



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

ARALIK 12.41 MW
Hydroelectric Power Plant

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SECTION A. General description of small-scale project activity

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

Title: ARALIK 12.41 MW HYDROELECTRIC POWER PLANT

Version: 02

Date: 13/08 2009

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) 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 3 km, including 2.8 km long water conveyance tunnel whereas design flow rate of the project is 5.00 m³/s and elevation difference of about 300.00 m.

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 29,482 tCO₂ per year. Compared with a natural gas power plant, the Project will replace consumption of about 10 million m³ 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. Approximately 200 people will be employed during construction phase. After the commissioning of the plant, the project is expected to create permanent job opportunities for about 12 local employees. 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 NO_x, PM and SO_x 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, 150 l/s of minimum flow will be released from the weir¹.

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

¹ Aralık Hepp Project Introductory Document page 3.

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caused about 9.2% decrease in population² 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 50% of the electricity has been generated by natural gas (NG) power plants which is fully imported and 20 bn m³ NG has been consumed. In terms of fuel dependency, Aralık HEPP is expected to replace about 9.7 million m³ NG and contribute to balance of payments which will, in addition, increase air quality and access to affordable energy services in national level³.

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
EIA Approval Letter	08/12/2006
Loan Agreement	10/04/2008
Start of Construction	01/04/2008
LSC Meeting	14/03/2009
Commissioning Date (Expected)	01/09/2009
Completion of PFA by GS	23/06/2009

Table 1. Aralık 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)	<ul style="list-style-type: none"> • KAR-EN Karadeniz Elektrik ve Üretim Ticaret A.Ş. • Global Tan Energy Ltd. 	No

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 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):

² <http://ekutup.dpt.gov.tr/bolge/gosterge/2004/ilce.pdf> (page 144)

³ <http://www.teias.gov.tr/ist2007/43.xls>

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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.

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 power⁴. 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 6.45 MW
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 8.0 km long 34.5 kV capacity overhead transmission line for connection to the national grid.

► Commencement of Operation:

September 2009.

► Licence Duration:

49 years.

⁴ <http://www.brighthub.com/engineering/mechanical/articles/7826.aspx>

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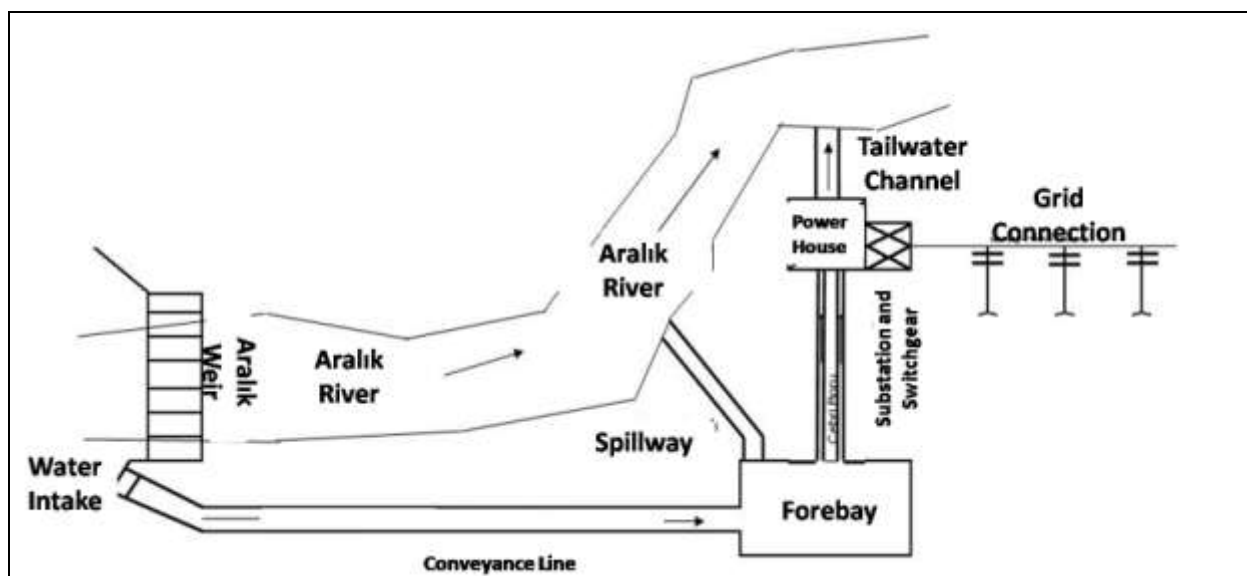


Figure 2. Aralik Run-Off-River HEPP Schematic Layout

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
2009 (01/10/2009 – 31/12/2009)	9,828
2010	29,482
2011	29,482
2012	29,482
2013	29,482
2014	29,482
2015	29,482
2016 (01/01/2016-30/09/2016)	19,654
Total emission reductions (Tons of CO ₂ e)	206,374
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO₂e)	29,482

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

No public funding nor ODA is used for the Aralik 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 activity⁵:

⁵ <http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf>

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- 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 13⁶, released on 14th December 2007 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.

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 CO₂e/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.

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

⁶ http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_PHPV5WESACMBTJ2YY54GAJYSIEI3HD

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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 statistics⁷, 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^{8,9}.

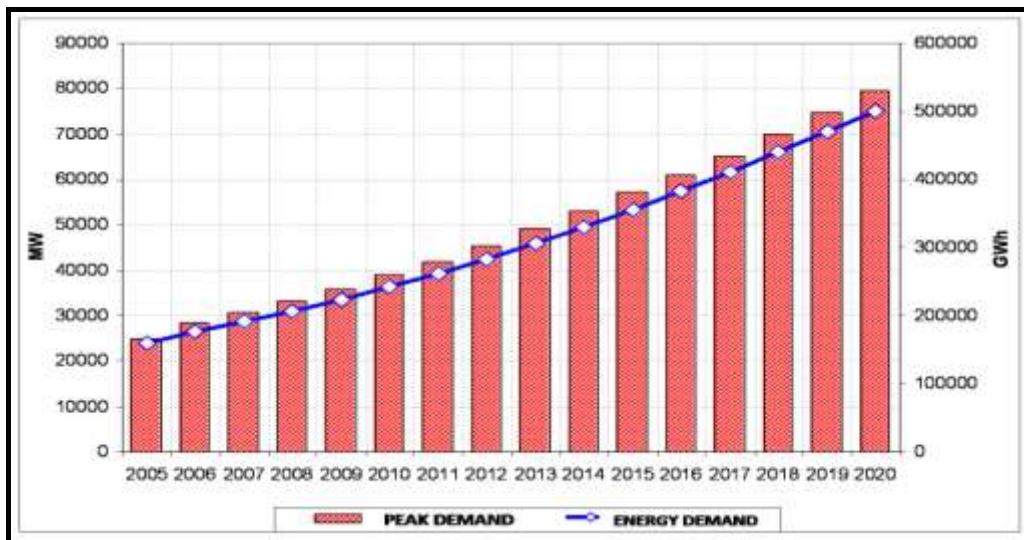


Figure 3. Peak Load and consumption projection for Turkish electricity system between 2005-2020¹⁰

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

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

9 IEA Turkey Country Report, 2005

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

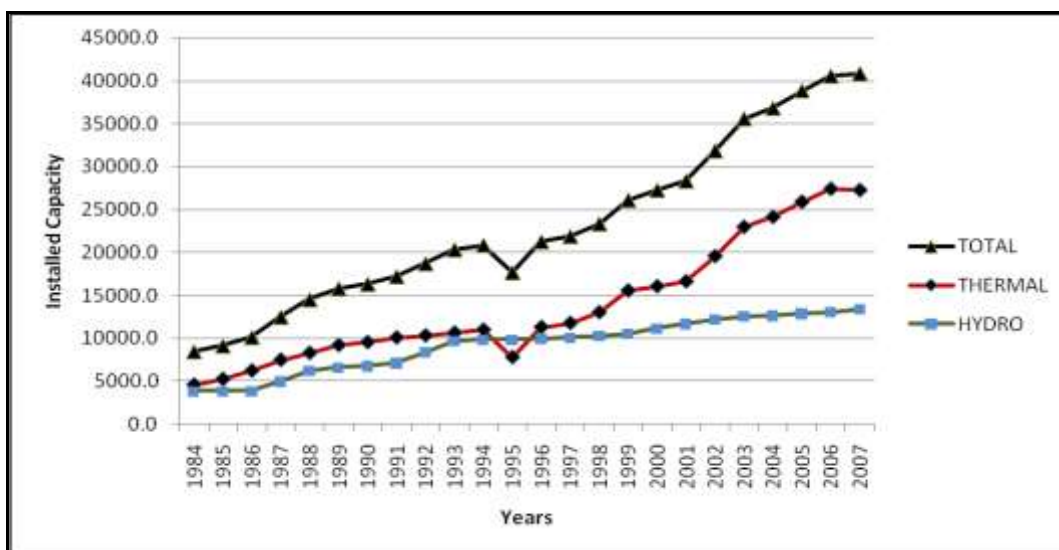


Figure 4. Annual Development of Turkey's Installed Capacity

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 29,480 tCO₂ emissions through replacing the electricity that would need to be supplied via the National grid in the absence of the project activity.

Additionality

Additionality of the proposed project has been assessed according to the Appendix B of the applied methodology. Main barriers identified are technological and financial barriers which are given in detail below.

The lack of financial incentives is the primary barrier for renewable energy investments in Turkey. The carbon market provides an innovative mechanism enabling an environment to emerge for renewable electricity generation sources. The following barriers apply to renewable energy investments in Turkey:

- *High level of initial financing and long payback period*
In general, HEPP unit capital investment costs are much higher than those of alternative (in terms of power output) thermal power plants. This high initial investment cost leads to a long payback period and a higher investment risk on project financing which makes it difficult to get loan from financial institutions and creditors^{11,13}.
- *Limited incentives for renewable energy:*
The Renewable Energy Law permits trading in competitive prices above the € 0.055 threshold. However, since a majority of power plants in Turkey are still owned by the state, the latter can control supply and hence influence the prices. Overall, competition for “must run” run-off-river HEPPs is difficult because their control on resources and generation is limited compared to conventional power plants (who can easily adapt generation to actual demand and price available in the market).
- *Uncertainty in the flow regime*

¹¹ <http://www.ieahydro.org/reports/Hydrofut.pdf> (page 5)

Generation capacity of the HEPPs is mainly dependent of the precipitation and flow rate of the basin. Although the feasibility of the projects are carried out considering long term flow rates measured in the river, still uncertainty in generation is very high which makes run-off-river hydroelectric power plants more sensitive against change in water quantity. Analysis of the installed capacity and actual electricity generated by hydroelectric power plants in Turkey has shown that uncertainty in utilization of installed capacity is very high and fluctuation can be as high as 50%.

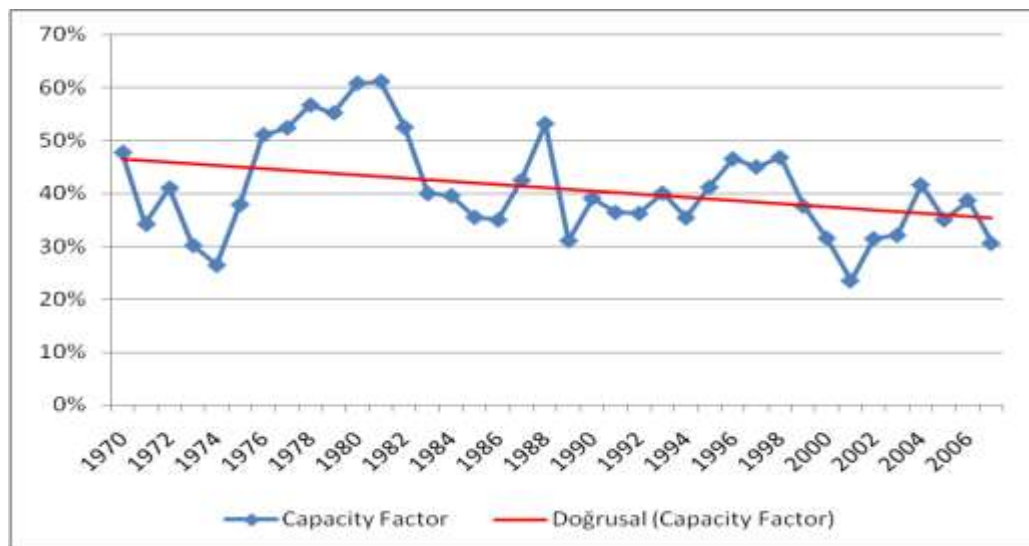


Figure 5. Normalized Fluctuation in Utilization of Installed Capacity of HEPPs in Turkey.^{14,15}

Another result originating from the figure above is the fact that average capacity factor is decreasing (red line in figure) which shows that plants with high capacity factors¹² have already been built and remaining hydroelectric potential is less feasible in terms of annual generation per installed power.

Financial Barriers

High level of initial financing and long payback period in general, HEPP unit capital investment costs are much higher than those of alternative (in terms of power output) thermal power plants. This high initial investment cost leads to a long payback period and a higher investment risk on project financing which makes it difficult to find loan funds from financial institutions and creditors.

According to the investment analysis made for Aralık HEPP, project IRR for the Aralık HEPP has been calculated as 5.26% in the absence of carbon revenue. When we include carbon revenue to the project income, project IRR increases to 7.51% which is still below the rates for a reasonable investment.

Since the projects having IRR values below 10.0% have difficulty in obtaining capital and bank loan funding, the project VER revenue greatly enables the project investors to obtain loan finance and also on more preferable terms and conditions than would otherwise be the case and as referred to in the web page of Clean Energy Foundation¹³.

For Aralık HEPP, in order to reach this IRR value, average electricity tariff must be at least 7€/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

¹² Capacity factor is defined as expected annual generation divided by installed power times working hours per year (8760h)

¹³ <http://www.temev.org.tr/duyurularS.htm> (p 3-accessed on 06th June 2008)

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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.

According to local regulations, electricity price is determined daily according to Market Financial Settlement Centre (MFSC) as defined in the regulations and there exists three tariffs during day, peak and night hours. Thermal power plants and HEPPs with storage facilities have flexibility to schedule their generation at peak hours when the tariff is high. However, run-off-river type HEPPs do not have significant storage facility therefore may not be able to benefit from high prices realized at when demand is high.

Parameters	Unit	Data Value
Installed Capacity	MW	12.41
Grid Connected output	GWh	45.15
Capital Investment	Million €	14,629,000
Corporate tax rate	%	20
Loan	Million €	10,240,000
Expected Tariff	€ Cents/kWh	5.5
Expected VERs price	€/ tCO ₂ e	10

Table 2. Main financial parameters used for investment analysis

Sensitivity Analysis

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

- Investment Cost
- Operating Cost
- Electricity Sales revenue

For a range of $\pm 10\%$ fluctuations in parameters above, table below has been obtained.

	% Fluctuation						
	10	5	2.5	0	-2.5	-5	-10
Investment Cost	6.38	5.80	5.52	5.26	5.01	4.76	4.30
Operating Cost	6.04	5.65	5.46	5.26	5.06	4.86	4.46
Electricity Income	3.65	4.46	4.86	5.26	5.65	6.04	6.80

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.

Common Practice Analysis

Analysis of other activities similar to the proposed project activity

According to the TEIAS statistics¹⁴, share of HEPPs in total installed capacity of Turkey is about 32.8% whereas share of HEPPs in total generation has been realized as about 18.6% in 2007¹⁵. However, when we look at the historical data, it seen that share of hydroelectric was much higher in the past as seen in the figure below.

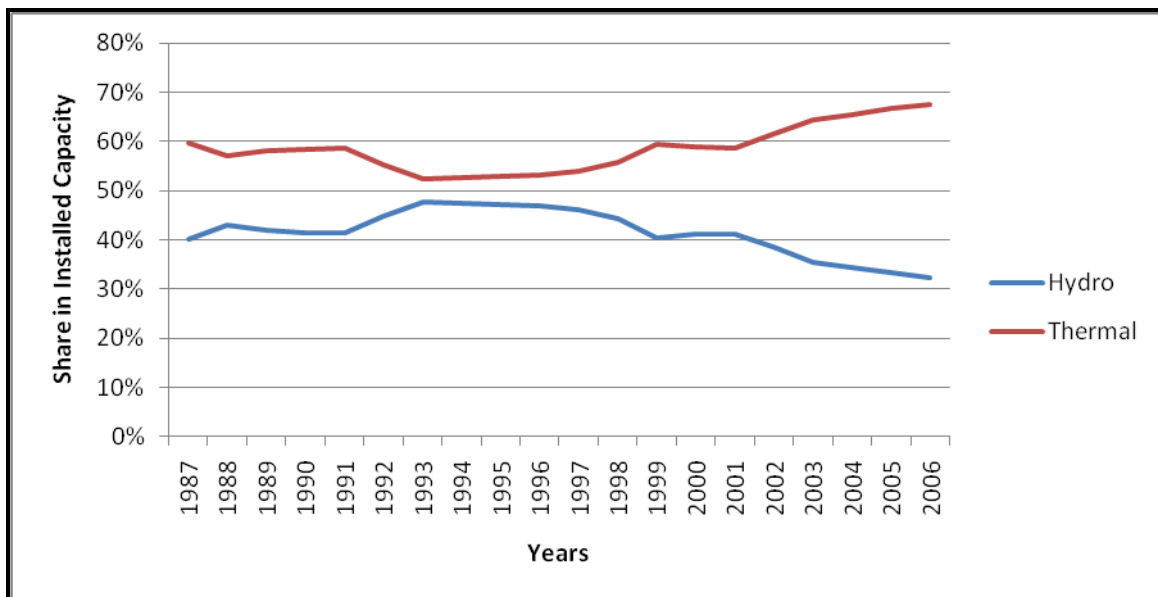


Figure 6. Annual Development of Turkey's Installed Capacity

Discuss any similar options that are occurring:

The main reason behind the decrease in share of hydro electricity power is due to the changes in government's economic policy which intends to encourage private companies to invest in energy generation and lower the weight of government on energy generation as a part of privatization efforts. On the other hand, private companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and uses conventional technologies. Installed capacity of thermal power plants owned by generation companies has increased from 123.4 MW in 1996 to 10,688.8 MW in 2007 whereas the total capacity of hydro electricity power plants has only increased from 75.3 MW to 1,345 MW in the same period which show that private companies find more attractive to invest is thermal power plants^{16,17,18}. When we look at the distribution of hydropower capacity by utilities, it is seen that 85.5% percent of total installed hydroelectric capacity is still owned by government by year 2007, whereas the remaining 14.5% are shared by auto producers, private generation companies and concessionary companies¹⁹.

Since the previous plants were built and financed by Government, security in electricity supply has been a more important criterion in decision process whereas for private companies profitability and risks are considered as more important factors in investment decision.

¹⁴ <http://www.teias.gov.tr/ist2007/1.xls>

¹⁵ <http://www.teias.gov.tr/ist2007/13.xls>

¹⁶ [http://www.teias.gov.tr/ist2007/5\(1984-05\).xls](http://www.teias.gov.tr/ist2007/5(1984-05).xls)

¹⁷ <http://www.teias.gov.tr/ist2006/8.xls>

¹⁸ <http://www.teias.gov.tr/ist2007/8.xls>

¹⁹ <http://www.teias.gov.tr/ist2006/5.xls>

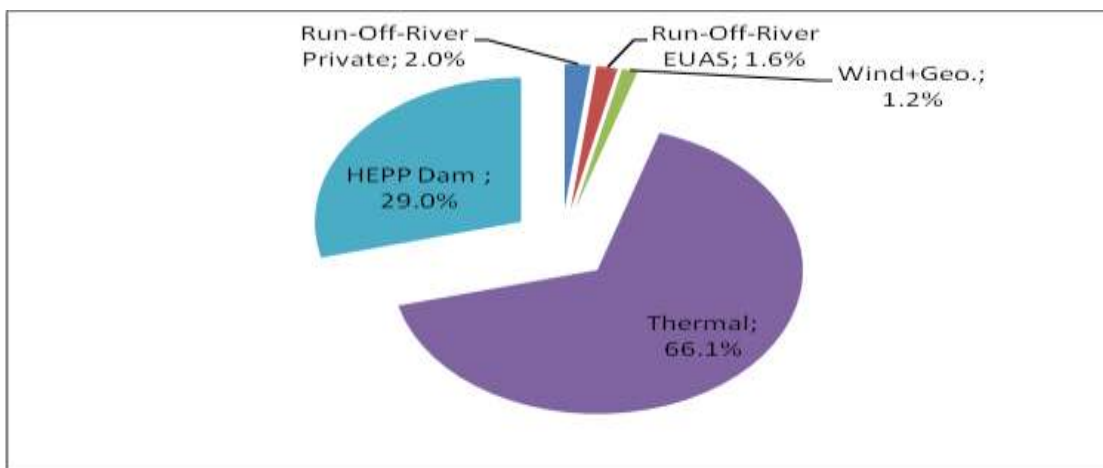


Figure 7. Share of Run-off-river type HEPPs in Turkey's installed capacity²⁰

Outcome of step 4:

Within the framework of the discussion above, hydroelectric power plants constructed by private companies are not considered as common practice in Turkey.

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 anymore.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

assumptions made are;

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

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

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

- a) Simple OM,
- b) Simple adjusted OM,
- c) Dispatch Data Analysis OM and
- d) Average OM.

²⁰ <http://www.teias.gov.tr/yukdagitim/kuruluguc.xls>

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

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

Table 4. Breakdown by source of the electricity generation for the five most recent years²¹

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 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, National GHG emission inventory has been used (Table1.A(b), column N. The inventory is available at link below; http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/tur_2009_crf_13apr.zip				
Value applied:	<table border="1"> <thead> <tr> <th>Fuel Source</th> <th>EF(tCO₂/Tj)</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> </tr> </tbody> </table>	Fuel Source	EF(tCO ₂ /Tj)		
Fuel Source	EF(tCO ₂ /Tj)				

²¹ <http://www.teias.gov.tr/ist2007/13.xls>

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	Coal	94.60
	Lignite	101.20
	Fuel Oil	72.60
	Diesel	72.60
	LPG	63.07
	Naphta	73.33
	Natural Gas	56.10
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, average national data can be used if data is from reliable source. Since data used is considered reliable and reflects the national circumstances, it has been used in calculations.	
Any comment:		

Data / Parameter:	FC _{i,y}
Data unit:	Tons or 1000 m ³ for gases
Description:	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/43.xls)
Value applied:	See table 14
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM calculation
Data / Parameter:	GE
Data unit:	%
Description:	Generation efficiency of thermal power plants
Source of data used:	Environmental map of Turkey (www.cedgm.gov.tr/dosya/cevreatlasi/atlasin_metni.pdf page 197) and EC Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Large Combustion Plants
Value applied:	See table 16
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for BM calculation
Any comment:	

Data / Parameter:	NCV
Data unit:	Tj/kt
Description:	Net Calorific Values of Fuel combusted in power plants.
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/45.xls)
Value applied:	See 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^{22,23}.

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

Step 2. Select an operating margin method

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

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

- **Ex-ante option**
A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VER-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period, or
- **Ex-post option**
The year in which the project activity displaces grid electricity, with the requirement that the emissions factor to be updated annually during monitoring.

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

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

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

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

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

²² <http://www.teias.gov.tr/ist2007/1.xls>

²³ <http://www.teias.gov.tr/ist2007/13.xls>

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$$EF_{grid, OM, y} = \frac{EF_{CO_2, i} \cdot FC_{i, y}}{EG_y} \quad (1)$$

where:

$EF_{grid, OM, y}$	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)
$EF_{CO_2, i}$	CO ₂ emission factor of fossil fuel type “i” in year “y” (tCO ₂ /GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must run power plants / units, in year “y” (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year “y”
y	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^{24,25,26,27}, the official source of related data. Fuel consumption values for the relevant years are given in table below:

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

Table 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 CO₂ emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories for fuels except for coal and lignite. For lignite and coal, the emission factors have been calculated using country specific heating values of fuels consumed and formulas given in Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. Details of the data used for the calculations are given in Annex 3.

²⁴ <http://www.teias.gov.tr/ist2007/42.xls>

²⁵ <http://www.teias.gov.tr/ist2007/43.xls>

²⁶ <http://www.teias.gov.tr/ist2007/44.xls>

²⁷ <http://www.teias.gov.tr/ist2007/45.xls>

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	COEF (tCO ₂ /kt)	Consumption (2005 - 2007) (tons or 1000m ³)	Total Emission (2005 - 2007) (tCO ₂)
Coal	2,065	16,906,064	34,915,268
Lignite	669	160,126,774	107,097,582
Fuel Oil	2,910	6,002,955	17,467,462
Diesel Oil	3,112	140,176	436,185
LPG	2,897	12,941	37,495
Naphtha	3,239	109,375	354,315
Natural Gas	2,069	53,249,105	110,178,911
Total Emissions			270,487,217

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^{28,29,30}. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants, gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,y}$ requires the inclusion of electricity imports with an emission factor of 0 tCO₂/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

Year	Gross Generation	Net Generation	Net/Gross	Gross Gen. Thermal	Net Gen. Thermal	Import	Total Supply to the Grid
2005	161,956	155,469	0.960	122,242	117,346	636	117,982
2006	176,299	169,543	0.962	131,835	126,783	573	127,356
2007	191,558	183,340	0.957	155,195	148,537	864	149,401
				Total Net Thermal Gen.	391,403	2,073	394,739

Table 3. Gross/Net electricity generation by Turkish Grid

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

$$EF_{grid,OM,y} = 270,487,217 \text{ tCO}_2 / 394,739 \text{ GWh} \\ = 685 \text{ tCO}_2/\text{GWh}.$$

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:

- The set of five power units that have been built most recently, and

²⁸ [http://www.teias.gov.tr/ist2007/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2007/35(2001-2005).xls)

²⁹ [http://www.teias.gov.tr/ist2007/36\(06-07\).xls](http://www.teias.gov.tr/ist2007/36(06-07).xls)

³⁰ [http://www.teias.gov.tr/ist2007/35\(2001-2005\).xls](http://www.teias.gov.tr/ist2007/35(2001-2005).xls)

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- 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 recently³¹.

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 TEİAŞ web page ^{32,33,34,35}. 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 38,311.2 GWh. Since 20% of the most recent year's generation falls partly on capacity of a 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 41,056.4 GWh.

Step 5. Calculate the build margin emission factor

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

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

Where:

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

Data for generation efficiency has been calculated using average values obtained from the environmental map of Turkey³⁶ (p197). For LPG and Naphtha whose weights are not very significant, IPCC best available techniques (EF_{BAT}) data has been used (p405)³⁷. For EF values of fuels consumed, IPCC default values at lower limit of 95% confidence interval have been used.

	EF CO ₂ (tCO ₂ /Tj)	Generation Efficiency	EF (tCO ₂ /MWh)
Coal	94.60	33.6%	1.014
Lignite	101.20	32.8%	1.112
Fuel Oil	72.60	35.1%	0.745
Diesel	72.60	27.5%	0.949
LPG	63.07	45.0%	0.505

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

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

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

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

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

36 www.cedgm.gov.tr/dosya/cevreatlasi/atlasin_metni.pdf

37 EC Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Large Combustion Plants

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Naphtha	73.33	45.0%	0.587
Natural Gas	56.10	46.0%	0.439

Table 4. Calculation of emission factor from most recent power plants

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

Fuel Source	Generation (MWh)	Percent Generation	EF	Weighted EF
Coal	1,463	3.6%	1.014	0.04
Lignite	11,482	28.0%	1.112	0.31
Fuel Oil	675	1.6%	0.745	0.01
Diesel oil	2	0.0%	0.949	0.00
LPG	50	0.1%	0.505	0.00
Naphtha	323	0.8%	0.587	0.00
Natural Gas	23,974	58.4%	0.439	0.26
Renewable and wastes	85	0.2%	0.000	0.00
Solid	5	0.0%	0.000	0.00
Total Renewable	2,999	7.3%	0.000	0.00
<i>TOTAL Capacity additions</i>				
	41,056.3	100.0%		0.621

Table 5. Most recent capacity additions corresponding to 20% by fuel source

Finally, by summing up the weighted EF_{BAT} values, overall build margin emission factor have been calculated as:

$$EF_{\text{grid, BM, y}} = 621 \text{ tCO}_2/\text{GWh}$$

STEP 6 - Calculate the combined margin emission factor

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

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

Where:

$EF_{\text{grid, BM, y}}$ = Build margin CO_2 emission factor in year “y” (tCO_2/MWh) as calculated from equation (2) above.

$EF_{\text{grid, OM, y}}$ = Operating margin CO_2 emission factor in year “y” (tCO_2/MWh) as calculated from equation (1) above.

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

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

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



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Based on the formula above (3), baseline emission factor is calculated as;

$$EF_{\text{grid, CM, y}} = 0.5 * 685 + 0.5 * 621 = 653$$

The combined margin emission factor is therefore **653 tCO₂/GWh**. Emission factor will remain same during the first crediting period as recommended by the methodology ACM0002, version 9.

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

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

Where:

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

Baseline emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y \quad (5)$$

Where:

- EG_y* = Net electricity delivered to the grid by the project activity in year *y* excluding transmission losses of the grid.
- EF_y* = Emission factor calculated according to selected methodology

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 have a reservoir so there will not be any emission from reservoir due to project activity.

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 CO₂ emissions from fossil fuel combustion” CO₂ emissions from fossil fuel combustion for process *j* are calculated based on the quantity of fuels combusted and the CO₂ emission coefficient of those fuels, as follows:

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

Where:

- PEFC_{j,y}* = Are the CO₂ emissions from fossil fuel combustion in process *j* during the year *y* (tCO₂/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 CO₂ emission coefficient of fuel type *i* in year *y* (tCO₂/mass or volume unit)
- i* = Is the fuel types combusted in process *j* during the year *y*

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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;

$$ER_y = BE_y - PE_{FC,y}$$

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

2009 (01/10/2009 – 31/12/2009)	9,828
2010	29,482
2011	29,482
2012	29,482
2013	29,482
2014	29,482
2015	29,482
2016 (01/01/2016-30/09/2016)	19,654
Total emission reductions (Tons of CO ₂ e)	206,374
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO ₂ e)	29,482

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

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	page(http://pmum.teias.gov.tr) using the ID and password of the project owner. All records will be kept for at least two years as requested by the applied methodology.
Any comment:	

Data / Parameter:	$FC_{i,j,y}$
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
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:	-

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.

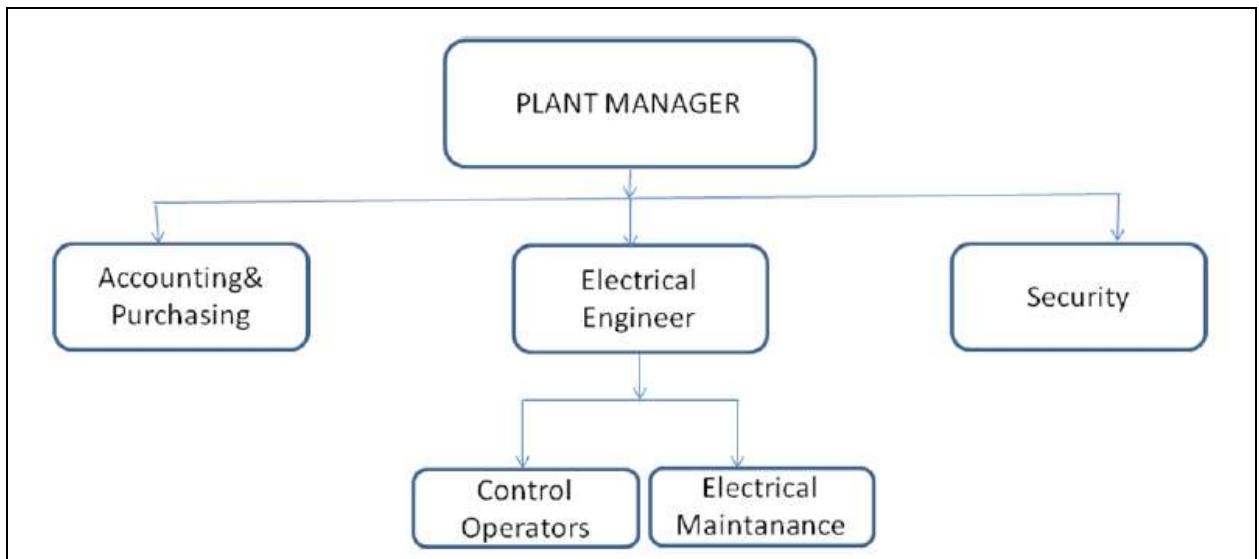


Figure 8. Operational structure of Aralık HEPP

VER Team Members is expected to include;

Plant Manager: Overall responsibility of compliance with VER monitoring plan

Electrical Engineer: Responsible for day to day running of plant, recording and monitoring of relevant data and periodic reporting

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

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

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

Installation of meter and data monitoring will be carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) will be used for monitoring the electricity generated by the power plant. 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 TEIAS³⁸ 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)

³⁸ http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/K01.xls

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Baseline Calculated By:

Mehmet Kemal Demirkol (Date of Completion: 15/06/2007)

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

Telephone: +90 232 465 21 87

Fax: +90 232 465 21 29

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:

Project construction has started in 01/04/2008. Project is expected to commence operation by 01/10/2009

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

The expected operational lifetime of the project is about 46 years (after construction phase) as the generation license is issued for 49 years starting at issue date. Plant will be delivered to the Government at the end of license period.

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 is expected to start in 01/10/2009.

C.2.1.2. Length of the first crediting period:

The project will use a renewable crediting period of 3x7 years. 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 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 8th December 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 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:

Local Stakeholder Meeting for Aralik project was held on 12th of March 2009 in Borçka Town in Artvin Province. Invitation list for the local 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" (Voice of Artvin) and distributed in Artvin and its districts including Borcka, on 07.03.2009).

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.

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Figure 9. Aralık 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 LSC 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 cavitation. 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 Üretim 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,



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- 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.

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Annex 1**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	KAR-EN Karadeniz Elektrik ve Uretim Ticaret A.Ş.
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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) (1000m ³ for gas)	EF (tCO ₂ /Tj)	COEF (tCO ₂ /kt)
Coal	23.00	98.2	2,876
Lignite	6.58	112.2	739
Fuel Oil	40.09	75.5	3,027
Diesel Oil	42.87	72.6	3,112
LPG	23.03	61.6	1,419
Naphtha	43.81	69.3	3,036
Natural Gas	36.92	54.3	2,005

Table 9. Values used in calculation of OM³⁹

	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	48,619,399
Lignite	48,319,143	50,583,810	61,223,821	160,126,774	118,280,161
Fuel Oil	2,005,899	1,746,370	2,250,686	6,002,955	18,171,423
Diesel Oil	28,442	61,501	50,233	140,176	436,284
LPG	12,908	33	0	12,941	36,716
Naphtha	84,481	13,453	11,441	109,375	332,038
Natural Gas	15,756,764	17,034,548	20,457,793	53,249,105	106,755,461

Table 10. Amount of fuels used for electricity generation^{40,41}Data Used in calculation of BM for Turkish Electricity Grid

	A NCV (Tj/kt or m ³ for gas)	B EF _{CO₂} (tCO ₂ /Tj)	D Generation Efficiency	E (=3.6/D/1000*B) EF ⁴² tCO ₂ /MWh
Coal	23.00	98.2	33.6%	1.053
Lignite	6.58	112.2	32.8%	1.233
Fuel Oil	40.09	75.5	35.1%	0.775
Diesel	42.87	72.6	27.5%	0.949

³⁹ 2006 IPCC Guidelines for National Greenhouse Inventories⁴⁰ <http://www.teias.gov.tr/istatistik2005/46.xls>⁴¹ <http://www.teias.gov.tr/ist2007/43.xls>⁴² IPCC Reference Document on Best Available Techniques for Large Combustion Plants

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LPG	23.03	61.6	45.0%	0.493
Naphtha	43.81	69.3	45.0%	0.554
Natural Gas	36.92	54.3	46.0%	0.425

Table 11. 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	1.053	3.6%
Lignite	11,482	1.233	28.2%
Fuel Oil	675	0.775	1.7%
Diesel oil	2	0.949	0.0%
LPG	50	0.493	0.1%
Naphtha	323	0.554	0.8%
Natural Gas	23,873	0.425	58.7%
Renewable and wastes	85	0.000	0.2%
Solid	5	0.000	0.0%
Total Renewable	2,725	0.000	6.7%
TURKEY'S TOTAL	40,681		100%

Table 12. Most recent capacity additions corresponding to 20%. ^{43,44,45,46}43 <http://www.teias.gov.tr/istat2004/7.xls>44 <http://www.teias.gov.tr/istatistik2005/7.xls>45 <http://www.teias.gov.tr/ist2006/8.xls>46 <http://www.teias.gov.tr/ist2007/8.xls>



Annex 4

MONITORING INFORMATION

Information about monitoring plan is given in section B.7.2

Annex 5

EIA EXEMPTION LETTER

<p>T.C. Çevre ve Orman Bakanlığı</p> 	<p>T.C. ÇEVRE ve ORMAN BAKANLIĞI ÇEVRESEL ETKİ DEĞERLENDİRMESİ VE PLANLAMA GENEL MÜDÜRLÜĞÜ</p>	<p>Karar Tarihi : 08.11.2006 Karar No :</p>
<h2>ÇED GEREKLİ DEĞİLDİR BELGESİ</h2>		
<p>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 Santrali (Kurulu Gücü 12.64 MW)" projesi hakkında "Çevresel Etki Değerlendirmesi Gerekli Değildir" kararı verilmiştir.</p>		
		<p> Medet ÇINAR Bakan a. Genel Müdür Yardımcısı</p>
<p>Proje Sahibi : Karadeniz Elektrik Üretim Ticaret A.Ş. Projenin Yeri : Artvin İli, Borçka İlçesi, Aralık Köyü, Aralık Deresi</p>		

Figure 10. EIA Exemption Letter Provided for Aralık HEPP