



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006**

CONTENTS

- A. General description of project activity.
- B. Application of a baseline and monitoring methodology
- C. Duration of the project activity / crediting period
- D. Environmental impacts
- E. Stakeholders' comments

Annexes

- Annex 1: Contact information on participants in the project activity
- Annex 2: Information regarding public funding
- Annex 3: Baseline information
- Annex 4: Monitoring plan
- Annex 5: EIA Exemption Letter
- Annex 6: Hepps owned by Generation Companies.
- Annex 7: Generation License

**SECTION A. General description of project activity.****A.1. Title of the project activity:**

Title: 7.11 MW BULAM HYDROELECTRIC POWER PLANT

Version: 10

Date: 29/02/2012

A.2. Description of the project activity:

Bulam Weir and HEPP Project is located in Southeast Anatolia, in the province of Adiyaman, on the Bulam river - a tributary of the Firat River. The project location is approximately 35 km from the city center of Adiyaman and 12 km from Kocali village, near the highway joining Adiyaman and Celikhan District of Malatya.

The proposed project aims utilization of the hydraulic potential for electricity generation. Project facilities occupy lands within a 5km area starting from southeast of Recep Village and extending in east-west direction. There exist a irrigation dam at the upstream of the plant which is operational since 1987 and irrigate about 1,097ha land. Also, there exist another project at the supstream which is at design phase for providing potable water to Adiyaman which is expected to be operational by 2015. In addition, there exist a fish farm and a bottling plant at the upstream which do not interact with the proposed project. The region has a higher average precipitation rate then the average and has a uneven topography. There exist no protected area within the project boundaries. The project land is mainly owned by government. The baseline scenario has been defined as the supply of same amount of electricity by the power plants that will benewly implemented and connected to the grid.

Bulam Weir and HEPP Project will be made up of a weir, a transmission pipe, a headrace tunnel, a forebay dam, a penstock and a power house. Held and channelized by a weir to be built at 1,240 m riverbed elevation and 1,251 m crest elevation, waters of Bulam creek will be taken into the first section of transmission pipe of 1.50 m diameter and 524.93 m length at the take off base elevation of 1,245.00 m. Then, same water flow will pass through the modified horseshoe tunnel of 3.00 m inner diameter and 2,421.29 m length to reach into the second section of transmission pipe of 1.50 m diameter and 1,247.70 m length, which is followed by the surge tank and the valve chamber. Total length of the transmission system is 4,193.92 m of which 1,772.63 m is made up of CTP pipe. All of the transmission plants will be under pressure.

Installed capacity of Bulam HEPP will be 7.11 MWe (7.9 MWm). It shall be commissioned after 2 years of construction period. The annual electricity production shall be 32.4 GWh.

Since in the preliminary license application, the project which supplies drinking water to Adiyaman province from the Bulam river was not finalized, the license for the project was taken as 9 MW. However the license was revised in November 2008 and the installed capacity was reduced to 7.11 MWe.

The energy which shall be generated at the Hydroelectric Power Plant shall be transmitted to Celikhan grid substation, located 12 kilometers away at the northeast of the project site, with a power transmission line. The transmission line shall be 12 km long, double circuit, 34.5 kV, 2 x 3/0 AWG conductors.



Main goals of the Bulam HEPP project include;

- Utilization of the hydroelectric potential of Turkey in order to meet the increasing electricity demand and guarantee energy security.
- Increase share of run-off-river HEPPs in electricity generation mix of Turkey and reduce GHG emissions.
- Wider use of distributed energy generation systems which help to decrease the transmission loss in the grid,
- Contribute to economic development by creating direct and indirect job opportunities during construction and operation phases.
- Reduce import dependency of fossil fuel weighed electricity sector and diversify generation mix through use of local resources.

Project will contribute to sustainable development in the region through creating new job opportunities during construction and operational phase. About 100 people will be employed (excluding subcontractors) during construction stage. Project will also create 14 permanent job opportunity during operation stage. According to the research conducted by State Planning Organization(SPO) on socio-economic level of Districts in Turkey, Celikhan District is ranked as 617th among 872 Districts in Turkey in terms of development level and classified in fourth(out of six) group. About 80% of the population works on agriculture and 18.65 % works on service sector whereas only 1.4% works on industry which has caused about 18% decrease in population¹ mainly due to lack of employment opportunities in the region. The Celikhan is ranked as 867th out of 872nd District in terms of per capita income. In that respect, direct and indirect contribution of project activities to local economy through employment and supply of needs from the region will have a significant effect on local economy.

Major milestones for project activities are given below;

Activity	Date
Issuance of Generation License	31/05/2006
EM Equipment Agreement*	06/06/2008
Start of Construction	01/08/2008
Preliminary Stakeholder Consultation Meeting	13/01/2009
SFR Meeting	17/02/2010
Approval and Commissioning(Expected)	01/08/2010
End of Licence Period	30/05/2054

* Investment Decision Date

Table 1. Main project activities

A.3. Project participants:

Name of Party involved (*)	Private and/or public entity(ies) project	Kindly indicate if the
----------------------------	---	------------------------

¹ <http://ekutup.dpt.gov.tr/bolgecel/gosterge/2004/ilce.pdf> (page 136)



((Host) indicates a host Party)	participants (*) (as applicable)	Party involved wishes to be considered as project participant
Turkey(Host)	MEM Enerji Elektrik Üretim AŞ.(MEM) Global Tan Energy Ltd. (GTE)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

Bulam Weir and HEPP Project is located in the Southeast Anatolia, in the province of Adiyaman, on the river of Bulam, a tributary of Fırat River. The location is about 35 km from the city center of Adiyaman and 12 km from Kocali village, near the highway joining Adiyaman Celikhan Malatya.

Bulam Weir is located just upstream of Fatopasa village. The location of the weir is in 1/25,000 scale map no. M40 a2 of Şanlıurfa, at UTM ED50 coordinates of 4 204 998 N 434 205 E. The location of the power house is in 1/25,000 scale map no. M40 b1 of Şanlıurfa, at UTM ED50 coordinates of 4 203 913N 438 201 E.

The coordinates of the project is also given as longitude and latitude as 37° 58' 48.5" - 59' 22.6" – N and 38° 17' 46.8" - 15' 2.7" E

A.4.1.1. Host Party(ies):

Although Turkey, the Host Country, passed legislation in Parliament on February 5th 2009 to ratify the Kyoto Protocol - Turkey does not have a quantitative emission reduction limit likely until post 2012 and as such is therefore in the interim period continues to be eligible for voluntary emission reduction projects.

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

Southeast Anatolian Region/Adiyaman Province

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

Bulam Town, Çelikhan District

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):



Figure 1. Location of the project activity



Figure 2. View of Project Location

A.4.2. Category (ies) of project activity:

Project activity involves electricity generation from renewable sources therefore it is categorized in the sectoral scope 1 “Energy Industry – Renewable Sources” according to the UNFCCC definition.

A.4.3. Technology to be employed by the project activity:

Hydroelectric power plants are structures that generate electricity utilizing energy of flowing water. Project consists of two Francis type turbines and two generators which are used to transform the potential energy of water to mechanical energy at the initial stage and later into electrical energy.

Project used conventional hydro electric power generation technology. Main characteristics of the power plant are as follows:

Total installed capacity	:7.11 MWe
Number of units	: 2
Capacity of units	: 2 x 3.55 MWe



Type of turbine	: Horizontal Francis
Gross Head	: 177.00 m
Net Head (for designed flow rate)	: 168.10 m
Synchronous speed of generators	: 750 rpm
Efficiency of turbines	: 0.930
Efficiency of generators	: 0.975

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO₂ e
2010 (01/08/2010-31/12/2010)	10,107
2011	24,257
2012	24,257
2013	24,257
2014	24,257
2015	18,194
2016	18,194
2017(01/01/2017-01/08/2017)	10,613
Total emission reductions (Tonnes of CO ₂ e)	154,136
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	22,019

Table 2. Estimated amount of emission reduction

Annual generation has been estimated as 43.194 GWh until end of 2015 and 32.397 GWh after 2015 due to supply of irrigation water for Adiyaman Province.

A.4.5. Public funding of the project activity:

No public funding or ODA is used for the project.

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

The United Nations approved consolidated baseline methodology applicable to this project is ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources”, Version 11².

ACM0002 refers to the following tools:

- “Tool for the demonstration and assessment of additionality”, Version 05.2,³ and
- “Tool to calculate the emission factor for an electricity system”, Version 01.1⁴.

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The choice of methodology ACM0002, is justified as the project activity meets its applicability criteria:

- The Bulam 7.11MWe HEPP is a grid connected renewable electricity generation project,
- The project does not involve switching from fossil fuel use to renewable energy at the site of the project activity; and
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.
- The proposed project is a run-off-river type HEPP and power density is higher than 4 W/m².

B.3. Description of the sources and gases included in the project boundary:

GHG gases included in the project boundary and used in calculation of emission reduction by the project activity are given in table below.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in baseline (Turkey Grid)	CO ₂	Yes	Main Emission Source
		CH ₄	No	Minor emission source. Excluded for simplification

² <http://cdm.unfccc.int/UserManagement/FileStorage/HGY3TLRFPQVM016WA4I7XCZD92KE5S>

³ http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

⁴ See: http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf



		N ₂ O	No	Minor emission source. Excluded for simplification
Project Activity	Emission from the reservoir of the proposed project is excluded as per the methodology applied.	CO ₂	No	Zero-emission electricity generation
		CH ₄	No	Zero-emission electricity generation
		N ₂ O	No	Zero-emission electricity generation

Table 3. GHG gases included in the project boundary

The project boundary is limited by the National Electricity Grid of Turkey. The Geographical and physical boundaries of the Turkish grid and location of the power plants are clear. Import data obtained from related the relevant government agencies (EUAS - Turkish Electricity Generation Corp., TEIAS – Turkish Electricity Transmission Corp., Ministry of Energy and Natural Resources) have been included in the calculations of the combined margin emissions.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

This project follows the methodology described in the ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. Selected methodology has been applied together with the “tool to calculate the emission factor for an electricity system, version 01.1” and “tool for assessment and demonstration of additionality, version 5.2”.

The baseline scenario has been identified as “*Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system”*”

Turkish electricity generation is mainly composed of thermal power plants and the share of renewable resources; especially hydroelectric power plants have decreased significantly in recent years. Since Turkey is an advanced developing country, there is an increasing demand for electricity which is fully expected to continue in the foreseeable future.

The trend in Turkey to date and given historically slow development of alternative energy resources is to build an increasing number of thermal power plants in the future to satisfy the annual growth in energy consumption demand. Turkey as an advanced developing nation, has looked at dealing with energy security by developing and constructing high capacity coal and natural gas power plants. The development of thermal power plants has been also encouraged by the large natural resource availability in Turkey, especially the abundance of economically accessible lignite.

In the absence of the proposed project activity, the same amount of electricity is required to be supplied via either the current power plants or by increasing the number of thermal power plants thus increasing GHG emissions.

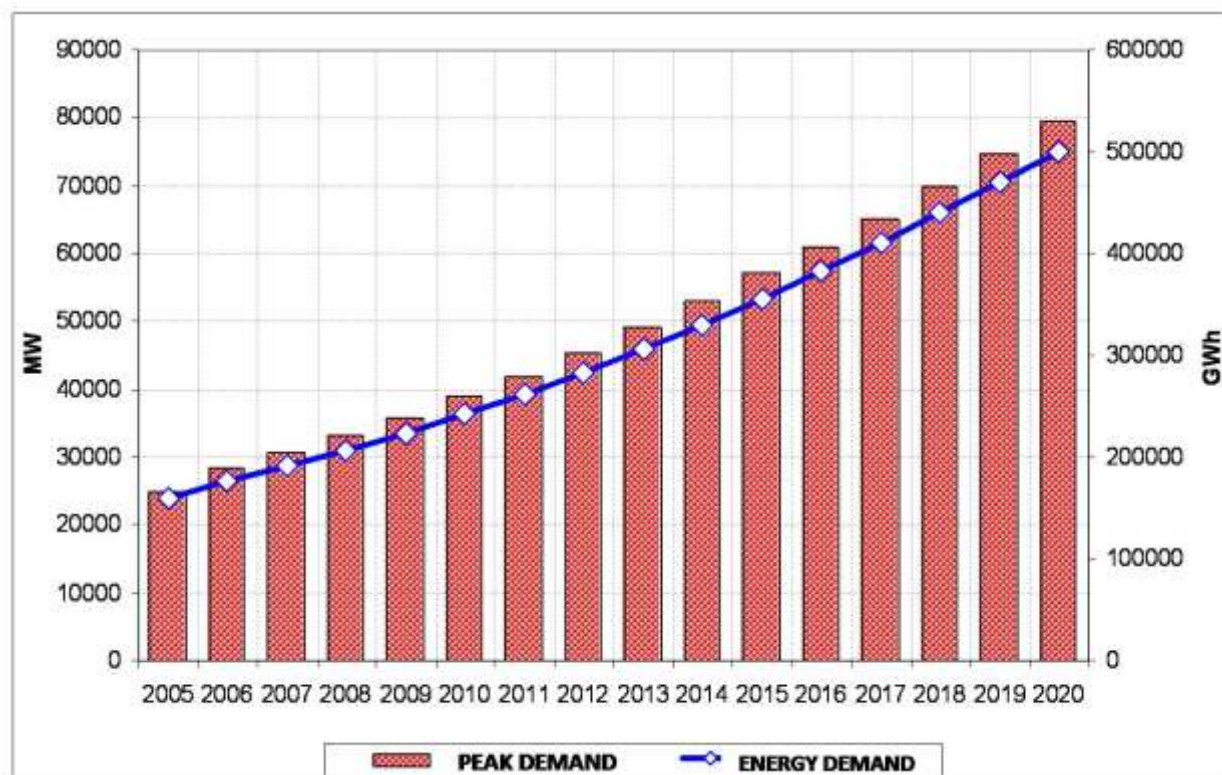


Figure 2. Peak Load and consumption projection for Turkish electricity system between 2005-2020⁵

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

According to the applied methodology (ACM0002) baseline scenario for the project has been defined as “generation of equal amount of electricity by the grid”. Emission factor for the baseline scenario has been calculated according to the combined margin approach as defined by the selected methodology. Within this framework, project is expected to generate about 32.4 GWh electricity and reduce about significant CO₂ emission through replacing the electricity that would need to be supplied via the national grid in the absence of the project activity. Additionality of the proposed project has been assessed according to the applied tool for demonstration of additionality as shown in following steps.

Step 1 - Identification of Alternatives to the project activity consistent with current laws and regulations

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

Most realistic and reliable alternatives to the project activity are:

1. Proposed project not undertaken as a VER project activity

⁵

<http://www.teias.gov.tr/apkuretimplani/veriler.htm>



2. Continuation of the current situation-supply of equal amount of electricity by the new power plants connected to the grid (including thermal and renewable)

The first alternative, which is the implementation of the project without carbon revenue is not financially attractive as discussed in investment analysis section below. The Second alternative (Scenario 2) is the baseline scenario and implementation of the proposed project as a VER activity would be additional to this scenario.

Outcome of Step 1a

Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore first and third alternatives are more likely to happen.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law⁶
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy⁷
3. Energy Efficiency Law⁸
4. Forest Law⁹
5. Environment Law¹⁰

The resultant alternatives to the project as outlined in Step (1a) are in compliance with the applicable laws and regulations which are assessed by EMRA before issuing license. The renewable energy generation license for Bulam HEPP has been issued considering Electricity Law and Law in utilization of Renewable Energy Resources for the purpose of generating electricity energy. The proposed project is also within the scope of and in compliance with Energy Efficiency Law(Article 2 of Part One). Environment Law is also satisfied in and the project has been exempted from a EIA study due to capacity of the project. Finally, 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.

Outcome of Step 1b

It has been demonstrated that proposed project is in compliance with the laws. Also, existence of thermal power plants serves as an evidence for demonstrating that alternatives are not prevented by laws or regulations.

⁶ Law number 4628, enactment date 03/03/2001 <http://www.epdk.gov.tr/english/regulations/electricity.htm>

⁷ Law number 5346, enactment date 18/05/2005
<http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf>

⁸ Law number 5627, enactment date 02/05/2007
http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc

⁹ Law number 6831, enactment date 31/08/1956

¹⁰ Law number 2872. Published in official gazette No. 18132 on 11/08/'83



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

Step 2 - Investment analysis

The investment analysis has been done in order to make an economic and financial evaluation of the project. No public funding or ODA are available in Turkey for finance of this type of projects.

Sub-step 2a - Determine appropriate analysis method

There are three options for the determination of analysis method which are:

- Simple Cost Analysis
- Investment Comparison Analysis and
- Benchmark Analysis

Since Project generates economic benefits from sales of electricity, the simple cost analysis is not applicable.

Also, since the baseline of the project is generation of electricity by the grid connected power plants, no alternative investment is considered at issue. So, it has been decided to use benchmark analysis for evaluation of the project investment.

Sub-step 2b. Option III. Apply benchmark Analysis

According to the “Tool for the demonstration and assessment of additionality”, a relevant benchmark for an equity IRR can be derived from government bond rates increased by a suitable risk premium (to reflect private investment and/or project type). For benchmark analysis of the project, bond rates available at time of investment decision(06/06/2008) from web page of a government bank have been used as given in table below. Two bonds which have similar maturity date to analysis period have been identified and their average has been determined as risk free rate or return.

Bond	Maturity Date	Currency	Rate
US900123AW05	05.02.2025	USD	7.32
US900123AL40	15.01.2030	USD	7.19
Average			7.25

Table 4. Bond rates used for the benchmark analysis¹¹

Sub-step 2c. Calculation and comparison of financial indicators

Parameters	Unit	Data Value
------------	------	------------

¹¹ <http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler.aspx/eurobond.aspx> (Accessed on 13/10/2010)



Installed Capacity	MWe	7.11 ¹²
Grid Connected output	GWh	43.194(32.397 After 2015) ¹³
Capital Investment	Million €	14.512 ¹⁴
Income tax rate	%	20
Expected Tariff	€ Cents/kWh	5.5 ¹⁵
Loan Repayment Period	Years	8 ^{16,17}
Expected VERs price	€/ tCO ₂ e	9
Analysis Period	Years	20 ¹⁸

Table 5. Main financial parameters used for investment analysis

Internal Rate of Return (IRR) of the Bulam HEPP has been calculated as 6.91 % based on the parameters given above without considering the carbon revenue. Project does not use any ODA or government incentive. Electricity tariff has been used as €5.5 Cent/kWh although this is the maximum amount and floor price is €5.0 Cents/kWh as given in renewable energy law. Annual generation has been taken as 43.194 GWh for the first five years and 32.397 GWh after supply of drinking water for Adıyaman considering the feasibility study made for the project. Considering carbon revenue, IRR increases to 9.60% and becomes more feasible with the expectation that electricity tariff will increase due to increasing electricity demand of Turkey and project will benefit from increasing price at the market.

Considering the Government bond rates are around 7.25% and estimated country risk premiums which are around 9.41% for Turkey¹⁹, it can be concluded that expected return on investment for these types of projects should be higher than 16.66% considering that business, currency and project risks are not included. Expectation that the electricity prices will increase is the risk for investors whereas realization of this expectation will increase the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and risk of investment decision. Considering the rapidly increasing electricity demand of Turkey, electricity tariff should increase to € cents 8/kWh so that project investment becomes reasonable. Another benchmark for similar project types have been defined by Worldbank as 15%²⁰ by a report generated in 2009, whereas an earlier World Bank report gives financial IRRs for several projects as 16% to 20% for similar projects.²¹ Even if we consider the

¹² Generation License

¹³ Feasibility Study Report page 1-5

¹⁴ Feasibility Study Report Section 8

¹⁵ Renewable Energy Law

¹⁶ <http://www.kap.gov.tr/yay/Bildirim/Bildirim.aspx?id=101254>

¹⁷ Loan Agreement

¹⁸ http://www.gib.gov.tr/fileadmin/user_upload/Yararli_Bilgiler/2007_KV_Oranlari.html

¹⁹ <http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem06.xls>

²⁰ Project Appraisal Document for a proposed IBRD Loan (page 81)

²¹ http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2004/03/09/000090341_20040309095924/Rendered/PDF/254970TR.pdf (page 36)



minimum benchmark IRR which is 15%, for Bulam HEPP, benchmark IRR is much higher than equity IRR of the project.

However, due to the uncertainty in economical environment, demand for electricity has decreased significantly in recent years which have frustrated the investors expecting higher electricity prices. Under this circumstances most reliable scenario for financiers and investors is the renewable law which guarantees 5.0€ to 5.5€ cents per kWh. Recent trends in global economy have shown that the consideration of guaranteed price is a realistic and reliable scenario that should be considered in investment analysis for similar projects.

Following figure is given in order to reflect the actual electricity prices realized obtained from monthly reports of Market Settling and Balancing Center²² between 01/01/2009-31/01/2010. It should be considered that these prices are highest prices obtained and power plants which sell electricity through bilateral agreements have lower income. Figure shows that the actual prices have even been lower than guaranteed price in some cases therefore assumption of 5.5€cents per kWh (or 55€ /MWh) is a realistic scenario as demonstrated below.

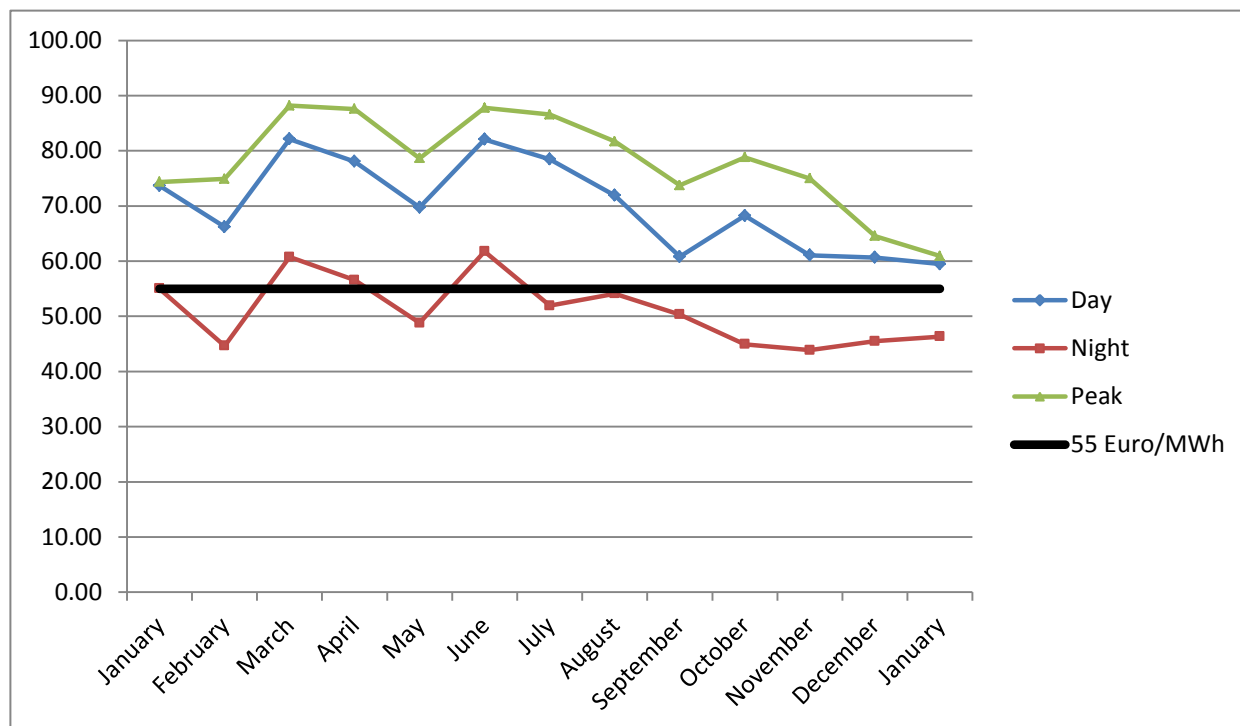


Figure 3. Highest tariffs observed between January 2009-January 2010 (€/MWh)

This IRR value represents the most optimistic scenario in terms of capital investment, electricity tariff and generation. This figure, when compared with Turkish bond yields in the market, it is seen that the project

²² <http://pmum.teias.gov.tr/UzlasmaWeb/>



is not financially attractive for investors as bond rates guarantee the same income without any investment risk.

Sub-step 2d - Sensitivity Analysis

Sensitivity analysis has been carried out for three main parameters identified;

- Investment Cost
- Operating Cost
- Electricity Sales revenue

For a range of $\pm 10\%$ fluctuations in Investment and Operating cost and -30% - $+40\%$ fluctuation in Electricity income, table below has been obtained.

	% Fluctuation						
	-10	-5	-2.5	0	+2.5	+5	+10
Investment Cost	9.92	8.26	7.56	6.91	6.31	5.75	4.73
Operating Cost	7.76	7.23	7.07	6.91	6.75	6.59	6.27
	% Fluctuation						
	-30	-20	-10	0	10	20	40
Electricity Income	0.39	2.45	4.61	6.91	9.38	12.05	18.23

Table 6. Sensitivity analysis for Bulam HEPP project (without carbon revenue)

The contingency for Construction costs which forms the most significant component of investment cost has been accepted as 10% as it is usually assumed as 10% in the Feasibility studies. Same fluctuation rate has also been applied to operational costs. The electricity income involves both fluctuation in generation figure and tariff. Fluctuation for tariff has been determined considering guaranteed price which forms basis for financial analysis and actual prices realized (as given in Figure 3 above) in the market and the tariff expected to reach benchmark IRR. Fluctuation in generation has been reflected in considering that the natural flow will also fluctuate.

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the project and make the project more attractive for investors. Considering that figures above are based on highest guaranteed price rather than average price, optimistic estimations for yearly generation and that those figures do not reflect the risk for investment, role of carbon income is a most significant number to enable the project to proceed and favorable investment and funding decision taken. Based on the above information, it is seen that project is not the most attractive option. Therefore project is considered as additional to the baseline scenario.

Step 3. Barrier analysis

This step is not applied for the proposed project.

Step 4. Common Practice Analysis

Analysis of other activities similar to the proposed project activity

According to the TEIAS statistics²³, share of HEPPs in total installed capacity of Turkey is about 32.8% whereas share of HEPPs in total generation has been realized as about 18.6% in 2007²⁴. However, when we look at the historical data, it seen that share of hydroelectric was much higher in the past as seen in the figure below.

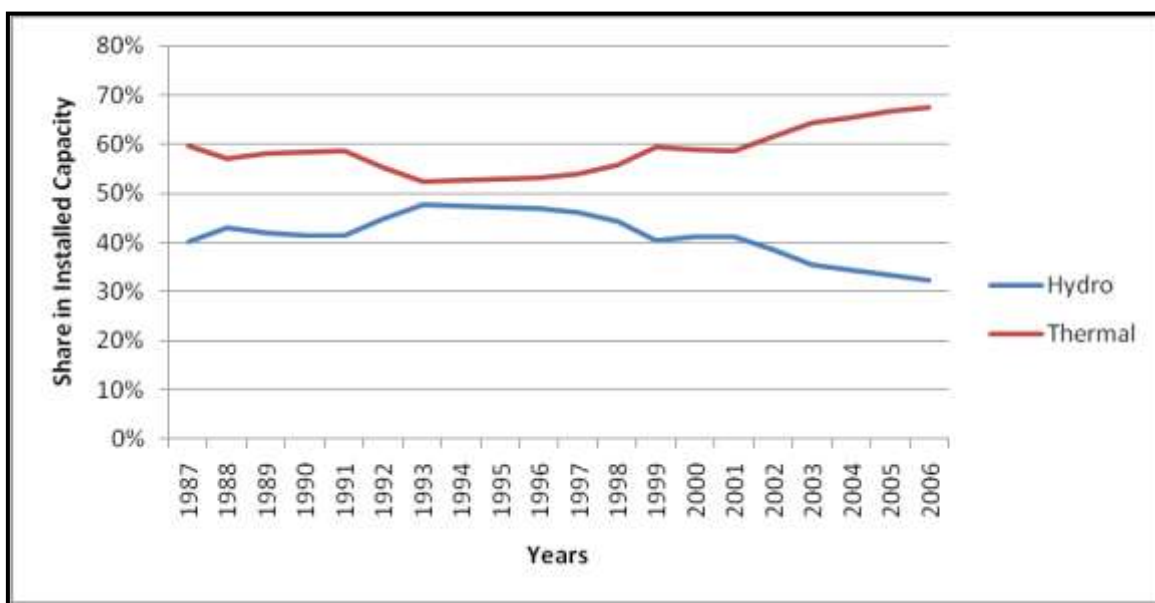


Figure 6. Annual Development of Turkey's Installed Capacity

Discuss any similar options that are occurring:

The main reason behind the decrease in share of hydro electricity power is due to the changes in government's economic policy which intends to encourage private companies to invest in energy generation and lower the weight of government on energy generation as a part of privatization efforts. On the other hand, private companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and uses conventional technologies. Installed capacity of thermal power plants owned by generation companies has increased from 123.4 MW in 1996 to 10,688.8 MW in 2007 whereas the total capacity of hydro electricity power plants has only increased from 75.3 MW to 1,345 MW (including autoproducers, generation companies, Build-Operate-Transfer (BOT) plants and concessionary companies) in the same period which show that private companies find more attractive to invest is thermal power plants^{25,26,27}.

²³ <http://www.teias.gov.tr/ist2007/1.xls>

²⁴ <http://www.teias.gov.tr/ist2007/13.xls>

²⁵ [http://www.teias.gov.tr/ist2007/5\(1984-05\).xls](http://www.teias.gov.tr/ist2007/5(1984-05).xls)

²⁶ <http://www.teias.gov.tr/ist2006/8.xls>

²⁷ <http://www.teias.gov.tr/ist2007/8.xls>

When we look at the distribution of hydro power capacity by utilities, it is seen that total generation capacity of the hydroelectric power plants owned by generation companies is 1,503 GWh by end of 2007²⁸ which corresponds to 0.78% of the total generation capacity(191,558.1 GWh) of Turkey at that time. However, a detailed review of these has shown that majority of these plants have been initially licensed/implemented as Autoproducer or BOT power plants but later licenses have been revised as Generation Company License during liberalization of Turkish Electricity Market and some of them have been built using VER revenue (See Annex 7 for details). When these plants are excluded, only two power plants (0.6MW Basaran HEPP and 12.5MW Tahta HEPP) could be identified. Some of generation capacities of these plants correspond to about 0.003% of total generation capacity at time of investment decision.

Out of these two projects, the Basaran Hepp (0.6 MW) is not of similar scale for the project or in the same region. Therefore it has been excluded from the common practice analysis. The other project, 12.5MW Tahta Hepp is not at similar scale(about 80% higher in terms of installed capacity) and the distance between two projects is more than 200km.

Besides the fact that each project is different and has unique characteristics, information (Investment model, incentives, ODA or public funding, investment finance cost or IRR) about these plants is not publicly available. Therefore a reliable comparison of these plants would not result in a reliable outcome. Figure below demonstrates that recently *built* hydroelectric power plants are not as efficient as the previous ones and serve as a good example to the point issued in previous statement. The figure also shows the fluctuation in electricity generation which poses high investment risk especially for run-off-river type hepps.

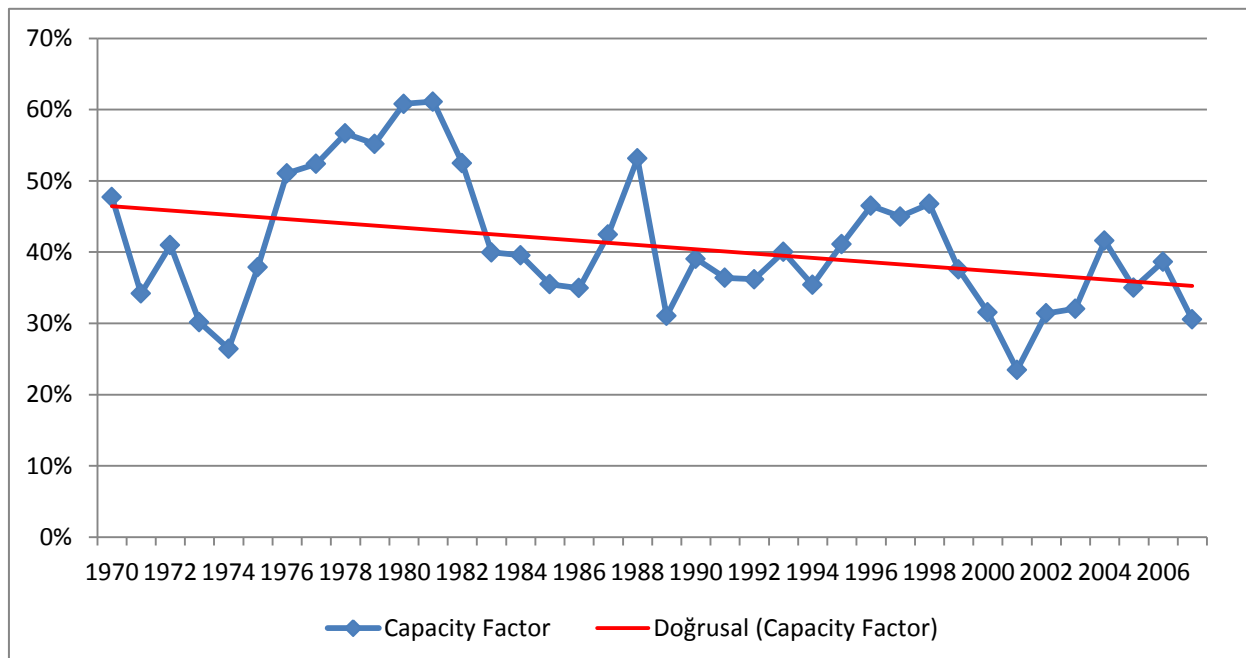


Figure 5. Evolution of Capacity(Plant Load) Factor of HEPPs in Turkey.^{23,24}

²⁸ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf> (page 120)



The statement above has also been confirmed by the owner of Tahta HEPP (Özgür Elektrik AS) such that company has informed us that they have other projects applied for GS registration (GS681-Pasa HEPP). Although the PDD for Pasa Hepp is not publicly available, the project owner has stated that IRR of Tahta Hepp is higher than many other projects and they have been using this project as an internal benchmark for their other projects.²⁹

Outcome of Common Practice Analysis:

Although the share of hydro in overall generation capacity of Turkey seems high, this represents the dam type, high efficiency, large hydro built by government in previous years therefore they are not comparable with proposed project type. Besides, analysis of existing plants owned by generation companies has shown that most them are implemented initially as autoproducer or under BOT contracts.

As discussed above in detail, there exists no other project in the same region similar to the project built without carbon revenue whereas a countrywide assessment has resulted in a single project of similar size but with higher IRR. The fact that capacity utilization of HEPPs is decreasing is demonstrated in figure above which shows that the most feasible projects have been already implemented and remaining projects have lower capacity factor.

Within the framework of the discussion above, and given the past and continuing weight and presence of the Government influence, as mentioned and illustrated from the above facts, the proposed type of project should not be considered as a common practice in Turkey.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission factor has been calculated in a conservative as requested by the methodology. Basic assumptions made are;

- Emission factor will remain same over the crediting period,
- Emission factor of fuels sources is “0” or the lowest value in the references when there is no information.

The Additionality Assessment of the project activity has been demonstrated using the latest version of the ‘Tool for Assessment and Demonstration of Additionality’.

According the “Tool to Calculate the Emission Factor for an Electricity System”, ver. 01.1, the following four methods are applicable to calculate the operating margin:

- a) Simple OM,
- b) Simple adjusted OM,

²⁹ Mr Gultekin Keles, Ozgur Elektrik AS (www.ozgurelektrik.com.tr)



- c) Dispatch Data Analysis OM and
d) Average OM.

Since the share of low-cost / must-run sources is below 50%, method (d) is eliminated. Also due to insufficient data available, methods (b) and (c) are not considered and thus (a) simple OM method is used in calculations. The following table is used for demonstrating the share of low cost/must run resources.

		2007	2006	2005	2004	2003	Average
Total Generation	[GWh]	191,558	176,300	161,956	150,698	140,581	164,219
Low-cost / must run	[GWh]	36,362	44,465	39,714	46,235	35,480	40,451
Low-cost / must run	[%]	19	25	25	31	25	25

Table 7. Breakdown by source of the electricity generation for the five most recent years³⁰

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

Data / Parameter:	EG_{v, Total}
Data unit:	MWh
Description:	Net Electricity delivered to the grid by power plants in Turkey in year 2007
Source of data used:	TEIAS web page - http://www.teias.gov.tr/ist2007/30(84-07).xls
Value applied:	183,339.7 GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for emission reduction calculation(for calculation of OM, Net-to-Gross electricity ratio and share of low-cost must-run sources)
Any comment:	

Data / Parameter:	EF_{CO₂, i, y i}						
Data unit:	tCO ₂ /TJ						
Description:	CO ₂ emission factor of fossil fuel type “i” in year “y”						
Source of data used:	-For EF of fossil fuels, IPCC values at the lower limit has been used.						
Value applied:	<table border="1"> <thead> <tr> <th>Fuel Source</th> <th>EF(tCO₂/Tj)</th> </tr> </thead> <tbody> <tr> <td>Coal</td> <td>89.5</td> </tr> <tr> <td>Lignite</td> <td>90.9</td> </tr> </tbody> </table>	Fuel Source	EF(tCO ₂ /Tj)	Coal	89.5	Lignite	90.9
Fuel Source	EF(tCO ₂ /Tj)						
Coal	89.5						
Lignite	90.9						

³⁰ <http://www.teias.gov.tr/ist2007/13.xls>



	Fuel Oil	75.5
	Diesel	72.6
	LPG	61.6
	Naphta	69.3
	Natural Gas	54.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.	
Any comment:		

Data / Parameter:	FC_{i,y}
Data unit:	Tons or 1000 m ³ for gases
Description:	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/43.xls)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM calculation

Data / Parameter:	GE
Data unit:	%
Description:	Generation efficiency of thermal power plants
Source of data used:	Annex I- Tool to calculate the emission factor for an electricity system
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for BM calculation
Any comment:	

Data / Parameter:	NCV
Data unit:	Tj/kt



Description:	Net Calorific Values of Fuel combusted in power plants.
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/45.xls)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM and BM calculation
Any comment:	

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

As per the tool, the following six steps for calculation of emission reductions have been applied:

Step 1. Identification of the relevant electrical power system

According to the “Tool to calculate the emission factor for an electricity system”, Version 01, a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity, and that can be dispatched without significant transmission constraints. Therefore, in this project activity the project electricity system includes the project site and all power plants attached to the Interconnected Turkish National Grid, which has an installed capacity of 40,835.7MW and gross generation about 191,558.1 by 2007³¹32.

For imports from connected electricity systems located in another host country (ies), the emission factor is taken as “0” tCO₂/MWh as requested by the methodology.

Step 2. Select an operating margin method

Since the fuel consumption data is not available for each power plant, method (d) is eliminated. Also due to insufficient data, methods (b) and (c) are not considered and thus (a) simple OM method is used in calculations. The following table is used for demonstrating the share of low cost/must run resources.

		2007	2006	2005	2004	2003	Average
Total Generation	[GWh]	191,558	176,300	161,956	150,698	140,581	164,219
Low-cost / must run	[GWh]	36,362	44,465	39,714	46,235	35,480	40,451
Low-cost / must run	[%]	19	25	25	31	25	25

31 <http://www.teias.gov.tr/ist2007/1.xls>

32 <http://www.teias.gov.tr/ist2007/13.xls>

Table 8. Breakdown by source of electricity generation for the five most recent years³³

The Simple Operating Margin (OM) emission factor ($EF_{\text{grid, OM, } y}$) is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all the generating plants serving the system, excluding low-cost/must-run power plants. As electricity generation from solar and low cost biomass facilities is insignificant and there are no nuclear plants in Turkey, the only low cost /must run plants considered are hydroelectric, wind and geothermal facilities.

The tool gives two options for the calculation of $EF_{\text{grid, OM, } y}$;

- *Ex-ante* option

A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VER-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period, or

- *Ex-post* option

The year in which the project activity displaces grid electricity, with the requirement that the emissions factor to be updated annually during monitoring.

For this project the *ex-ante* approach is selected. Data for calculating the three year average is obtained from the period 2005 – 2007, the most recent data available at the time of PDD submission to the DOE.

Step 3. Calculating the operating margin emission factor according to the selected method.

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

- Based on fuel consumption and net electricity generation data of each power plant / unit (Option A), or
- Based on net electricity generation data, the average efficiency of each power unit, and the fuel type(s) used in each power unit (Option B), or
- Based on total net electricity generation data of all power plants serving the system, fuel types, and total fuel consumption of the project electricity system (Option C)

As fuel consumption and average efficiency data for each power plant / unit are not available, Option C is used for simple OM calculation. Under Option C, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must run power plants / units, and based on fuel type(s), and total fuel consumption of the project electricity system, as follows:

(1)



³³ <http://www.teias.gov.tr/ist2007/13.xls>



where:

- $EF_{grid, OM, y}$ Simple operating margin CO₂ emission factor in year y (tCO₂/GWh)
 $FC_{i, y}$ Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit)
 $NCV_{i, y}$ Net calorific value (energy content) of fossil fuel type *i* in year y (GJ / mass or volume unit)
 $EF_{CO_2, i}$ CO₂ emission factor of fossil fuel type *i* in year y (tCO₂/GJ)
 EG_y Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must run power plants / units, in year y (MWh)
i All fossil fuel types combusted in power sources in the project electricity system in year y
y Either the 3 most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

For the calculation of the Simple OM, the amount of fuel consumption ($FC_{i, y}$) and heating values of fuels are taken from website of TEIAS34:35:36:37, the official source of related data. Fuel consumption values for the relevant years are in table below.

Fuel Type	FC _{i,y} unit [Ton, except for Natural Gas (NG) (1000 m ³)]			
	2007	2006	2005	Total
Hard Coal	6,029,143	5,617,863	5,259,058	16,906,064
Lignite	61,223,821	50,583,810	48,319,143	160,126,774
Fuel Oil	2,250,686	1,746,370	2,005,899	6,002,955
Diesel Oil	50,233	61,501	28,442	140,176
LPG	0	33	12,908	12,941
Naphtha	11,441	13,453	84,481	109,375
Natural Gas	20,457,793	17,034,548	15,756,764	53,249,105

Table 9. Fuel Consumption in thermal power plants

The NCV of the fuels consumed have been calculated using data from the TEIAS web page. The emission factors required for calculation of CO₂ emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories for fuels. Details of the data used for the calculations are given in Annex 3.

34 <http://www.teias.gov.tr/ist2007/42.xls>

35 <http://www.teias.gov.tr/ist2007/43.xls>

36 <http://www.teias.gov.tr/ist2007/44.xls>

37 <http://www.teias.gov.tr/ist2007/45.xls>



	COEF (tCO ₂ /kt)	Consumption (2005 - 2007) (tons or 1000m ³)	Total Emission (2005 - 2007) (tCO ₂)
Coal	1,954	16,906,064	33,032,943
Lignite	601	160,126,774	96,197,334
Fuel Oil	3,026	6,002,955	18,165,198
Diesel Oil	3,112	140,176	436,185
LPG	2,830	12,941	36,623
Naphtha	3,061	109,375	334,828
Natural Gas	2,003	53,249,105	106,643,758
Total Emissions			254,846,869

Table 10. Calculation of emission factors for fuels

Net electricity generated and supplied to the grid by thermal plants has been calculated using data obtained from the TEIAS web page^{38,39,40,41}. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,y}$ requires the inclusion of electricity imports with an emission factor of 0 tCO₂/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

Year	Gross Generation	Net Generation	Net/Gross	Gross Gen. Thermal	Net Gen Thermal	Import	Total Supply to the grid
2005	161,956	155,469	0.960	122,242	117,346	636	117,982
2006	176,299	169,543	0.962	131,835	126,783	573	127,356
2007	191,558	183,340	0.957	155,195	148,537	864	149,401
				Total Net Thermal Gen.	392,665	2,073	394,739

Table 11. Gross/Net electricity generation by Turkish Grid

Having calculated the total fuels emissions and net generation by thermal power plants as given in previous two tables, The $EF_{grid,OM,y}$ is calculated by simply dividing total emission by total net thermal electricity generation as defined in equation (1) above;

$$EF_{grid,OM,y} = 254,846,869 \text{ tCO}_2 / 394,739 \text{ GWh} \\ = 646 \text{ tCO}_2/\text{GWh.}$$

38 [http://www.teias.gov.tr/ist2007/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2007/35(2001-2005).xls)39 [http://www.teias.gov.tr/istatistik2007/36\(06-07\).xls](http://www.teias.gov.tr/istatistik2007/36(06-07).xls)40 [http://www.teias.gov.tr/ist2007/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2007/35(2001-2005).xls)41 <http://www.teias.gov.tr/istatistik2007/35.xls>

**Step 4. Identifying the cohort of the power units to be included in the build margin.**

The sample group of power units (m) used to calculate the build margin consists of whichever is larger of:

- a) The set of five power units that have been built most recently, and
- 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 recently⁴².

Option (b) has been chosen to identify this cohort of power units to be included in the build margin, since it is larger (in terms of power generation) than the result of (a).

The list of the most recent capacity additions to the grid and their average and actual generation capacities are available at the TEIAS web page^{43,44,45,46,47,48}. For determination of plants that comprise 20% of the system's generation, gross generation in year 2007 which is 191,558.1 GWh has been taken as reference and its 20% has been determined as about 38,311.6 GWh. Since 20% of the most recent year's generation (38,311.6 GWh) falls partly on capacity of a power plant, this plant was fully included in the calculations as requested by the methodological tool applied. Thus, total capacity included in BM calculation has increased to 41,056 GWh which reduces to 40,519.3 GWh after excluding plants benefitting from VER revenue.

Step 5. Calculate the build margin emission factor

The Build Margin emission factor $EF_{grid, BM, y}$ is calculated as the generation-weighted average emission factor of a sample of power plants m for a specific year, as follows:

$$EF_{grid, BM, y} = \sum EG_{m,y} \cdot EF_{EL,m,y} / \sum EG_{m,y} \quad (2)$$

Where:

- $EF_{grid, BM, y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
 $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)
 m = Power units included in the build margin
 y = Most recent historical year for which power generation data is available

“Tool to Calculate the Emission Factor for an Electricity System” has been used for plant efficiency data although this approach is very conservative. Since tool does not contain any specific data for plants with

42 If 20% falls on part capacity of a unit, that unit is fully included in the calculation

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

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

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

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

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

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



LPG, Naphta etc. all of the plants consuming liquid fuels have been considered as open cycle plants. Plants using lignite and coal have been assumed as suing subcritical technology, whereas natural gas plants have been assumed as combined cycle plants. The assumptions have been based on TEIAS statistics which gives heating values of fuels consumed in thermal power plants^{49,50} and corresponding electricity generation^{51, 52} which shows that values used are very conservative compared to actual situation.

Plant efficiency data has For EF values of fuels consumed, IPCC values at lower limit of 95% confidence interval has been used as requested by applied methodology.

	EF CO₂ (tCO₂/Tj)	Generation Efficiency	EF (tCO₂/MWh)
Coal	89.5	39.0%	0.826
Lignite	90.9	39.0%	0.839
Fuel Oil	75.5	39.5%	0.688
Diesel	72.6	39.5%	0.662
LPG	61.6	39.5%	0.561
Naphtha	69.3	39.5%	0.632
Natural Gas	54.3	60.0%	0.326

Table 12. Calculation of emission factor from most recent power plants

The build margin emission factor has been determined for the most recent capacity additions as shown in table below. For electricity generation from renewables and solid wastes, the emission factors have been taken as being “zero” since data is not available and the contribution of these plants is insignificant. The Build margin emission factor in the last column has been determined by multiplying each EF value with the corresponding electricity generation value for that fuel and dividing it by the total generation by the most recent capacity additions.

Fuel Source	Generation (MWh)	Percent Generation	EF	Weighted EF
Coal	1,463	3.6%	0.826	0.03
Lignite	11,482	28.0%	0.839	0.23
Fuel Oil	675	1.6%	0.688	0.01
Diesel oil	2	0.0%	0.662	0.00
LPG	50	0.1%	0.561	0.00
Naphtha	323	0.8%	0.632	0.00
Natural Gas	23,974	58.4%	0.326	0.19

⁴⁹ <http://www.teias.gov.tr/ist2007/45.xls>

⁵⁰ <http://www.teias.gov.tr/ist2007/45.xls>

⁵¹ [http://www.teias.gov.tr/ist2007/36\(06-07\).xls](http://www.teias.gov.tr/ist2007/36(06-07).xls)

⁵² [http://www.teias.gov.tr/ist2007/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2007/35(2001-2005).xls)



Renewable and wastes	85	0.2%	0.000	0.00
Solid	5	0.0%	0.000	0.00
Total Renewable	2,999	7.3%	0.000	0.00
<i>TOTAL Capacity additions</i>	41,056.3	100.0%		

Table 13. Most recent capacity additions corresponding to 20% by fuel source

From the list of the plants included in BM calculation, those built using VER revenue has been excluded as per the tool.

PROJECT	TYPE	INSTALLED CAPACITY (MW)	GENERATION CAPACITY (GWh)	STANDARD
ANEMON	WPP	30.4	92	GS
BARES	WPP	30.0	105	VER+
DOGAL ENERJI (BURGAZ)	WPP	14.9	48	GS
KARAKURT	WPP	10.8	28	GS
MARE MANASTIR	WPP	39.2	129	GS
KARGILIK	HEPP	23.9	83	VCS
KALEALTI	HEPP	15.0	52	VCS
Total		164.2	537.0	

Table 14. List of plants identified as VER projects

Source: <http://www.markitenvironmental.com> and <http://cdmgoldstandard.org>

Finally, by summing up the weighted EF values, overall build margin emission factor have been calculated as:

$$\begin{aligned} \mathbf{EF}_{\text{grid, BM, } y} &= 19,350 \text{ tCO}_2 / (41,056.3 - 537) \text{ GWh} \\ &= \mathbf{478 \text{ tCO}_2/\text{GWh}}. \end{aligned}$$

STEP 6 - Calculate the combined margin emission factor

Based on ACM0002, weighted average baseline emission factor is calculated as follows;

$$\mathbf{EF}_{\text{grid, CM, } y} = w_{\text{OM}} * \mathbf{EF}_{\text{grid, OM, } y} + w_{\text{BM}} * \mathbf{EF}_{\text{grid, BM, } y} \quad (3)$$

Where:

$\mathbf{EF}_{\text{grid, BM, } y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) as calculated from equation above.

$\mathbf{EF}_{\text{grid, OM, } y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh) as calculated from equation (1) above.



w_{OM} =Weighting of operating margin emissions factor (%)
 w_{BM} =Weighting of build margin emissions factor (%)

The default values of the weights, w_{OM} and w_{BM} , as recommended by the selected methodology are 0.5, respectively. These default values have been used in calculating CM emission factor together without rounding the values of EF_{OM} and EF_{BM} .

Based on the formula above, baseline emission factor is calculated as;

$$EF_{grid, CM, y} = 0.5 * 646 + 0.5 * 478 = 562$$

The combined margin emission factor is therefore **562 tCO₂/GWh**. Emission factor will remain same during the first crediting period as recommended by the methodology ACM0002.

The *ex-ante* emission reductions (ER_y) are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (4)$$

Where:

ER_y = Emission reductions in year y (tCO₂)
 BE_y = Baseline emissions in year y (tCO₂)
 PE_y = Project Emissions in year y (tCO₂)
 LE_y = Leakage emissions in year y (tCO₂)

Baseline emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:

EG_y = Net electricity delivered to the grid by the project activity in year y excluding transmission losses of the grid.

EF_y = Emission factor calculated according to selected methodology
 = 43,194 GWh(Until end of 2012) x562 tCO₂/GWh
 =24,257 tCO₂ (Until end of 2012)
 = 32,397 GWh(After 2012) x562 tCO₂/GWh
 =18,194 tCO₂ (After 2012)

Project emissions

The proposed project activity involves the generation of electricity by a hydroelectric power plant which do not cause any newly flooded area or formation of a new reservoir. However, to be conservative, existing river bed was assumed as “0” and power density was calculated accordingly.

The power density of the project activity (PD) is calculated as follows:



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

Where:

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

For proposed project HEPP,

- Cap_{PJ} = 7.110 000 W
 Cap_{BL} = 0.0 W
 A_{PJ} = 18,670 (m²)⁵³
 A_{BL} = 0.0 (m²)

Therefore PD is calculated as ;

$$PD = \frac{7110000 - 0}{18670 - 0}$$

$$PD = 380.8 \text{ W/m}^2$$

Leakage

The energy generating equipment is not transferred from or to another activity. Therefore leakage is also considered as “0”.

$$LE_y = 0$$

As a result: Total Emission Reduction is;

$$ER_y = BE_y$$

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

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
2010 (01/08-31/12)	10,107
2011	24,257

⁵³ Bulam Hepp, Reservoir Area Map



2012	24,257
2013	24,257
2014	24,257
2015	18,194
2016	18,194
2017(01/01-01/08)	10,613
Total emission reductions (Tonnes of CO ₂ e)	154,136
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	22,019

Table 15. Estimated emission reduction by the proposed project

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

Data / Parameter:	EG _v
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the Bulam Hydroelectric power plant in year y. Estimated annual generation forming the basis for emission reduction calculation is 43.194 GWh until 2015 and 32.397 GWh after.
Source of data:	Metering devices used in power plants, monthly records signed by TEİAŞ and plants manager and invoices will be used.
Measurement procedures:	Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEİAŞ. Each month, an officer from TEİAŞ and the manager/electricity technician of the plant will record the readings and sign. This record will form the basis for monthly invoicing.
Monitoring Frequency	Continuous measurement and at least monthly recording
QA/QC procedures to be applied:	Two ammeters will backup each other. These meters will be chosen according to national regulations and approved and sealed by TEİAŞ at start up of the plant. Maintenance and calibration of the metering devices will be made by TEİAŞ periodically. In addition to invoices and metering devices, the electricity delivered to the grid can be cross checked through TEİAŞ web page(http://pmum.teias.gov.tr) using the ID and password of the project owner. All records will be kept for at least two years as requested by the applied methodology.
Any comment:	

Data / Parameter:	Cappj
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be	Project site



used:	
Measurement Procedure	N/A
Monitoring Frequency	Yearly
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	APJ
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 Procedure	Measured from topographical surveys or maps
Monitoring Frequency	Yearly
QA/QC procedures to be applied:	-
Any comment:	Project involves a small weir and will not cause any new flooded area or reservoir formation.

B.7.2. Description of the monitoring plan:

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established. Monitoring of the project emissions will be carried in line with the applied methodology ACM0002.

In order to demonstrate the emission reduction, only the required data is the net electricity delivered to the grid by the project activity. Net electricity generation will be measured and recorded by both TEIAS and project owners for billing purposes therefore no new additional protocol will be needed monitoring emission reduction. Power Plant Manager, will be responsible for the electricity generated, gathering all relevant data and keeping the records. He will be informed about VER concepts and mechanisms and how to monitor and collect the data which will be used for emission reduction calculations.

Generation data collected during crediting period will be submitted to Global Tan Energy who will be responsible for calculating the emission reduction subject to verification: Generation data will be used to prepare monitoring reports which will be used to determine the vintage from the project activity. These reports will be submitted to the duly authorized and appointed Designated Operational Entity 'DOE' before each verification period.

The monitoring system organization chart is shown in Figure below, in which the authority and responsibility of project management are defined.

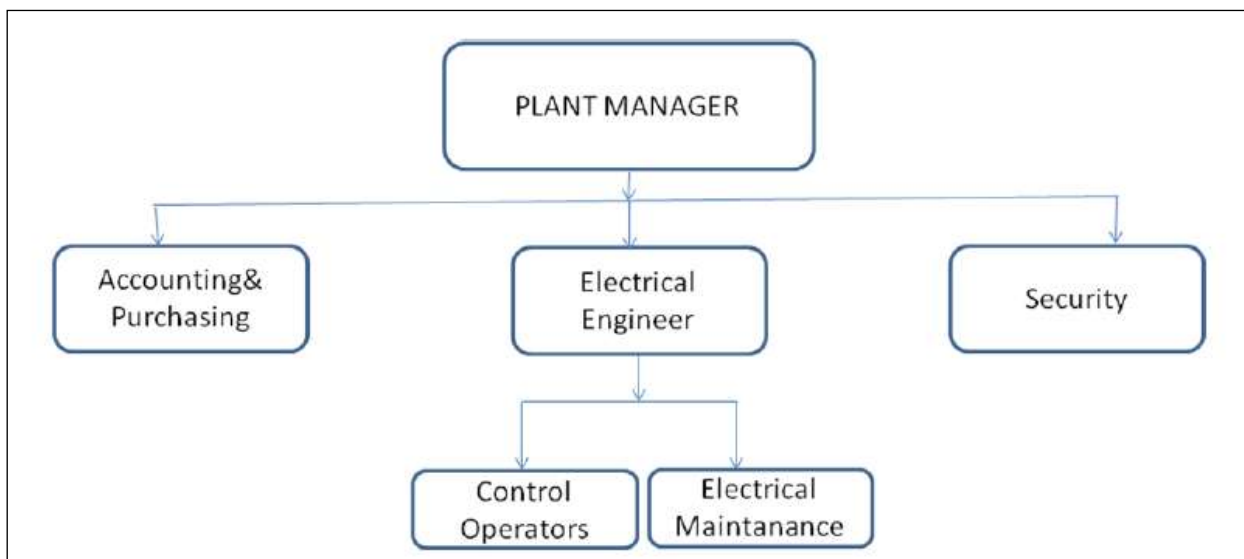


Figure 8. Operational structure of Bulam HEPP

VER Team Members is expected to include;

Plant Manager: Overall responsibility of compliance with VER monitoring plan

Accounting Manager: Responsible for keeping data about power sales, invoicing and purchasing.

Control Operators & Electrical Maintenance: Staff will responsible for day to day operation and maintenance of the plant and equipments. All staff will be trained and have certificated for working with high voltage equipments.

Global Tan Energy: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of meter and data monitoring will be carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) will be used for monitoring the electricity generated by the power plant and fed to the grid. Also, electricity consumption of the plant from the grid (if any) will be calculated based on electricity bills and meters and considered in net electricity generation calculation. Readings will be done using main metering devices and spare metering device will be used for comparison only. Data from metering devices will be recorded by TEIAS monthly and form the basis for invoicing using the template formed by TEIAS⁵⁴ which will be used for cross checking of generation data. The transmission loss of the Turkish Grid will also be deducted from the plant generation during invoicing by TEIAS.

In addition to the two metering devices, generation of the Bulam HEPP can be cross checked from TEIAS – PMUM web site (<http://pmum.teias.gov.tr>) which is accessible using a password provided to electricity generation companies. Since the data in PMUM web page will show the net electricity generated less transmission loss, in order to match the data, the figures taken from PMUM web site must

⁵⁴ http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/K01.xls



be multiplied by transmission loss factor of the grid. All data will be kept for at least two years after the crediting period for QA/QC purposes.

In case of a major failure at both metering at the same time, electricity generation by the plant since the last measurement will be able to be monitored by another metering device at the inlet of the main substation operated by TEIAS where the electricity is fed to the grid.

In addition to emission reductions, sustainable development indicators given in passport will be monitored by the project developer also as given in GS Passport.

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

Baseline and monitoring methodology completed in 15/06/2010

By:

Mehmet Kemal Demirkol

Global Tan Energy Limited (GTE- <http://www.gte.uk.com>)

Telephone: +90 312 472 35 00

Fax: +90 312 472 33 66

E-mail: kemal@gte.uk.com

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 project activity has been identified as 06/07/2008, date of equipment purchase agreement.

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

As per the generation license issued, plant will be operated about 45(excluding 5 years period for design & construction period) years by the company and delivered to Government at the end of license period.

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

C.2.1. Renewable crediting period:

Renewable crediting period is chosen for the project activity.

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

The crediting period is expected to start in 01/08/2010

C.2.1.2. Length of the first crediting period:

First crediting period will be valid for seven years.

**SECTION D. Environmental impacts****D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:**

Projects smaller than 10 MW are exempt from Environmental Impact Assessment Study.⁵⁵ Application and approval for exemption from EIA study has been received from the Ministry of Environment and Forestry in November 2007. The approval for exemption of EIA study has been included as Annex 5 of this document.

For Bulam HEPP, environmental impacts have been assessed in feasibility report prepared for the project. According to the assessment, project aggregate used in weir construction and concrete works will be provided through sites determined provided from appropriate places near the project site and excavation material will be used to fill these sites. Excess material will be stored in appropriate places in the region. Since there exist no forest or protected area in the project site, project will not have any impact on forest or protected species.

For preventing impact on biodiversity, a fish passage has been built as an integral part of weir design considering universally accepted fish passage designs⁵⁶ which is translated to Turkish and published by DSI. The project design of HEPPs, including weir and fish passage is also approved by DSI before implementation and commissioning of the plant. The fish passages are design to guarantee a steady minimum and free flow to enable continuous fish migration. The water released from the weir is determined considering the water demand for natural habitat in river bed. For the proposed projects, minimum flow has initially been determined as 100l/s but later has been increased to minimum 10% of average natural flow in recent 10 years which can be increased by DSI if necessary. The figure 10% is the minimum amount derived from tenant (Montana) method which is the most commonly applied model⁵⁷ and can be increased anytime if it is seen that 10% is not sufficient as per the water right utilization agreement between the project owner and DSI. The flow of the river and water released from the weir will be monitored through existing gauging devices at the upstream of the weir and a new gauging device installed at the downstream of the weir.

Project will also contribute mitigation with climate change through avoiding fossil fuel consumption for electricity generation and thus support international efforts. Project is not expected to have significant social transboundary impact other than the job opportunities created during exported equipments manufacturing.

In order to protect the aquatic life in the river bed, minimum amount of water will be released continuously. Weir design will also include a fish passage enabling migration upwards. Other issues regarding compliance of the project with respect to GS requirements have been assessed through “Special Guidance on Run-off-River HEPPs” given in local stakeholder consultation report.

⁵⁵ <http://www2.cevreorman.gov.tr/yasa/y/25318.doc>

⁵⁶ <ftp://ftp.fao.org/docrep/fao/010/y4454e/y4454e.zip> (English), <http://www.fao.org/docrep/012/y4454tr/y4454tr.pdf> (Turkish)

⁵⁷ http://www.dsi.gov.tr/english/congress2007/chapter_2/32.pdf



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:

The environmental impacts of the proposed project are not considered to be significant since no negative impact of the project activities have been identified. Land use, grazing or agricultural activities will not be affected negatively by the project activity. All necessary permissions including, environmental, health and safety, have been acquired from relevant agencies and all precautions have been applied strictly by Investor Company.

SECTION E. Stakeholders' comments

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

Preliminary Stakeholder meeting of the project was held on January 13th 2009 in Bulam Town. Invitation letters were sent by mail and fax to local and national government institutions, NGOs, GS supporters. Since Turkey had not then ratified Kyoto Protocol there was no official DNA in the country. However, as the most relevant government agencies, Ministry of Environment and Forestry and Ministry of Energy and Natural Resources were invited. Local people have been invited through announcement published in newspaper (Yeni Yol Newspaper of Adiyaman, on 03.01.2009).

DUYURU

GÖNÜLLÜ ANLAŞMALAR ÇERÇEVESİNDE KARBON TİCARETİ SERTİFİKALANDIRILMASINA YÖNELİK OLARAK, AKENERJİ ELEKTRİK ÜRETİM A.Ş. TARAFINDAN YÜRÜTÜLEN BULAM HİDROELEKTRİK SANTRALİ GÖNÜLLÜ EMİSYON AZALTIMI PROJESİNE İLİŞKİN PAYDAŞLAR TOPLANTISI 13 OCAK 2009 TARİHİNDE GERÇEKLEŞTİRİLECEKTİR. TOPLANTIYA İLİŞKİN DETAYLAR VE TOPLANTI PROGRAMI AŞAĞIDA BİLGİLERİNİZE SUNULMUŞTUR. İLGİLİ KİŞİLERİN TOPLANTIMIZA KATILMALARI BİZLERİ MEMNUN EDECEKTİR.

Paydaşlar Toplantısı:
Tarih : 13 Ocak 2009 - Salı
Saat : 14:00 – 16:00
Yer : Bulam Regülatörü ve HES Şantiyesi, Doğanlı Köyü Aksu Mezrası Çelikhan-Adıyaman

Toplantı Programı:
14:00 - 14:20 Açılış ve Tanıtım
14:20 - 14:50 Proje Tanıtımı
14:50 - 15:10 İklim Değişikliği, Karbon Ticareti ve Proje (GTE)
15:10 - 15:50 Forum (DSİ – ETKB – ÇvOB – AKENERJİ – GTE)
15:50 - 16:00 Çevresel ve Sosyal Değerlendirme Listesi (GTE)

KONUUYLA İLGİLİ BİLGİ ALMAK VE KATILIM İÇİN: shm@gte.uk.com ADRESİNE E-POSTA GÖNDEREBİLİR VEYA 0(232) 465 21 87 No'lu TELEFONU ARAYABİLİRSİNİZ.

Figure 4. Newspaper announcement dated on 03.01.2009 for first SC meeting of Bulam HEPP

Ms. Sevilay TOPÇU, Carbon Trade Project Coordinator of GTE, made the opening speech and gave brief information about the aim of the meeting. After the opening speech, Mr. Çağdaş ANIL, Project Engineer of Bulam HEPP introduced the project and mentioned the benefits and gave detailed info. Later, Ms. Sevilay TOPÇU, made a presentation related to climate change, carbon trade and contribution of the project to environment and sustainable development.

At the end of presentations, participants' questions have been replied by Mr. Çağdaş ANIL; Project Manager of Bulam HEPP, Mr. Kenan SAĞBAŞ and Ms. Sevilay TOPÇU.

preliminary Stakeholder consultation meeting has been recorded to video and minutes have been noted. Comments have also been requested from government agencies and invitees by letters sent by mail.



Figure 6. Participants of Bulam HEPP Local Stakeholders Consultation



Figure 7. Comments (Kenan SAĞBAŞ replies Ahmet ÇELİK's (Representative of TEMA Foundation) question

Main meeting that substitutes SFR has been organized on 17/02/2010 in Doganlı Village The invitees have been contacted and informed letters, newspaper ads, telephone and through village heads.

Since the female participation was limited in the first meeting, second meeting has been organized in one of the villages close to the project to enable female participation. DOE representative have also been invited to the meeting and participated to the meeting.

The meeting has been opened with introduction of the purpose of the meeting and presentations about project and climate change carbon certification has been made which also includes a summary of the comments received in preliminary meeting.

In general, meeting has been assessed as satisfactory by the local people. Project has been evaluated as positive by all participants who have filled and returned feedback forms. The main concern about the project has been raised by land owners in the region who drains irrigation water for tobacco growing. The



farmers have emphasized that they support project implementation as long as they have access to water resources for irrigation.

After presentations, questions of the locals have been answered by speakers and the SD matrix has been discussed. Issues raised during meeting and responses are as below;

Ercan Turan (Governor of Celikhan): Thanks for the information and meeting. IT sure that this project will serve national economy and reduce foreign dependency. You mentioned about job opportunities provided to locals , can you provide more specific information about number of local recruited? Also, we expect continuation of contribution to locals after project construction is completed as a part of CSR activity. Would you consider plantation around the region? During construction, it has had some impacts on locals like traffic congestion but locals have tolerated these impacts as they have expectations from this project and they rely on this project.

Feramuz Ataoglu (Project Manager): Directorate of Forestry in Celikhan and Adiyaman have visited us and asked if we can consider planting tree in the region. We have discussed this issue with our managers and they have approved this. We have requested from Directorate of Forestry to allocate us a proper place so that we can plant trees.

Ercan Turan (Governor of Celikhan): Can these plants be hazelnut or walnut trees which will also provide income to locals?

Feramuz Ataoglu (Project Manager):It can be but the Directorate of forestry will decide on the species to be planted. They'll allocate the land we'll made amenajman in the site. We'll continue to contribute to the locals directly and indirectly. We'll recruit at least 8 people during operation and prefer to recruit local as much as possible provided that they have the required skills or capacity. We'll also recruit support and security staff but this is usually carried through outsourcing. We'll also request them to recruit local people and I guess they'll also prefer to recruit locals.

Ercan Turan (Governor of Celikhan): There exists fish species in the river, will they be affected by the project activity?

Feramuz Ataoglu (Project Manager): We have built a fish passage in the weir, it may seen from the pictures shown during presentation. This is required by DSI in all projects

Ercan Turan (Governor of Celikhan): How will you measure or change the water flow from fish passage?

Feramuz Ataoglu (Project Manager): AS per the design, we cannot have any interference on the amount of water. The level of fish passage will be about 30cm below the weir body so that there will be continuously and free flow.

Local Participant: Have considered building a wind power plant here?

Feramuz Ataoglu (Project Manager): We have WPPs in other regions but it depends on wind capacity.



Local Participant: We irrigate our lands during summer, how will it affect our lands?

Feramuz Ataoglu (Project Manager): The project design has been made considering drinking water and irrigation water demand in the region. Initially, the project capacity was higher but it has been reduced considering existing and future demand for water.

Local Journalist: I have two questions. What measures will be taken for your conveyance line if there exist road expansion in the future? Also, in some parts, road ground has collapsed or seems to be collapsing. There are two construction studies in the region, your project and another construction in the Pınarbasi region. Why haven't you taken any measure for preventing collapsing.

Feramuz Ataoglu (Project Manager): I don't agree your statement about collapsing road due to our project activities.

Local Journalist: I was informed in that way?

Feramuz Ataoglu (Project Manager): Let me show you on the map (Project layout and map is shown on projection device a). This is the region we work, our weir construction and plant facilities. This is the collapsed region. We have no activity in the region collapsed therefore it is not due to our activities. In the vicinity of weir construction, we have made assessment and a protocol with the Directorate of Highways and built retaining walls and there is collapsed section in the area we work. We'll go for site visit after questions, we can show the regions we work, the wall we built and the collapsed regions.

Local Participant: Can you also inform us about expropriation?

Feramuz Ataoglu (Project Manager): Expropriation process is continuing. We have four parcels in doganlı village and 9 parcels around the powerhouse. Other regions are public lands. The value of the land is determined by expert group including local representatives. There has been 10 objections to the value. Eight of these objections have been finalized and the remaining two cases have been delayed due to a mistake in the report but expected to be finalized by end of the month.

Local Participant: Do you decide on the value, pay and get the ownership?

Feramuz Ataoglu (Project Manager): No, government decides on the value but we pay the amount. The ownership will be belong to public as this is a public project. We are buying on behalf of government and deliver to the government. All the payments have been made to bank accounts of owners but blocked until official procedures are completed.

Local Participant: How do you provide needs for staff (food etc)

Feramuz Ataoglu (Project Manager): Our subcontractor is doing this, but as far as I know they try to maintain a balance so they make shopping from all settlements in the region.

Local Participant: We have a house around the river bed, at the downstream of the weir which is accessed by a wooden bridge. It is flooded in the water level is high. Can you help us? This is mainly within the responsibility of Governor but may be you can help.

Ercan Turan (Governor of Celikhan): According to the regulation, there should be at least 5 houses to make an investment in that region.

Feramuz Ataoglu (Project Manager): This is not about us but we can have a look if there is anything we can do.



Evren Kaleli (GTE): If there is no other question than we can start site visit and inform you about the project on site.

The participants have been asked to assess the project against each indicator of the SD matrix.

Finally, the meeting has been closed and the participants have been informed that they'll be able to contact project owner or developer for any issues or feedback about the project for a 60 days period and documents will be available on web page of Global Tan Energy (www.gte.uk.com). No comments have been raised until 15/06/2010 by the stakeholders about the project.

E.2. Summary of the comments received:

The comments from stakeholder have been positive in general. The concerns raised by the participants were mainly about the effect of the project on the availability of drinking and usable water and job opportunities.

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

AKENERJİ ÜRETİM A.Ş. has taken into account the comments of the stakeholders. A definite amount of water shall always be released continuously into the river, without using it, as required by DSI (state hydraulic works). This amount of water shall not be used by the project owner. Since the project has been designed originally as 9 MW and then revised to 7.11 MWe considering that the same water source will be used. Since use of water resources for as drinking water and for irrigation has priority with respect to electricity generation and water flow will be measured by DSI gauging stations, this issue is not expected to create any problem. Also, some participants have stated that some springs have disappeared during tunnel construction. Project manager has guaranteed that this will be resolved after isolation of tunnel is completed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	MEM ENERJİ ELEKTRİK ÜRETİM AŞ. (Subsidiary of Akenerji AS)
Street/P.O.Box:	Miralay Şefik
Building:	15
City:	Taksim
State/Region:	İstanbul
Postcode/ZIP:	
Country:	Turkey
Telephone:	(0090) 212 249 82 82
FAX:	(0090) 212 249 73 55
E-Mail:	info@akenerji.com.tr
URL:	http://www.akenerji.com.tr
Represented by:	
Title:	Project Coordinator



CDM – Executive Board

page 42

Salutation:	Mrs.
Last name:	Palabiyik
Middle name	
First name:	Özlem
Department:	Business Development
Personal e-mail:	opalabiyik@akenerji.com.tr
Organization:	Global Tan Energy Limited
Street/P.O.Box:	Ehlibeyt mahallesi 1259. Sokak
Building:	7/2
City:	Ankara
State/Region:	-
Country:	Turkey
Telephone:	(0090) 312 472 35 00
FAX:	(0090) 312 472 33 66
E-Mail:	email@gte.uk.com
URL:	www.gte.uk.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last name:	Demirkol
Middle name:	Kemal
First name:	Mehmet
Department:	Management
Direct FAX:	(0090) 312 472 35 00
Direct tel:	(0090) 312 472 33 66
Personal e-mail:	kemal@gte.uk.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING WAS USED FOR FINANCING THE PROJECT ACTIVITIES.

**Annex 3****Data Used in calculation of OM for Turkish Electricity Grid**

	NCV (Tj/kt) (1000m ³ for gas)	EF (tCO ₂ /Tj)	COEF(tCO ₂ /kt)
Coal	21.83	89.5	1,954
Lignite	6.61	90.9	601
Fuel Oil	40.08	75.5	3,026
Diesel Oil	42.86	72.6	3,112
LPG	45.94	61.6	2,830
Naphtha	44.17	69.3	3,061
Natural Gas	36.88	54.3	2,003

Table 16. Values used in calculation of OM ⁵⁸

	2005	2006	2007	Total Fuel Consumption 2005-2007	Total Emission 2005-2007
Hard Coal	5,259,058	5,617,863	6,029,143	16,906,064	34,915,268
Lignite	48,319,143	50,583,810	61,223,821	160,126,774	96,197,334
Fuel Oil	2,005,899	1,746,370	2,250,686	6,002,955	18,165,198
Diesel Oil	28,442	61,501	50,233	140,176	436,185
LPG	12,908	33	0	12,941	36,623
Naphtha	84,481	13,453	11,441	109,375	334,828
Natural Gas	15,756,764	17,034,548	20,457,793	53,249,105	106,643,758

Table 17. Amount of fuels used for electricity generation ^{59,60}.

Year	Gross Generation	Net Generation	Net/Gross	Gross.Gen. Thermal	Net.Gen Thermal	Import	Total
2005	161,956.2	155,469.1	0.960	122,242.3	117,345.9	636	117,982
2006	176,299.8	169,543.1	0.962	131,835.1	126,782.5	573	127,356
2007	191,558.1	183,339.7	0.957	155,195.2	147,274.7	864.3	148,139
Total Net Thermal Gen.					392,665	2,073	393,476.5

⁵⁸ 2007 Turkey National GHG Inventory,
http://unfccc.int/national_reports/annex_i_ghg_inventories/items/2715.php

⁵⁹ <http://www.teias.gov.tr/istatistik2005/46.xls>

⁶⁰ <http://www.teias.gov.tr/ist2007/43.xls>

Table 18. Net Electricity supply to the grid by thermal plants and imports (GWh)⁶¹**Data Used in calculation of BM for Turkish Electricity Grid**

	NCV	EF _{CO2}	Generation Efficiency	EF
	(Tj/kt or m ³ for gas)	(tCO ₂ /Tj)	%	(tCO ₂ /MWh)
Coal	21.83	89.5	39.0%	0.826
Lignite	6.61	90.9	39.0%	0.839
Fuel Oil	40.08	75.5	39.5%	0.688
Diesel	42.86	72.6	39.5%	0.662
LPG	45.94	61.6	39.5%	0.561
Naphtha	44.17	69.3	39.5%	0.632
Natural Gas	36.88	54.3	60.0%	0.326

Table 19. Net calorific values, generation efficiency and emission factor data used in calculations

Fuel Source	Electricity Generated (MWh)	EF	Share in total generation
Coal	1,463	0.826	3.6%
Lignite	11,482	0.839	28.0%
Fuel Oil	675	0.688	1.6%
Diesel oil	2	0.662	0.0%
LPG	50	0.561	0.1%
Naphtha	323	0.632	0.8%
Natural Gas	23,974	0.326	58.4%
Renewable and wastes	85	0.826	0.2%
Solid	5	0.839	0.0%
Total Renewable	2,999	0.688	7.3%
TURKEY'S TOTAL	41,056.3		100.0%

Table 20. Most recent capacity additions corresponding to 20%.^{62,63,64,65}⁶¹ <http://www.teias.gov.tr/istat2007/49.xls>⁶² <http://www.teias.gov.tr/istat2004/7.xls>⁶³ <http://www.teias.gov.tr/istatistik2005/7.xls>⁶⁴ <http://www.teias.gov.tr/istat2006/8.xls>⁶⁵ <http://www.teias.gov.tr/istat2007/8.xls>



Annex 4

MONITORING INFORMATION


Information about monitoring plan is given in section B.7.2.



Annex 5

EIA EXEMPTION LETTER





T.C.
ÇEVRE VE ORMAN BAKANLIĞI
Çevresel Etki Değerlendirmesi ve Planlama Genel Müdürlüğü

SAYI : B 18 0 ÇED 0 01.03/228-07 12387
KONU: Bulam Regülatörü ve HES Projesi 62122 09 Kasım 2007


MEM ENERJİ ELEKTRİK ÜRETİM SAN. VE TİC. A.Ş.
(Miralay Şefik Bey Sk. No: 15 Kat:3-4 Ak Han Gümüşsuyu 34437 Beyoğlu / İSTANBUL)

İlgili yazıda, Adyaman İli sınırları içerisinde, Fırat Nehri'nin kollarından biri olan Kahta Çayının yankolu Bulam Çayının üzerinde MEM Enerji Elektrik Üretim San. ve Tic. A.Ş. tarafından Bulam Regülatörü ve HES projesi (kurulu gücü toplam 8,84 MW olan nehir tipi santral) yapılması planlandığı belirtilerek, söz konusu faaliyetin ÇED Yönetmeliği kapsamında değerlendirilmesi talep edilmektedir.

16.12.2003 tarih ve 25318 sayılı Resmî Gazetede yayımlanarak yürürlüğe giren ÇED Yönetmeliği Seçme Eleme Kriterleri Uygulanacak Projeler Listesi (Ek-II) Madde 22'de kurulu gücü 10 MW ve üzeri olan nehir tipi santraller yer almaktadır. Söz konusu faaliyetin kurulu gücünün 10 MW'ın altında olması nedeniyle ÇED Yönetmeliği kapsamı dışında değerlendirilmektedir.

Ancak, proje ile ilgili olarak 2872 sayılı Çevre Kanunu ile 5491 Sayılı Çevre Kanununda Değişiklik Yapılmasına Dair Kanuna istinaden yürürlüğe giren ilgili yönetmeliklere uyulması ve mer'î mevzuat uyarınca ilgili kurum/kuruluşlardan gerekli izinlerin alınması, ekolojik dengenin bozulmamasına, çevrenin korunmasına ve geliştirilmesine yönelik tedbirlere riayet edilmesi gerekmektedir.

Bilgilerinizi ve gereğini rica ederim.


Ömer SOYLU
Bakan a.
Genel Müdür V.

*54/SA/BA/2007
ofc. 19/11*

DAĞITIM:
Gereği:
- MEM Enerji Elk. Üretim San. ve Tic. A.Ş.,

Bilgi:
- Adyaman Valiliği
(İl Çevre ve Orman Müdürlüğü)

Yazışma Adresi: Sağışlıoğlu Caddesi 14/E 05565 ANKARA
www.cesvreorman.gov.tr Tel: (0312) 207 60 00 Faks: (0312) 207 61 51
e-mail: sedat@cesvreorman.gov.tr

TURKISH REPUBLIC
MINISTRY OF ENVIRONMENT AND FORESTRY
Environmental Effect Evaluation and Planning General Management

No: B18.0.CED.001.03/228-07 12387 62122
SUBJECT: Bulam Weir and HEP Project

9.November.2007



MEM ENERJİ ELEKTRİK ÜRETİM SAN. VE TİC.AŞ.
(Miralay Şefik Bey Sk. No. 15 Kat 3 -4 Ak Han Gümüşsuyu 34437 Beyoğlu/İSTANBUL)

In the referenced letter it is stated that MEM Enerji Elektrik Üretim San. ve Tic. A.Ş. plans to build the Bulam Weir and HEP project (run of river power plant with a total installed capacity of 8.84MW) in the Adiyaman province, on the Bulam Stream, which is one of the subbranches of Kahta stream, a branch of Fırat River, requesting that the above mentioned construction activity be evaluated under the CED (Environmental Impact Assessment) Regulation.

Run of river projects with a total installed capacity of 10 MW and above are included in Article 22 of the List of Projects to be Evaluated According to Criteria of CED (Environmental Impact Assessment) Regulation, published in official gazette no. 25318, dated 16.12.2003. Since the installed capacity of the mentioned power plant is below 10MW, it is to be evaluated outside the scope of the CED (Environmental Impact Assessment) Regulations.

Since it is required to comply with the Environmental Law no.2872 and Law no. 5491 which makes changes in the Environmental Law and the related regulations which came into force based on these laws and to get the necessary permissions from the related organisations based on the existing laws and regulations; not to disturb the ecological balance; take the necessary precautions to protect and develop the environment.

Please be informed and act accordingly.

(Signature)

Omer SOYLU
(for the Minister)

Ass. Gn. Manager

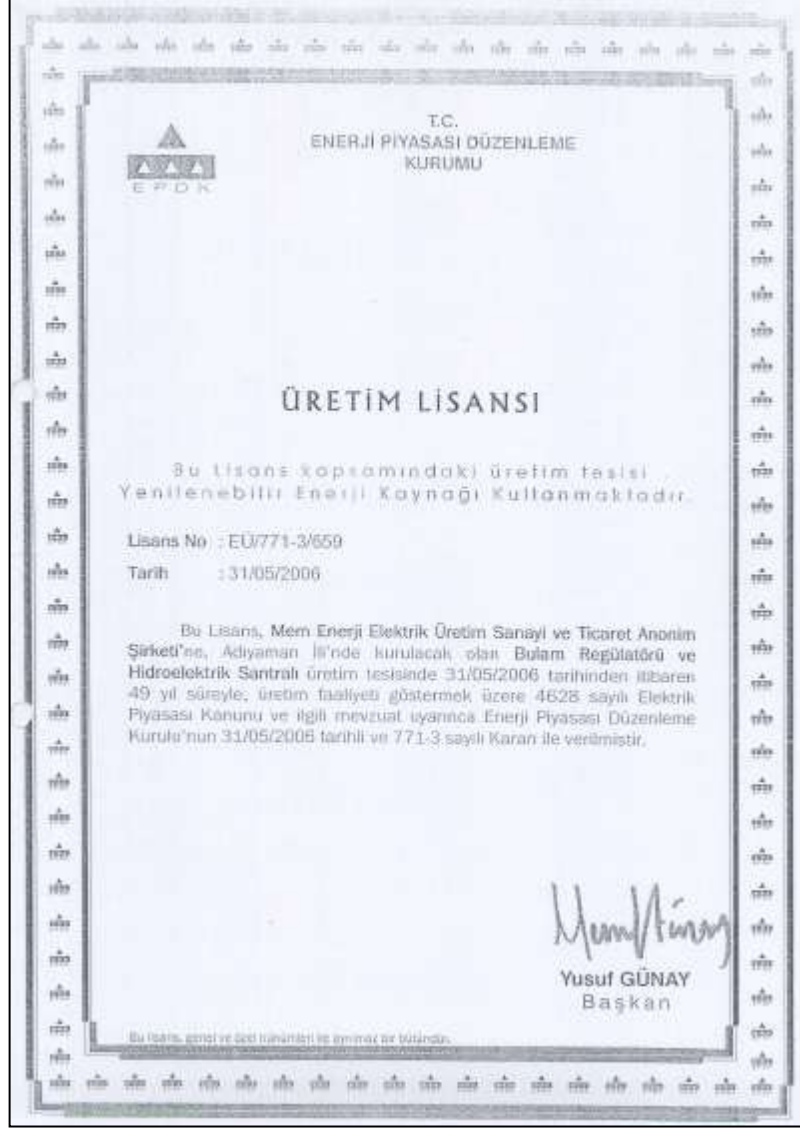


ANNEX 6: HEPPS OWNED BY GENERATION COMPANIES

Company/Project Name	Installed Capacity (MW)	Generation Capacity (GWh)	Status	Link
BEREKET (DENİZLİ)	3.7	12	Built As Autoproducer	http://www.teias.gov.tr/istatistikler/12-13.xls
BEREKET (DALAMAN)	37.5	179	Built As Autoproducer	http://www.teias.gov.tr/istatistikler/12-13.xls
BEREKET (FESLEK)	9.5	41	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
BEREKET (GÖKYAR)	11.6	43	Built As Autoproducer	http://www.dsi.gov.tr/skatablo/Tablo1.htm
BEREKET (MENTAŞ)	39.9	163	Built As Autoproducer	http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/sonaerdirilen.asp
EKİN ENERJİ (BAŞARAN HES)	0.6	5		
ERE - BİRKAPILI	48.5	171	Initially Built as autoproducer	http://www.ere.com.tr/enerji_birkapili.html
ERE - AKSU - ŞAHMALLAR	14.0	45	Built As Autoproducer	http://www.ere.com.tr/enerji_gazipasa.html
ERE - SUGÖZÜ - KIZILDÜZ	15.4	55	Built As Autoproducer	http://www.ere.com.tr/enerji_gazipasa.html
EŞEN-II (GÖLTAŞ)	43.4	170	Built As Autoproducer	http://www.teias.gov.tr/istat2004/13-14.xls
ELTA (DODURGA)	4.1	12	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
İÇTAŞ YUKARI MERCAN	14.2	44	Built As Autoproducer	http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/sonaerdirilen.asp
İSKUR (SÜLEYMANLI HES)	4.6	18	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
KURTEKS Karasu Andırın HES	2.4	19	Concessionary Company	http://www.kahramanmaras.bel.tr/hizmetler/ustyapi-hizmetleri/1392-hidro-elektrik-santrali.html
MOLU ENERJİ (BAHÇELİK HES)	4.2	30	Built As Autoproducer	http://www.teias.gov.tr/istat2004/13-14.xls
ÖZGÜR ELEK. K.MARAŞ Tahta HES	12.5	54		
PAMUK (Toroslar)	23.3	112	Build-Operate-Transfer	http://www.limak.com.tr/index.php?lang=tr&pid=420
SU ENERJİ (ÇAYGÖREN HES)	4.6	19	Built As Autoproducer	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 11)
TEKTUĞ-KARGILIK	23.9	83	Built as VER Project	www.markitenvironmental.com
TEKTUĞ-KALEALTI HES	15.0	52	Built AS VER Project	www.markitenvironmental.com
TEKTUĞ-KEBANDERESİ	5.0	32	BOT	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 11)
YAPISAN HACILAR	13.3	90	Built As Autoproducer	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 61)
YPM ALTINTEPE HES	4.0	18	BOT	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 95)
YPM BEYPINAR HES	3.6	18	BOT	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 96)
YPM KONAK HES	4.0	19	BOT	http://www.dsi.gov.tr/skatablo/Tablo1.htm (Row 101)
TOTAL	362.8	1,503		

Table 20. List of HEPPs Operational at time of investment decision

Annex 7
Generation License



Generation License Translation

REPUBLIC OF TURKEY
ENERGY MARKET REGULATORY AUTHORITY

LLicense :EU/771-3/659
Number
DDate :31/05/2006

GENERATION LICENSE

This license has been granted to MEM Enerji Elektrik Üretim Sanayi ve Ticaret Anonim Şirketi in order to be engaged in BULAM Weir and Hydroelectric Power Plant for 49 years starting from 31/05/2006 , by decision

of Energy Market Regulatory Authority dated 31/05/2006 and numbered as 7717-3 in accordance with the electricity market law numbered 4628 and relevant regulation.

(Signed and Sealed)