0	Hydro (With Dam)	2008
GÖZEDE HES (TEMSA ELEKTRİK) BURSA	2.4	10.0	Hydro (run of river)	2008
H.G.M ENERJİ (KEKLİCEK HES) (Yeşilyurt)	8.7	18.0	Hydro (run of river)	2008
HAMZALI HES (TURKON MNG ELEKTRİK)	16.7	117.0	Hydro (run of river)	2008
HİDRO KNT. (YUKARI MANAHOZ REG. VE HES)	22.4	79.0	Hydro (run of river)	2008
İÇ-EN ELK. (ÇALKIŞLA REGÜLATÖRÜ VE HES)	7.7	18.0	Hydro (run of river)	2008
KALEN ENERJİ (KALEN II REGÜLAT. VE HES)	15.7	50.0	Hydro (run of river)	2008
MARAŞ ENERJİ (FIRNIS REGÜLATÖRÜ VE HES)	7.2	36.0	Hydro (run of river)	2008
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21.0	96.0	Hydro (run of river)	2008
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21.6	108.0	Hydro (run of river)	2008
TORUL	105.6	322.0	Hydro (With Dam)	2008

YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	0.8	5.0	Hydro (run of river)	2008
TOTAL	**6,718.6**	**43,962.3**		

Annex 4

MONITORING INFORMATION

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Annex 5

1. Screenshot of Generation License of Kavakçalı HPP

T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

E P D K

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi
Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/1980-1/1404

Tarih : 18/02/2009

Bu Lisans, **Pak Enerji Üretimi Sanayi Ve Ticaret Anonim Şirketi**'ne, **Muğla** İli'nde kurulacak olan **Kavakçalı HES** üretim tesisinde 18/02/2009 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 18/02/2009 tarihli ve 1980-1 sayılı Kararı ile verilmiştir.

Hasan KÖKTAŞ
Başkan

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

Energy Market Regulatory Authority

Generation License
The unit that covered in this license uses renewable energy resources

License No:EÜ/1980-1/1404

Date: 18/02/2009

This license is given to the Pak Enerji Üretimi Sanayi ve Ticaret A.Ş. for the 49 operation years, utilized at 18.02.2009 of Kavakçalı HPP in Muğla Province by the 1980-1st decision of Energy Market Regulatory Authority date 21/01/2010,which is in line with Electricity Law numbered 4628 and related legislations.

2. Screenshot of "EIA not required letter" of Kavakçalı HPP

T.C.
ÇEVRE ve ORMAN BAKANLIĞI
ÇEVRESEL ETKİ DEĞERLENDİRMESİ VE PLANLAMA
GENEL MÜDÜRLÜĞÜ

Karar Tarihi: 03/02/2010
Karar No : 1924

ÇED OLUMLU BELGESİ

17.07.2008 tarih ve 26939 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 14. maddesi gereğince; *"Kavakçalı Regülatörü ve HES (10,88 MW)"* projesi hakkında *"Çevresel Etki Değerlendirmesi Olumlu Kararı"* verilmiştir.

Fevzi İŞBİLİR
Bakan a.
Genel Müdür

Proje Sahibi : Pak Enerji Üretimi Sanayi ve Ticaret A.Ş.
Projenin Yeri : Muğla İli, Köyceğiz İlçesi sınırları içerisinde, Namnam Çayının memba kolu olan Derindere üzerinde

MUĞLA GOVERNORSHIP

DIRECTORATE of FORESTRY and the ENVIRONMENT

Decision Date: 01.07.2010
Decision No:1924

Examination-evaluation process has been carried out for Kavakçalı Hydroelectric Power Plant with a capacity of 10.88 MWe, within the framework of Annex-II in Environmental Impact Assessment Regulation published on the Official Gazette dated 17/07/2008 and numbered 26939 and precautions proposed in the Project Information File are found to be sufficient. It is deterined that an EIA Report is not required, "EIA Not Required Decision" is given in accordance with Article 17 of Environmental Impact Assessment Regulation.

Project owner: Pak Enerji Üretimi Sanayii ve ticaret A.Ş
Project area: on Derindere river connected to Namnam stream within the Köyceğiz District of Muğla Province