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:

Title: ARALIK HEPP
Version: 10
Date: 05/03/2012

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

Aralık is a run-off river type hydroelectric power plant (HEPP) project located on Aralık Creek in Blacksea region of Turkey. The electricity generation license has been awarded to KAR-EN Karadeniz Elektrik ve Uretim Ticaret A.Ş. (KAREN)[1] for a period of 49 years by the Turkish licensing authority named as Energy Market Regulatory Authority (EPDK).

The purpose of the project is to generate energy from the running waters of Aralık Creek and consists of a weir, upstream and downstream cofferdams, spillway, conveyance tunnel and powerhouse with turbines and generators.

Total length of the conveyance line will be about 2,767m long with a 2,682 m long water conveyance tunnel and a 84.55m long inlet canal whereas design flow rate of the project is 5.00 m^3/s and elevation difference of about 300.00 m.[2]

Aralık HEPP will have a total installed capacity of 12.41 MW with an expected electricity generation of about 45.15 GWh per annum. Corresponding emission reduction is about 25,374 tCO_2 per year. Compared with a natural gas power plant, the Project will replace consumption of about 10 million m^3 of natural gas and save about 2.5 million US Dollar foreign currency per year.

The main goals of the Aralık HEPP project include;

- Using Turkey's hydroelectric potential to meet the increasing demand for electricity and contributing toward the guarantee of Turkey's energy security.
- Increase the share of run-off river type HEPPs in the mix of electricity generation in Turkey; reduce dependency on imported fossil fuel and providing as a consequence a tangible reduction in GHG emissions.
- Contribute to economic development by creating direct and indirect job opportunities during the construction and operation phases.

The project will contribute to the sustainable development in the region through creating new job opportunities during the construction and operational phases. After the commissioning of the plant, the project is expected to create permanent job opportunities for about 12 local employees[3]. In addition to direct and indirect job opportunities, the project will contribute to sustainable development through activities conducted within the framework of corporate social responsibility.

Assessment of project activities in terms of sustainable development has been carried out according to GS toolkit and effect of the project has been determined as positive for seven items with no negative score. In terms of environmental impact, project is considered to have positive impact on air quality due to avoided NOx, PM and SOx emissions whereas no negative impact on water quality other pollutants and biodiversity has been identified. In order to avoid impact on aquatic life in the river bed, minimum flow corresponding to 10% of average natural flow will be released from the weir.

[1] Company name has been changed to "Coruh Elektrik Uretim Sanayi ve Ticaret A.S." after acquisition by another group in late 2010.

[2] ARALIK HEPP FSR, page 4-6

[3] Pre-EIA page 14

According to the research conducted by State Planning Organization(SPO) on socio-economic level of Districts in Turkey, Borcka District is ranked as 295th among 872 Districts in Turkey in terms of development level and classified in third(out of six) group. About 94.6% of the population works on agriculture and service sector whereas only 5.4 % works on industry which has caused about 9.2% decrease in population[4] mainly due to lack of employment opportunities in the region. 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 development in the region.

In addition to contribution to local economy, project will also contribute use of local and renewable resources to meet the increasing energy demand of Turkey and reduce dependency on fossil fuels. According to Turkish Electricity Transmission Company(TEIAS) statistic, in 2007 about 49.6% (corresponding to 95,024.8 GWh generation) of the electricity has been generated by natural gas(NG)[5] power plants which is fully imported and about 20.457 bn m^3 NG has been consumed[6]. In terms of fuel dependency, Aralık HEPP is expected to replace about 4.82 million m^3 NG (=45.15GWh/95,024.8*%49.6) and contribute to balance of payments which will, in addition, increase air quality and access to affordable energy services in national level.

KAREN has also made significant contributions to physical infrastructure of the community around the project boundaries and intending to continue this contribution in the future. Details of the contributions made during the construction phase and those planned to be done during operational phase are given in Section E.

Main milestones of the project is given in table below.

Milestone	Date
License Issuance	16/05/2006
Board Decision for Consideration of Carbon Revenue	20/10/2006
Feasibility Study Report	November 2006
EIA Approval Letter	08/12/2006
Equipment Purchase Agreement(Investment Decision)	27/07/2007
Start Date of PA	27/07/2007
Start of Construction	21/03/2008
Loan Agreement	10/04/2008
Preliminary Stakeholder consultation Meeting	14/03/2009
Completion of PFA by GS	10/03/2010
Commissioning Date	30/04/2010
Start Date of Crediting Period	01/05/2010
SFR Meeting	06/05/2010

Table 1. Aralik Project Milestones

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
Turkey (Host)	• KAR-EN Karadeniz Elektrik ve Üretim Ticaret A.Ş. • Global Tan Energy Ltd.	No

[4] http://ekutup.dpt.gov.tr/bolgesel/gosterge/2004/ilce.pdf (page 144)

[5] http://www.teias.gov.tr/ist2007/32.xls

[6] http://www.teias.gov.tr/ist2007/43.xls

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

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

The Project is located in Aralık town of Borçka district which is located in the province of Artvin City. The Site is accessed to Borçka and Artvin via a paved town road of 10 km and 45 km long respectively. Elevation of the Site is 125 m.

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 yet and it is likely that it will not have a quantitative emission reduction limit until post 2012. As such, Turkey will in the interim period continues to be eligible for voluntary emission reduction projects.

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

Black Sea Region/Artvin Province.

A.4.1.3. City/Town/Community etc:

Aralık Village of Borcka District in Artvin Province.

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

Coordinates of the Powerhouse and Weir is given below;

	Latitude	Longitude
Weir	41°23'53" N	41°44'06" E
Powerhouse	41°23'36" N	41°41'49" E

Figure 1. Aralık HEPP Project Site

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

Type I: Renewable Energy Projects
Category I D: Grid connected renewable electricity generation
Sectoral scope 1: Energy Industry – Renewable Sources

In hydroelectric power plants, kinetic energy of the river and elevation difference along the river bed is converted to electrical energy. Water used to produce electricity is fed back to the river after passing through the turbines. Aralık HEPP Project is also classified as a run-off-river type HEPP and consists of a regulator, conveying channel, penstock, power generation turbines, office buildings and switchgear area. For the proposed project, only an abandoned house and the land around weir has been used. The house and land have been first purchased by plant manager via mutual agreement, and then the official expropriation has been made.

Run-off-river type hydro electric power plants do not have significant storage capacity on the contrary to plants with dam and storage facility. Therefore electricity generation in river type HEPPs depend on flow regime of the river. Whenever the water is available the hydroelectric power plant generates electricity and when there is no water no power is generated. During rainy seasons when there is maximum flow of water available in the rivers, they produce maximum power[7]. These types of hydroelectric power plants produce the power continuously only as long as flowing water is available.

Technical characteristics of Aralık HEPP have been summarized below.

► Plant Characteristics	
Type:	**Channel type.**
Channel Length:	**2,873 m**
Design Discharge:	**5.00 m3/sec**
► Total Installed Capacity:	**12.41 MW**
► Powerhouse Characteristics	
Net Head:	**292.23 m**
Turbine Type:	**Horizontal Pelton type.**
Turbine Power:	**2 each x 6.205 MWe**
Generator Capacity:	**2 each x 6.21 MVA**
► Hydrology:	**Regular regime with high seasonal precipitation in the form of rain.**
► Annual Energy Generation	
Firm Energy:	**-**
Secondary Energy:	**-**
Total Energy:	**45.15 GWh**
► Switchyard:	**34.5 kV switchgear equipment, 6.3/34.5 kV power transformer and 5.0 km long 34.5 kV capacity overhead transmission line for connection to the national grid *.**
► Commencement of Operation:	**30/04/2010.**
► Licence Duration:	**49 years.**

*Building the transmission line is within the responsibility of TEIAS. However, in order to accelerate the process and prevent delay of commissioning due to budget constraints of TEIAS, the investment cost will be paid by project owner (Source: Grid Connection Agreement).

[7] http://www.brighthub.com/engineering/mechanical/articles/7826.aspx

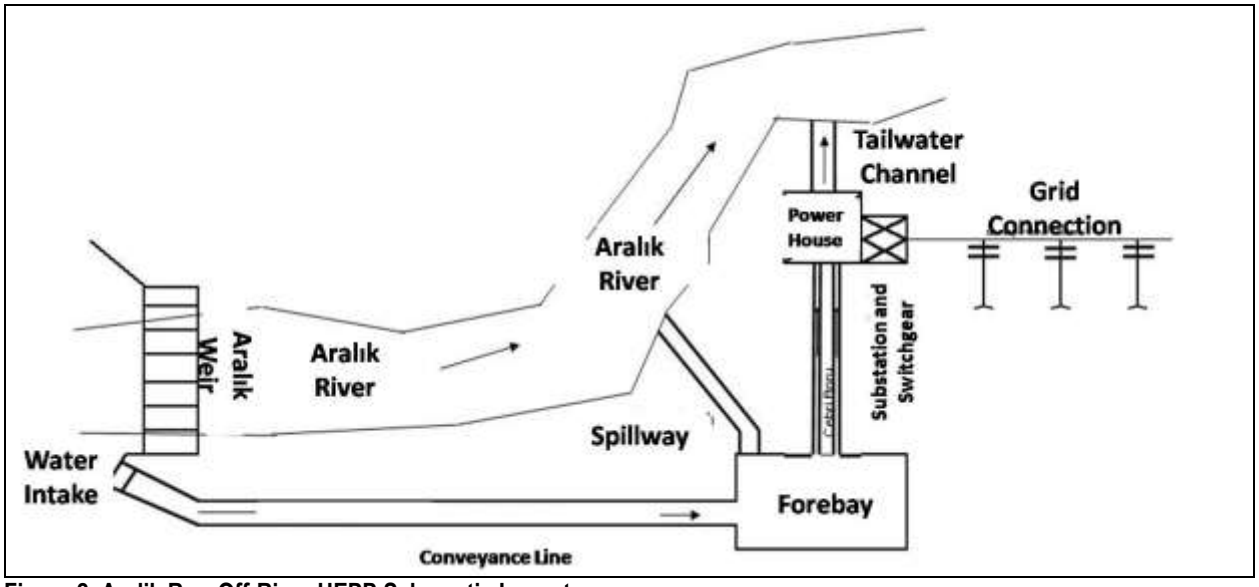

Figure 2. Aralik Run-Off-River HEPP Schematic Layout

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

Years	Annual estimation of emission reductions in tons of CO_2 e
2010(01/05/2010 – 31/12/2010)	16,916
2011	25,374
2012	25,374
2013	25,374
2014	25,374
2015	25,374
2016	25,374
2017 (01/01/2017-30/04/2017)	8,458
Total emission reductions (Tons of CO_2 e)	**177,618**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	25,374

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

No public funding nor ODA is used for the Aralık HEPP project.

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

Project is not a part of debundled project activity. There is no registered small-scale activity or an application to register another small-scale project activity[8]:

[8] http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale,
- Activity at the closest point.

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:

The UNFCCC approved simplified baseline and monitoring methodology AMS I.D., version 14[9], valid after 30th July 2009 was applied for the project activity as the most recent version when the project has been submitted to DOE.

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

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

- The Aralık HEPP is a grid connected renewable electricity generation project,
- The project does not involve combined heat and power generation activity,
- Installed power capacity of the project is below 15 MW and it does cause any new reservoir formation.
- Project activity does not involve addition of new unit
- Project activity does not seek for retrofit or modify an existing unit.

B.3. Description of the project boundary:

Project boundary is defined as limited to the project activity site according to the applied methodology. For the proposed project activities, project boundary involves, Aralık Weir, Penstock, Conveyance line and Powerhouse as defined in section A.4.1.4 in detail.

B.4. Description of baseline and its development:

According to the methodology baseline scenario has been identified as "The kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/GWh) calculated in a transparent and conservative manner as:

> *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 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.

[9] http://cdm.unfccc.int/UserManagement/FileStorage/UQ8WZYCH5IVSPBNF276OMGE10TDX9A

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.

According to the TEIAS statistics[10], share of HEPPs in total installed capacity of Turkey is about 32.8% whereas share of HEPPs in total generation is only 18.7%. However, when we examine the historical data, it is observed that total installed capacity of thermal power plants has shown a rapid growth in parallel with the demand for electricity whereas hydroelectric power generation has grown at a far slower rate - the energy generation proportion decreasing from 40% historically to current levels as shown in the figure below [11,12].

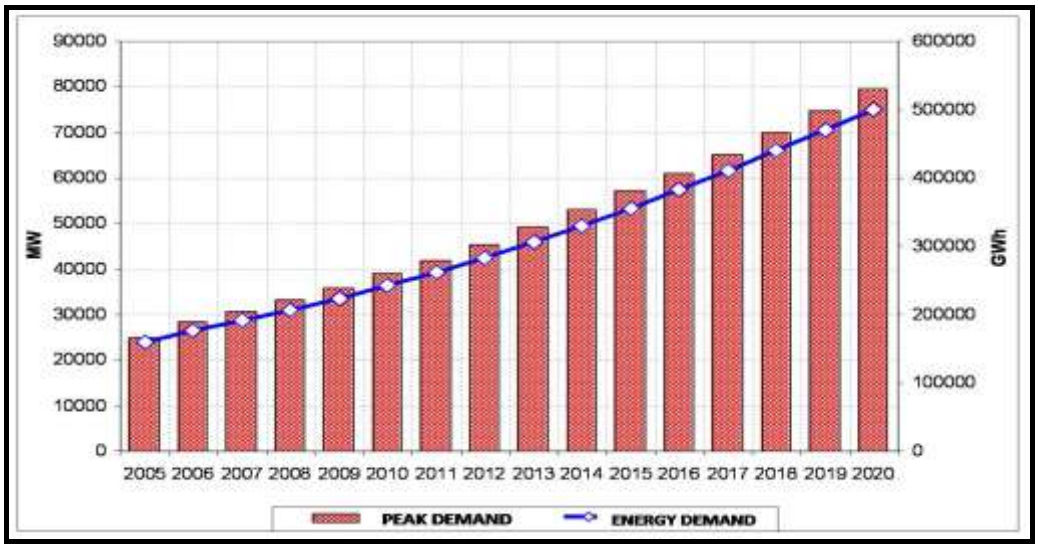

Figure 3. Peak Load and consumption projection for Turkish electricity system between 2005-2020[13]

10 http://www.teias.gov.tr/ist2007/1.xls

11 http://www.teias.gov.tr/ist2007/32.xls

12 IEA Turkey Country Report, 2005 (page 118)

13 http://www.teias.gov.tr/apkuretimplani/veriler.htm

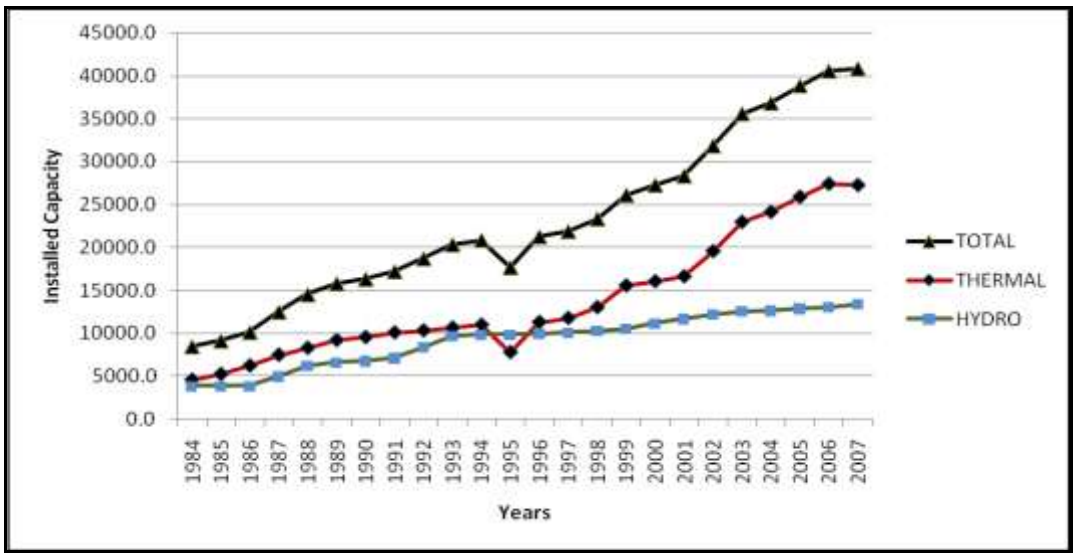

Figure 4. Annual Development of Turkey's Installed Capacity

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:

According to the applied methodology the baseline scenario for the project has been defined as "generation of equal amount of electricity by the power plants connected to 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, the project is expected to generate about 45.15 GWh electricity and reduce about 25,374 tCO_2 emissions 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 "Tool for the demonstration and assessment of additionality" version 5.2[14] 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
2. Continuation of the current situation-supply of equal amount of electricity in the grid

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.

ın thebaseline scenario, emissions will continue to increase since the growth of thermal power plants has increased and is expected to continue to disproportionately increase in the future due to demand for electricity predicted to increase by near 100% from the current level of approximately 40,000 MW to 79,000 MW by 2020.

Outcome of Step 1a

Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore Second alternative need to happen which has been defined as baseline scenario.

[14] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf/history_view

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

The following applicable mandatory laws and regulations have been identified:

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

The resultant alternatives to the project as outlined in Step (1a) are in compliance with these applicable laws and regulations.

Outcome of Step 1b

Mandatory legislation and regulations for each alternative are taken into account in sub-step 1b. 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. Aralik HEPP has been financed through loans from commercial banks and company own resources.

***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, 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, Government bond rates from web page of Central Bank of The Republic of Turkey (TCMB) have been used as given in table below.

[15] Law number 4628, enactment date 03/03/2001 http://www.epdk.gov.tr/documents/10157/351a7a0c-52a9-40d5-8e12-f8e61afe7247

[16] Law number 5346, enactment date 18/05/2005 http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf

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

[18] Law number 6831, enactment date 31/08/1956. Made available to the DOE upon request.

[19] Law number 2872. Published in official gazette No. 18132 on 11/08/'83. Made available to the DOE upon request.

According to the "Tool for the demonstration and assessment of additionality" version 5.2[20] (valid from August 2008 onwards), 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, Government bond rates from web page of Central Bank of The Republic of Turkey (TCMB) available at time of investment decision have been used as given in table below.

Government Bond	Auction Date	Currency	Rate
TRT040209T13	17.04.07	TRY	16.42
TRT070312T14	17.04.07	TRY	17.98
TRT040209T13	08.05.07	TRY	17.83
TRT260214T10	08.05.07	TRY	21.74
TRT070312T14	15.05.07	TRY	17.75
TRT150212T15	29.05.07	TRY	9.94
TRT110608T11	12.06.07	TRY	18.50
TRT070312T14	12.06.07	TRY	17.41
TRT040209T13	26.06.07	TRY	17.12
TRT260214T10	26.06.07	TRY	21.92
TRB031007T16	03.07.07	TRY	16.20
TRT060509T18	03.07.07	TRY	15.93
TRT070312T14	03.07.07	TRY	16.61
TRB160108T11	17.07.07	TRY	15.56
TRT260214T10	17.07.07	TRY	22.01
		Average	**17.53**

Table 2. Sample of Government bond rates used for the benchmark analysis[21]

Parameters	Unit	Data Value
Installed Capacity	MW	12.41(Generation License)
Grid Connected output	GWh	45.15(Generation License)
Capital Investment	Million €	12.615 (Feasibility Report)
Corporate tax rate	%	20[22]
Loan	Million €	8.200[23]
Operating Cost	Million €	1.2[24]
Expected Tariff	€ Cents/kWh	5.5[25]

[20] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf/history_view

[21] http://www.tcmb.gov.tr/evds/dibs/istihl.xls (Column Z)

[22] http://www.google.com/url?sa=t&source=web&cd=1&sqi=2&ved=0CBUQFjAA&url=http%3A%2F%2Fwww.mmmb.org.tr%2Fdefault.aspx%3Fpid%3D24826%26nid%3D16297&ei=widmTa3rO43OswbZnendDA&usg=AFQjCNGeYv5-CH0f2XnWkCyLV43DE-T5Rg

[23] Assumed as 35% initially. According to loan agreement signed later than investment decision, actual figure is around €8.8M

[24] TEIAS/EPDK Tariffs and Invoices for Grid Fee, Staff cost from similar plants of project owner for staff cost.

Expected VERs price	€/ tCO_2e	8[26]

Table 3. Main financial parameters used for investment analysis

IRR has been calculated according to the tool as stated in the applied methodology. 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 45.15 GWh and maintenance cost has been assumed as €63,000 which corresponds to 0.5% of the investment cost based on previous experiences on similar project which is a conservative assumption for a project of this size[27]. Investment decision date has been identified as the date of equipment purchase agreement and bonds used in benchmark have been selected accordingly. Calculation and estimations have been made conservatively therefore IRR value represents the most optimistic scenario in terms of capital investment and electricity generation. On the other hand electricity tariff is expected to increase so that the investment becomes attractive however as given below, expectations have not been realized yet due to the market conditions.

Considering the Government bond rates(17.53%) and estimated country risk premiums which are around 4.5% for Turkey[28], it can be concluded that expected return on investment for these types of projects should be around 22.03% for reasonable investors. The expectation of many investors is returns around 25% for successful investments for some investment funds[29]. Another benchmark for similar project types have been defined by Worldbank as 15% [30] 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.[31] Even if we consider the minimum benchmark IRR which is 15%, for Aralik HEPP, in order to reach this IRR values, average electricity tariff must be around 6€c/kWh in the absence of carbon revenue and assuming that initial investment figures are realized so that the investment will become reasonable. Considering that realized investment figures are significantly (about 33%) higher than figures estimated at time of investment decision, tariff should be more than 6€c/kWh to reach the benchmark.

For Aralik HEPP, equity IRR has been calculated as 13.93% in the absence of carbon revenue. When we include the carbon revenue in the cash flow, equity IRR increases to nearly 15.98% and the project becomes more attractive and viable for the investors as coupled with the view that energy sale prices that can be achieved from the project will likely increase in future years. Expectation that the electricity prices will increase is the risk for investors whereas realization of this expectation will 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.

When we extend the investment analysis to licence period, operation period of the project by investor becomes 45 years since the licence is issued in May 2006 for 49 years and but plant is commissioned by 30/04/2010. Extending the license period wil also bring additional maintenance and renovation cost but for simplicity, only turbine cost has been considered. Analysis has been replicated for license period based on figures at time of investment decision and also on realized investment costs. The analysis for feasibility studies for license period has resulted in IRR of 14.48% whereas realized costs have shown that IRR becomes 10.81% for actualinvestment cost.

[25] Renewable Energy Law

[26] State of Voluntary Carbon Market 2009, (figure 29)

[27] http://hydropower.inel.gov/hydrofacts/plant_costs.shtml

[28] http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem06.xls

[29] www.**greatturkfund**.com/images/data/GTF_Presentation_9Nov2009.pdf

[30] Project Appraisal Document for a proposed IBRD Loan (page 81)

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

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 Center[32] 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.

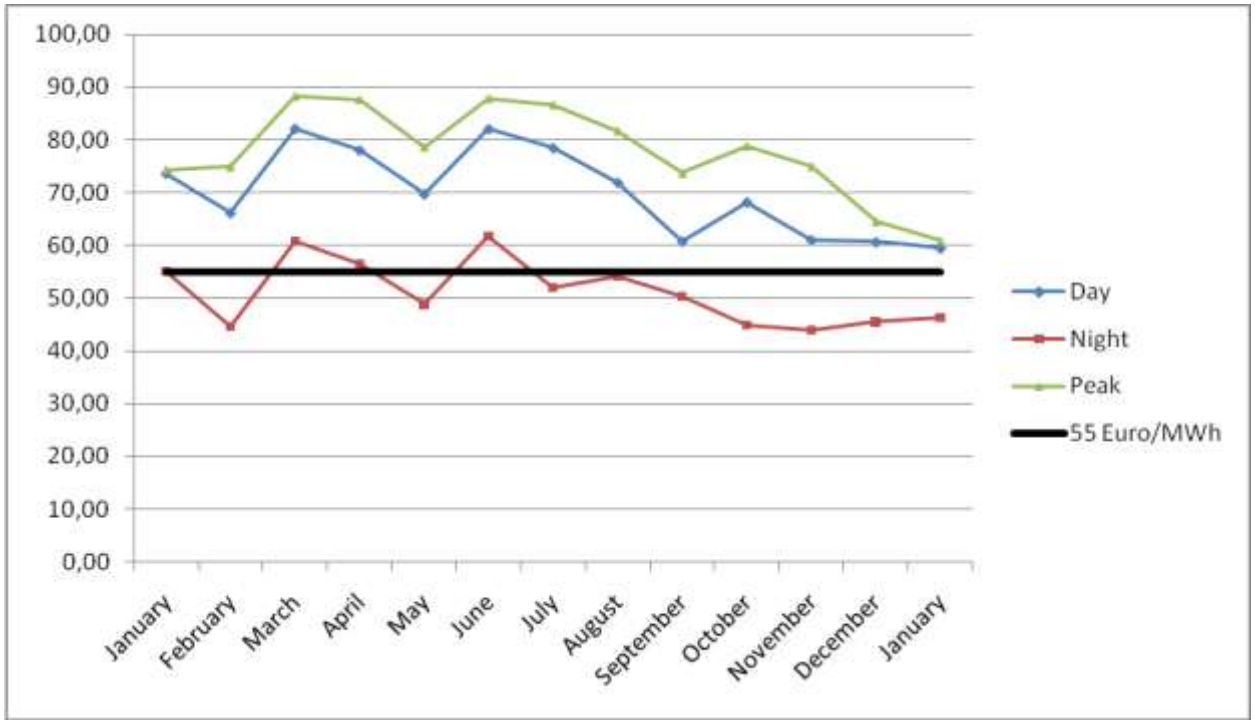

Figure 5. Highest tariffs observed between January 2009-January 2010 (€/MWh)

This IRR value represents the most optimistic scenario in terms of capital investment and electricity generation whereas electricity tariff is expected to increase due to increasing electricity demand so that the investment becomes attractive.

For Aralık HEPP, in order to reach this IRR values, average electricity tariff must be above 7.5 €c/kWh so that the investment will become reasonable. Considering that control of run-off-river hydroelectric power plants on generation period is limited, expectation that the floor 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 minimizing investment risk.

Sub-step 2d Sensitivity Analysis

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

- Investment Cost

[32] http://pmum.teias.gov.tr/UzlasmaWeb/ (Accessed on July 2010)

- Operating Cost
- Electricity Income

For a range of ±10% fluctuations in Investment and operational costs and ±35% fluctuation for Electricity income (which is combination of tariff and generation), table below has been obtained.

	% Fluctuation						
	-10	**-5**	**-2.5**	**0**	**2.5**	**5**	**10**
Investment Cost	15.99	14.90	14.40	13.93	13.48	13.05	12.26
Operating Cost	14.69	14.31	14.12	13.93	13.74	13.54	13.16
	-35	**-20**	**-10**	**0**	**10**	**20**	**35**
Electricity Income	5.52	9.19	11.58	13.93	16.24	18.53	21.92

Table 3. Sensitivity analysis for Aralık HEPP project without carbon revenue

Outcome of Sensitivity Analysis

The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the Project remarkably. Considering that figures above are based on a higher price rather than the government guaranteed floor 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.

According to the table, in order to exceed the minimum benchmark IRR defined by WB (15%) study referred above, the tariff should be above 6€cent/kWh. However, when we review the actual prices, it is seen that prices show a very high fluctuation and 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. The figure also shows that the highest prices are achieved in summer months as expected. However, it should also be noted that run of river type HEPP projects suffer from lack of water in summer hence can not benefit from the highest prices therefore, actual income is much lower for the proposed project type. When we consider the actual benchmark determined as per the additionality tool applied, it is seen that average tariff should be about 8€cent/kWh to reach attractive returns for investors.

For the best case scenario, (10% decrease in investment and operational cost and 35% increase in income), the IRR becomes 25.68%. However, since the realized costs are significantly higher (around 29.47 million TL) as demonstrated by auditing report and provisional acceptance letter, it is not possible to expect 10% decrease in investment cost. When we consider the realized investment figure(29.47M TL pr 33.6% increase in investment cost) and reduce operational cost by 10%, IRR will be around 15.92% for 35% increase in electricity income in the absence of carbon revenue.

Step 3. Barrier analysis

This step is not applied as per the tool.

Step 4. Common Practice Analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity

According to the TEIAS statistics, the share of HEPPs in total installed capacity of Turkey is about 32.8%[33] whereas share of HEPPs in total generation is only 18.7%[34]. However, when we look at the historical data, it seen that total installed capacity of thermal power plants has shown a rapid growth in parallel with the demand for electricity whereas the increase in hydroelectric power generation has been much slower. This has decreased the share of hydroelectric power from 40% in the past to the current levels, as seen in the Figure below. [35]

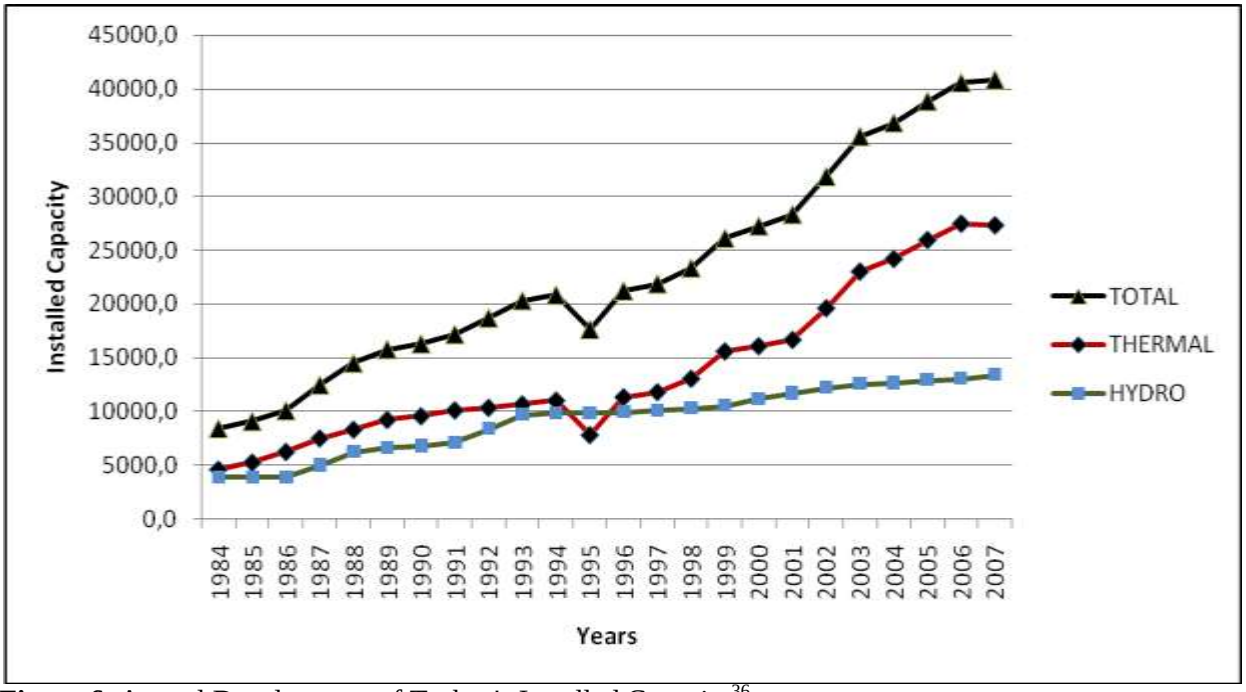

Figure 6. Annual Development of Turkey's Installed Capacity[36]

Sub-step 4b - 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[37,38,39].

[33] http://www.teias.gov.tr/ist2007/1.xls

[34] http://www.teias.gov.tr/ist2007/32.xls

[35] IEA Turkey Country Report, 2005 (Table 16 in page 117)

[36] http://www.teias.gov.tr/ist2007/13.xls

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

[38] http://www.teias.gov.tr/ist2006/8.xls

[39] 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 2007[40] 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. Sum of generation capacities of these two hepps correspond to about 0.03% of total generation capacity at time of investment decision.

When the analysis is reduced to plants at similar capacities(those plants within ±50% range in terms of installed capacity), we see that only only 6 plants(FESLEK, AKSU, YUKARI MERCAN, TAHTA, KALEALTI and HACILAR HEPPs) are at similar capacities(Plants at similar capacity involves those between 6.2 MW and 18,6 MW) having total capacity of 78.5MW. Out of these 6 plants, 4 have been built as autoproducer and one has benefitted from carbon revenue asa VCS project whereas only 12.5 MW Tahta Hepp has been identified as the single project which has been implemented as generation company and without carbon revenue.

Besides the fact that each project is different and has unique characteristics, information (Investment model, incentives, 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.

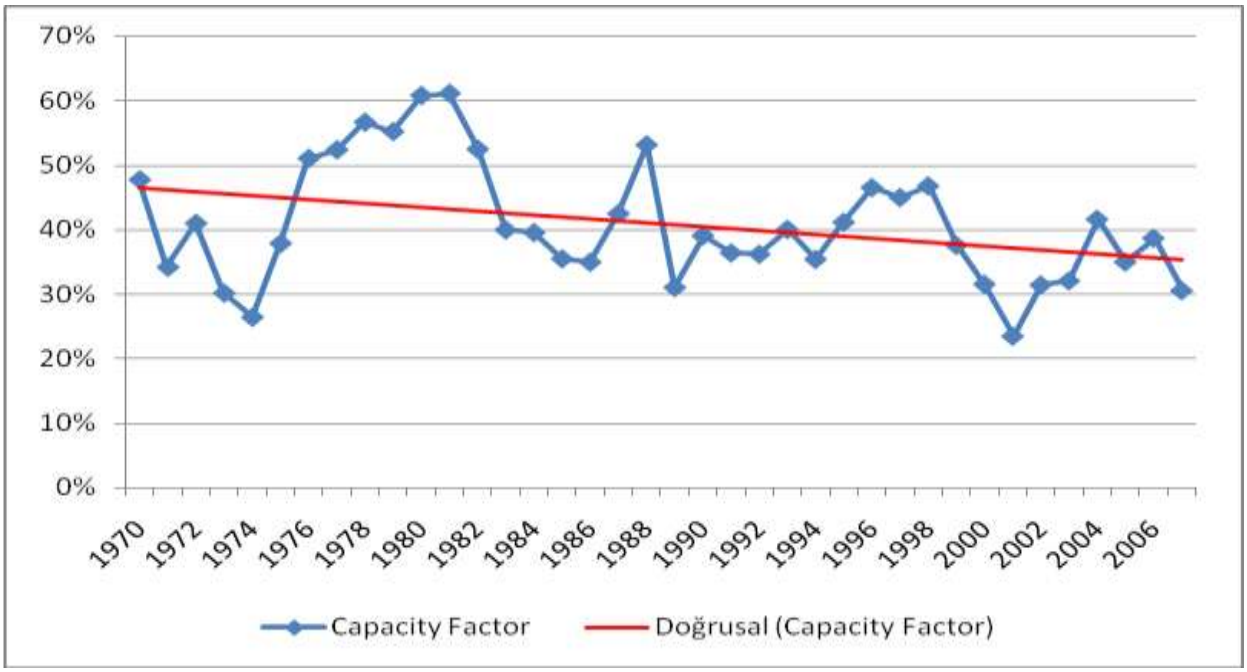

Figure 5. Evolution of Capacity(Plant Load) Factor of HEPPs in Turkey. Hata! Yer işareti tanımlanmamış.[34]

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

[40] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf (page 120)

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.[41]

Outcome of Step 4. Common Practice Analysis:

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.

Although the share of hydro in overall generation capacity of Turkey seems high, this represents the dam type, high efficiency, large hydros having storage capacities (flexibility to generate in peak hours) and built by government in previous years therefore they are not comparable with proposed project type in terms of storage capacity and financing.

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.

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 investment and common practice analysis have been conducted using the 'Tool for Assessment and Demonstration of Additionality' ver.5.2.

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,
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

[41] Mr Gultekin Keles, Ozgur Elektrik AS (http://www.bmholding.com.tr/index1.php?CatId=140&LId=2)

Table 4. Breakdown by source of the electricity generation for the five most recent years[42]

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

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net Electricity delivered to the grid by the Aralık HEPP in year y
Source of data used:	Generation License issued for the Aralık HEPP
Value applied:	45.15 GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for emission reduction calculation.
Any comment:	

Data / Parameter:	$EG_{y, Total}$
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:	**Fuel Source** / **EF (tCO2/Tj)**: Coal 89.5; Lignite 90.9; 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 applied tool, 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:	

[42] http://www.teias.gov.tr/ist2007/13.xls

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 table Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM calculation

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 table 15
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 01.1, 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 2007[43,44].

For imports from connected electricity systems located in another host country (ies), the emission factor is taken as “0” tCO_2/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.

43 http://www.teias.gov.tr/ist2007/1.xls

44 http://www.teias.gov.tr/ist2007/13.xls

The Simple Operating Margin (OM) emission factor ($\mathbf{EF}_{grid, OM, y}$) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/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 $\mathbf{EF}_{grid, OM, y}$;

- *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 CO_2 emissions per unit net electricity generation (tCO_2/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:

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

where:

$\mathbf{EF}_{grid, OM, y}$ Simple operating margin CO_2 emission factor in year y (tCO_2/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)
$EF_{CO2, i,}$ CO_2 emission factor of fossil fuel type *i* in year y (tCO_2/GJ)
EGy Net electricity generated and delivered to the grid by all power sources 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 TEIAS[45,46,47,48], the official source of related data. Fuel consumption values for the relevant years are in table below.

	$FC_{i,y}$ unit [Ton, except for Natural Gas (NG) (1000 m^3)]			
Fuel Type	**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 5. 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 CO_2 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.

	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

45 http://www.teias.gov.tr/ist2007/42.xls

46 http://www.teias.gov.tr/ist2007/43.xls

47 http://www.teias.gov.tr/ist2007/44.xls

48 http://www.teias.gov.tr/ist2007/45.xls

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 6. 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[49,50,51,52]. 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 tCO_2/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 7. 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;

$$\mathbf{EF}_{grid,\ OM,\ y} = 254{,}846{,}869\ tCO_2 / 394{,}739\ GWh$$
$$\mathbf{= 646\ tCO_2/GWh.}$$

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

49 http://www.teias.gov.tr/ist2007/30(84-07).xls

50 http://www.teias.gov.tr/ist2007/35(2001-2005).xls

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

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

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[53].

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 [54,55,56,57,58,59]. 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 $\mathbf{EF}_{grid,\ BMs,\ y}$ is calculated as the generation-weighted average emission factor of a sample of power plants *m* for a specific year, as follows:

$$\mathbf{EF}_{grid,\ BM,\ y} = \sum \mathbf{EG}_{m,y} \cdot \mathbf{EF}_{EL,m,y} / \sum \mathbf{EG}_{m,y} \quad \textbf{(2)}$$

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

"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 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[60] and corresponding electricity generation[61, 62] which shows that values used are very conservative compared to actual situation.

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

54 http://www.teias.gov.tr/istat2004/7.xls
55 http://www.teias.gov.tr/istatistik2005/7.xls
56 http://www.teias.gov.tr/ist2006/8.xls
57 http://www.teias.gov.tr/ist2007/8.xls

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

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

60 http://www.teias.gov.tr/ist2007/45.xls

61 http://www.teias.gov.tr/ist2007/36(06-07).xls

62 http://www.teias.gov.tr/ist2007/35(2001-2005).xls

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

	EF CO_2 (tCO2/Tj)	Generation Efficiency	EF (tCO_2/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 8. 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 renewable 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
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
TOTAL Capacity additions	41,056.3	100.0%		

Table 9. 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 10. 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:

$$\mathbf{EF}_{grid,\ BM,\ y} = 19{,}350\ tCO_2 / (41{,}056.3\text{-}537)\ GWh$$
$$\mathbf{= 478\ tCO_2/GWh.}$$

STEP 6 - Calculate the combined margin emission factor

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

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

Where:

EFgrid,BM,y =Build margin CO2 emission factor in year y (tCO_2/MWh) as calculated from equation above.
EFgrid,OM,y =Operating margin CO2 emission factor in year y (tCO_2/MWh) as calculated from equation (1) above.
wOM =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;

$$\mathbf{EF}_{grid,\ CM,\ y} = 0.5 * 646 + 0.5 * 478 \mathbf{= 562}$$

The combined margin emission factor is therefore **562 tCO_2/GWh.** Emission factor will remain same during the first crediting period as recommended by the methodology

Project emissions

The proposed project activity involves the generation of electricity by hydro electric power plant therefore project activity does not result in greenhouse gas emissions. Project does not form a new reservoir(see figure 5 below) so there will not be any emission from reservoir due to project activity. There will be a accumulation behind the weir body but the

The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. According to the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" CO_2 emissions from fossil fuel combustion for process j are calculated based on the quantity of fuels consumed(via equipment working hours) and the CO_2 emission coefficient of those fuels, as follows;

$$\mathbf{PEFC_{j,y} = \sum FC_{i,j,y} \times COEF_{i,y}} \quad \textbf{(6)}$$

Where:
PEFCj,y = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);
$FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass /volume)
$COEF_{j,y}$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
i = Is the fuel types combusted in process j during the year y

For emission coefficient of diesel fuel, value calculated in combined margin emission factor will be used. Since project emissions will also depend on fuel consumption, exact figures will be determined during annual verifications.

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;

$$ERy = BE_y - PE_{FCj,y}$$

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

Years	Estimation of Project Activity Emissions* (Tonnes of CO_{2e})	Estimation of Baseline Emissions (Tonnes of CO_{2e})	Estimation of Leakage (Tonnes of CO_{2e})	Annual estimation of emission reductions (Tonnes of CO_{2e})
2010(01/05/2010 – 31/12/2010)	0	16,916	0	16,916
2011	0	25,374	0	25,374
2012	0	25,374	0	25,374
2013	0	25,374	0	25,374
2014	0	25,374	0	25,374
2015	0	25,374	0	25,374
2016	0	25,374	0	25,374
2017 (01/01/2017-30/04/2017)		8,458		8,458
Total emission reductions (Tons of CO_2 e)	**0**	**177,618**	**0**	**177,618**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the power plant in year y
Source of data to be used:	Metering devices used in power plants, monthly records signed by TEIAS and plants manager and invoices will be used.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimated annual generation forming the basis for emission reduction calculation is 45 GWh.
Description of measurement methods and procedures to be applied:	Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the manager/electricity technician of the plant will record the readings and sign. This record will form the basis for monthly invoicing. Meters will have accuracy class of 0.5S. Brand of the meters will be Elster A1500.
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 TEIAS at start up of the plant. Maintenance and calibration of the metering devices will be made by TEIAS periodically. In addition to invoices and metering devices, the electricity delivered to the grid can be cross checked through TEIAS 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. Meters should not require calibration for a period of less than 10 years as per the regulations[63] and be in compliance with regulations of EPDK.[64]
Any comment:	

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type i combusted in Diesel power generator during the year y
Source of data to be used:	Onsite measurements from equipment working hours. Data can be checked from invoices provided by the plant operator for fuel purchase. Emission factor for diesel fuel will be taken for combined margin emission factor calculations.
Measurement Procedure	Gauges and reading devices on diesel generator
Monitoring Frequency	Continuously
QA/QC procedures to be applied:	Data recorded by the equipment will be cross-checked by the fuel invoices
Any comment:	-

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Equipment Purchase Agreement.
Measurement Procedure	Determine the installed capacity based on recognized standards during on site visits
Monitoring Frequency	Yearly
QA/QC procedures to be	

[63] Standard for meters used in electricity meters (submitted to DOE)

[64] http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

applied:	
Any comment:	-

Data / Parameter:	AP_J
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	Calculated from topographical surveys
Monitoring Frequency	Yearly
QA/QC procedures to be applied:	In case of difficulty in calculating reservoir area, maximum surface area will be calculated as is the reservoir is full.
Any comment:	The project does not cause any new reservoir formation. The weir is at the same level with the river bed. Excess water will spillover the weir therefore the area will be limited to the existing river bed as seen from picture below.

Figure 5. View of reservoir from weir body.

Project will not cause formation of a new reservoir since as shown in picture above, even at maximum level, the flooded area does not exceed existing river bed.

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.

In order to demonstrate the emission reduction, only the required data is the net electricity delivered to the grid by the project activity and consumption for the auxiliary diesel generator. IPCC guidelines will be used as data source for calculating the project emissions due to diesel fuel consumption.

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.

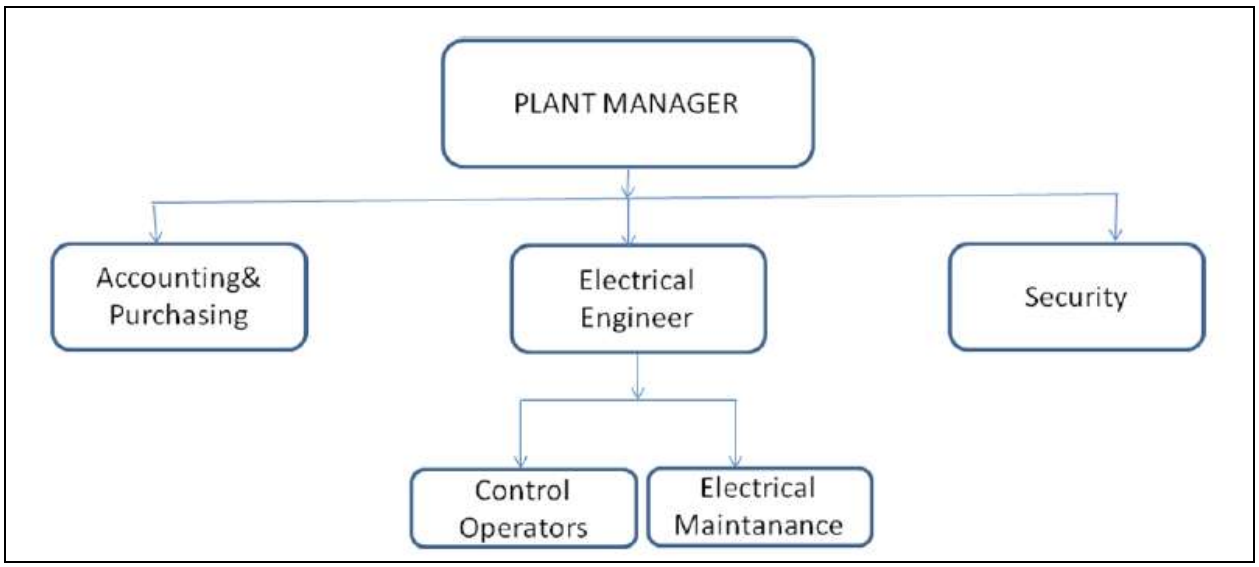

Figure 8. Operational structure of Aralık HEPP

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) installed in the powerhouse control room will measure the electricity generated and will be used for monitoring the electricity generated by the power plant. Meters should comply with the regulation of TEIAS and standards

referred in regulation.[65] 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 TEIAS[66] which will be used for cross checking of generation data. In addition to the two metering devices, generation of the Aralık 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 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 and monitoring methodology and the name of the responsible person(s)/entity(ies)

Baseline Calculated By:
Mehmet Kemal Demirkol (Date of Completion: 15/06/2010)
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 is defined as 27/07/2007, date of equipment purchase agreement. Project has become operational as of 30/04/2010.

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

The expected operational lifetime of the project is about 45 years (after construction phase) as the generation license is issued for 49 years starting at issue date(16/05/2006) and plant is commissioned by 30/04/2010. Plant will be delivered to the Government at the end of license period.

[65] http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

[66] http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/K01.xls

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

Renewable crediting period is chosen for the project activity.

C.2.1.	Renewable crediting period

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

The crediting period will start in 01/05/2010.

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

The studied literature results show however defined, that the external costs of hydro power, which we know are much lower than those of fossil thermally generated electricity and alternative electricity generation systems including renewables. Two studies given below shows that the external costs of Run-off-River type hepps are lower than wind and solar power plants [67] and have better performance compared to other main electricity generation sources[68].

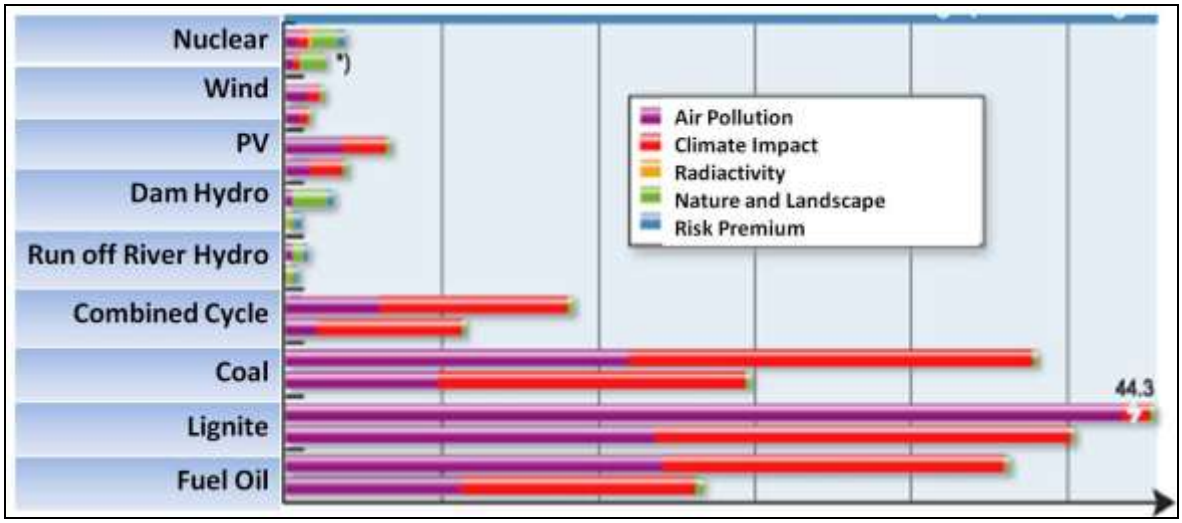

Figure 9. External Costs of Various electricity generation systems.

The pre-EIA assessment for Aralık HEPP project has been prepared by *En-Cev Ltd. Şti.* as defined by the regulations in July 2006. The Report was approved by the Ministry of Environment and Forestry (MoEF) on 08/12/ 2006.

This Report has been evaluated by the relevant local government agencies and Ministry of Environment and Forestry (MoEF). After evaluation of the project and comments of the local agencies, the Ministry of Environment and Forestry has concluded that

[67] http://www.swv.ch/de/argumentarium_i_mehr.cfm#lokale_umweltauswirkungen

[68] http://lrs.epfl.ch/webdav/site/lrs/shared/Document/hirschberg1.pdf (Figure 6)

project does not have significant environmental effects and the EIA assessment is positive for the project activities. The EIA approval letter has been included as Annex of this document.

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:

No significant negative permanent affect of the project has been identified. The pre-EIA Report prepared for the project covers all aspects of the project including capacity, interaction with other plants in the vicinity, natural resources used, waste management, social and economic impacts, technology and materials used, current land use in the region, any historical or protected site within the project boundaries, geological assessment of the project site and any communities affected by the project.

Since the project is a run-off-river type hydro electric power generation activity, effects of project on environment has been assessed according to the table C.2 of special guidance of Gold Standard Toolkit. Assessment has shown that project activity complies with GS guidance for run off river type HEPPs.

In addition to all existing local regulations, KAREN has issued all additional pre-cautions to minimize any adverse environmental impacts that may be caused by project activity as a company policy.

SECTION E. Stakeholders' comments

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

Two stakeholder meetings have been organized for Aralik Hepp project. A preliminary meeting has been held on 12th of March 2009 in Borçka Town in Artvin Province. Stakeholder Feedback Round(SFR) meeting for the project has been held on 06/05/2010 in Aralık Hepp Powerhouse. Stakeholders have been informed about the comments of the preliminary meeting and a site visit on powerhouse and weir has been organized.

Invitation list for the stakeholder meeting has been based on Gold Standard Toolkit. Local and international NGOs, Government Agencies and individuals were invited. Invitations have been made by registered mails, newspaper ads and through village heads. Local people have been invited through announcement published in a daily newspaper called "Artvin'in Sesi" distributed in Artvin and its districts including Borcka district.

Although there exist no DNA in Turkey, Ministry of Environment and Forestry and Ministry of Energy and Natural Resources were invited by registered mail to the meeting. When possible, participation of the invitees was confirmed in order to make necessary arrangements for the meeting. Local representatives of three GS supporting NGOs were invited through postal system and or courier or hand delivery letters. Invitation letters were sent by mail and fax to local and national government institutions, NGOs, GS supporters.

Figure 9. Aralik Hydroelectric Power Plant Initial Stakeholder Meeting Newspaper Ad

E.2. Summary of the comments received:

In general stakeholders' comments were positive about the Project. Issues raised during the meeting have been assessed in more detail in stakeholder consultation report.

Main issues raised by the participants were about;

- Amount of water flow in the river bed,
- Impacts of HEPP on microclimate and environment in the region and,
- Job opportunities for the local people.

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

Since the proposed project activity is a run-off-river type HEPP, it does not involve construction of a dam and water storing reservoir, therefore it does not affect the microclimate in the region. Also, it has been explained that there will be a minimum water flow in the river bed to keep aquatic life and that plant can not be operated when the water flow decreases below about 40% of the project design value due to prevent turbine cavitations. It has been declared that local people will have priority in employment when they have the required skills.

In addition to employing local people, KAR-EN Karadeniz Elektrik ve Uretim Ticaret A.Ş. has also declared that they have made following contribution to local community in the region during construction and they are intending to continue these contributions during operation phases.

- Renovation of the existing roads and paving the steep pathways with concrete,
- Rehabilitation of the village clinic,
- Renovation of the entrance door and roof of the village mosque,
- Renovation of entrance door and roof of the village school,
- Donation of construction material to the village,
- Donating chairs and desks for the village marriage hall,
- Donation to local NGOs in the region,
- Renovation of cottages, roof and floor of gendarme border patrol station,
- Contribution to renovation of social facilities building for teachers,
- Construction of the village water reservoir,

- Modernizing announcement and audio system of a school in Borcka,
- Donating pipes to provide access to drinking water in Taslitarla Village,
- Rehabilitating the Borcka municipality waste and covering up with earth fill.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	KAR-EN Karadeniz Elektrik ve Uretim Ticaret A.Ş. (recently changed as Artvin Coruh Elektrik Uretim Sanayi ve Ticaret A.S.)
Street/P.O.Box:	Turan Emeksiz Sok.
Building:	Park Apt. No:3 A Blok D:26
City:	Ankara
State/Region:	06700
Postfix/ZIP:	N/A
Country:	Turkey
Telephone:	+90 312 4680057
Fax:	+90 312 4680067
E-Mail:	turkey@energo-pro.com
URL:	www.energo-pro.com
Represented by:	
Title:	Executive Manager
Salutation:	Mr.
Last Name:	Karshakov
Middle Name:	-
First Name:	Boyan
Department:	Management
Telephone:	+90 312 4680057
Fax:	+90 312 4680067
Personal E-Mail:	b.karshakov@energo-pro.com

Organization:	Global Tan Energy Limited
Street/P.O.Box:	Ehlibeyt Mahallesi 1259 Sokak
Building:	No. 7/2
City:	Çankaya
State/Region:	Ankara
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

BASELINE INFORMATION

Data Used in calculation of OM for Turkish Electricity Grid

	NCV (Tj/kt) (1000m³ for gas)	**EF (tCO_2/Tj)**	**COEF(tCO2/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 11. Values used in calculation of OM

	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 12. Amount of fuels used for electricity generation[69,70]

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**

Table 13. Net Electricity supply to the grid by thermal plants and imports (GWh)[71,72]

69 http://www.teias.gov.tr/istatistik2005/46.xls

70 http://www.teias.gov.tr/ist2007/43.xls

71 http://www.teias.gov.tr/ist2007/49.xls

72 http://www.teias.gov.tr/ist2007/30(84-07).xls

Data Used in calculation of BM for Turkish Electricity Grid

	NCV (Tj/kt or m^3 for gas)	EF $_{CO2}$ (tCO_2/Tj)	Generation Efficiency %	EF (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 14. 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 15. Most recent capacity additions corresponding to 20%.[73,74,75,76]

[73] http://www.teias.gov.tr/istat2004/7.xls

[74] http://www.teias.gov.tr/istatistik2005/7.xls

[75] http://www.teias.gov.tr/ist2006/8.xls

[76] http://www.teias.gov.tr/ist2007/8.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 Bakanlığı

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

Karar Tarihi : 08./12./2006
Karar No :

ÇED GEREKLİ DEĞİLDİR BELGESİ

16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 17. maddesi gereğince; "Aralık Regülatörü ve Hidroelektrik Santralı (Kurulu Gücü 12.64 MW)" projesi hakkında "*Çevresel Etki Değerlendirmesi Gerekli Değildir*" kararı verilmiştir.

Medet ÇINAR
Bakan a.
Genel Müdür Yardımcısı

Proje Sahibi : Karadeniz Elektrik Üretim Ticaret A.Ş.
Projenin Yeri : Artvin İli, Borçka İlçesi, Aralık Köyü, Aralık Deresi

Figure 10. EIA Exemption Letter Provided for Aralık HEPP

Annex 6

Special Guidance on Run off River Type Hepps

Management Domain	Minimum Flow Goal is a dynamic flow regime, which qualitatively simulates the natural hydrological regime	The project is designed to release minimum flow of 10% of the natural flow. Minimum flow will be monitored and can be increased by DSI as per the water right utilization agreement[77].
	Minimum flow which guarantees habitat quality and prevents critical oxygen and chemical concentrations	Minimum flow will be released for the section between the weir and the HEPP. Also least two springs will merge the Aralık Creek carrying 1.1-0.15 m3/s even at dry season which will be sufficient for the habitat.[78] The adequacy of released flow will be monitored by an expert.
	No disconnection of lateral rivers	There is no disconnection of lateral rivers in the project. Flows of Aralık Weir will be discharged back to the same weir after being used in energy production.
	Minimum water depth for fish migration during critical periods	A continuous flow will always be released from the weir. The fish passage is designed so that there will always be water flowing through passage as long as there is water in the river. An expert assessment will be conducted and included in the verification report to evaluate the functionality of the fish passage.
	Lateral and vertical connectivity (flood plains and groundwater) shall not be substantially disturbed	There will be no disconnection of lateral rivers. Project is a small run of river project and it does not have a storage volume to disturb the underground waters. There exist two creeks which are connected to the main river after the weir and increase the flow in the river bed.
	Provides sufficient transport capacity for sediments	Through the sediment passage in weir, any sediments accumulating before the weir will be released to downstream.

[77] http://www.mevzuat.adalet.gov.tr/html/21493.html

[78] Aralık HEPP Pre-EIA study, page 3

	Landscape compartments shall not be destroyed	Since the project does not have a dam but a small weir to regulate the waters of the brook, landscape compartments will not be endangered. The water diverted will be conveyed through a tunnel thus will have minimum impact on landscape.
	Flood plain ecosystems shall not be endangered	There exists no significant floodplain area as can be seen from pictures. Since the project does not have a dam but a small and all precautions are taken, landscape compartments and flood plain ecosystems will not be endangered.
	Conservation of locally adapted species and ecosystems	There exists no endemic species identified in the project area.[79]
Hydropeaking	Rate of change of water level should not impair fish and benthic populations	A consistent flow of 3 m3/s of minimum flow will be released continuously to protect fish and benthic populations.
	Reduction in water level should not lead to drying of the water course.	A minimum flow will be maintained in the project even in dry seasons.
	Protective measures if flood plain ecosystems are impaired.	The project is run-off-river type and is not expected to have an impact on flood plain ecosystem.
	No isolation of fish and benthic organisms when water level decreases	The weir will prevent the isolation of fish and organisms by providing a steady minimal flow, even when water level decreases. A water flow will always be provided through fish passage to prevent isolation.
	No impairment of spawning habitat for fish	The weir will not affect the spawning habitat for fish. Necessary precautions including minimum flow, sediment and fish passage has been included in project design.[80]
Reservoir management	Are there feasible alternatives to reservoir flushing?	Since the project is a run of river power plant, it does not feature any significant storage volume.
	Changes in reservoir levels should not impair lateral ecosystems (flood plains, river shores, …)	Since the project is a run of river power plant, it does not feature any significant storage volume. Unlike the dam reservoirs, a reservoir operation policy cannot

[79] Aralık Hepp, Pre-EIA page 40

[80] Aralık Hepp, Pre-EIA page 3 and 5

		be applied to this project.
	Connectivity with lateral rivers should not be impaired	There exist no lateral river affected by the project activity.
	Sediment accumulation areas should be used as valuable habitats, where feasible.	The project is a small run-off-type HEPP. No significant accumulation is expected as there exist a sediment passage in the weir design and all sediments are trapped by the dam type hepps at the upstream.
	Special protection of flood plain ecosystems if they are impaired	The project is not expected to have an impact on flood plain ecosystem.
Sediment management	Sediments have to pass through the power plant.	No significant sediment accumulation is expected due to dams at the upstream. A settling tank will be built for sediments that can come from the Weir. At the end of the settling tank, a discharging pipe will be built to discharge the sediments into the river bed.[80]
	No erosion and no accumulation in the river bed below storage dams and water intakes because of a deficit in sediments.	Since the project is a run of river power plant, it does not feature any significant storage volume. Sediment will be transported and discharged to the weir to prevent accumulation in the weir.[80]
	Sediment transport should sustain morphological structures, which are typical for the river.	A settling tank will be built for sediments that can come from the Weir. At the end of the settling tank, a discharging pipe will be built to discharge the sediments into the river bed.
	No accumulation of sediments below dams	Since the project is a run of river power plant and included a sediment passage, it does involve accumulation of sediment. The sediment will be transported flow released from the weir. [81]
	Riverine habitats have to be established	Riverine habitats is not expected to be affected by the project as necessary precautions are issued.
Power plant design	Protection of animals against injury and death stemming from power plant operations (turbines, canals, water intakes, …)	Necessary precautions will be taken in the power plant to prevent injury to animals during operation. There exists no open canal and fences have been build around the weir. Also, to

[81] Aralık Hepp Pre EIA page 5

		prevent fish species, filters will be installed before turbines.
	Free fish migration upwards and downwards (as far as technologically feasible)	Since there will be always water flowing in the original river bed, free fish migration upwards and downwards will be available. There will be a fish passage to enable fish migration .[82]
Social impacts	Cultural landscapes	Cultural Landscapes will not be affected by the project activity. There exists no cultural heritage and area used for construction is very low.
	Human heritage (including protection of special ethnic groups)	There will not be any social impact on human heritage and way of life since the power plant will not be on any settlement territory.
	Preservation of lifestyles	There will not be any disturbance on human heritage and way of life.
	Empowerment of local stakeholders in the decision-making process (about mitigation and compensation of social impacts)	Local stakeholders will be able to express their views about social impacts at stakeholders meetings whereby the project owners would take the proper mitigation measures. Two meetings have been made for the proposed project.
	Resettlement of local population under similar or better living conditions (than prior to the project)	There will not be any resettlement due to project activities. There was a derelict house near the weir which has been expropriated for safety reasons and used as plant facility. The house has been purchased from owner by plant manager via mutual agreement at first stage and then expropriated for the project in second stage.
	Build additional social infrastructure, sufficient to cope with population increase (due to migration induced by the project)	The project will not induce any migration but will have positive impact on infrastructure thorough irrigation channels, roads etc.
	Water quality and fishing losses affecting downstream riverside population	The downstream water quality will not be affected, since the same water flows will be kept downstream. Besides, the weir will provide fishing opportunities for the locals.

[82] Aralık Hepp, Pre-EIA page 48

Annex 7

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**		