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

Grid-Connected Electricity Generation From Renewable Resources:

SELALE 13.61 MW Hydroelectric Power Plant Project, Turkey

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: SELALE 13.61 MW HYDROELECTRIC POWER PLANT
Version: 01
Date: May 2009

A.2. Description of the project activity:

SELALE is a 'Run-off-River' type hydroelectric power plant(HEPP) project. SELALE HEPP Project is planned to be implemented by Muradiye Elektrik Üretim A.Ş and the project site is located on Bendimahi weir in Muradiye province of Van.

The Regulator will be built at 1,782 meters elevation on Bendimahi Weir and then waters of the weir will be directed to SELALE HEPP with a transmission line of 4.6 km. The Regulator will be built 7.9 meters above the weir bed and a minimum flow will be ensured through the weir to maintain the natural habitat.

The water will be released to the weir bed without a change in chemical composition after passing through transmission lines and turbines at a rate of 19.0 m^3/second. Total annual electrical energy generation is estimated at 56.22 GWh.

Milestones of the Project

Milestone	Date
License Issuance	14/06/2007
EIA Approval	08/08/2007
License Amendment	13/03/2008
Equipment Purchase Contract	14/01/2008
LSC Meeting	16/04/2009
Start of Construction	01/05/2008
Submission of draft PDD to DOE	01/08/2009
Expected Commissioning Date	31/12/2009

Table 1. SELALE Project Milestones

No pollution source is anticipated during the construction and operation of the project. Run-off river HEPP projects are among the projects with minimal impact on environment and local people. No environmentally harmful emission is anticipated. After the conversion of potential energy of water to electrical energy the water flow will be maintained without any pollution. During the construction all regulations regarding protection of air quality will be followed. Any solid and liquid wastes formed during the construction and operation of the plant will be collected and discharged in accordance with 'Control of Solid Wastes' and 'Control of Water Pollution' regulations.
The plant will have an installed capacity of 13.61 MW and generate 56,220 MWh energy annually. According to calculations based on electricity generation estimates, SELALE HEPP project will result in a CO_2 reduction of 36,712 tons per year due to use of renewable resources.

The project is anticipated to have a binary impact on economical structure. The primary impact is regional and local people will be offered employment during the construction of the project. The construction work is planned to take 2 years and 300 personnel is planned to be employed within the scope of the project. This opportunity will increase income level of local population incrementally and will contribute to the prevention of migration from the region during the construction of the project. The positive impact on economical structure will also indirectly contribute to the quality of social life in the region. After the commissioning of the plant, the project is expected to create permanent job opportunities for about 10 local employees. According to the research conducted by State Planning Organization(SPO) on socio-economic level of Districts in Turkey, Muradiye is ranked as 836th among 872 Districts in Turkey in terms of development level and classified in 6th (out of 6) group. About 86% of the population works on agriculture and 12.7% works on low value added service sector whereas only 1.07% works on industry which places Muradiye to 799th in ranking[1]. 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 direct and indirect job opportunities the project will contribute to sustainable development through activities conducted within the framework of corporate social responsibility. 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 20bn m^3 NG has been consumed. In terms of fuel dependency, SELALE HEPP is expected to replace about 9 million m^3 NG and contribute to balance of payments which will, in addition, increase air quality and access to affordable energy services in national level[2].

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)	Muradiye Elektrik Üretim A.Ş Global Tan Energy Ltd.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

SELALE HEPP project is located within the boundaries of Muradiye District of Van Province.

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

[1] http://ekutup.dpt.gov.tr/bolgesel/gosterge/2004/ilce.pdf

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

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.:

Eastern Anatolia Region, Van Province

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

Muradiye District.

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

GPS coordinates of the weir and powerhouse is given below.

	LONGITUDE	LATITUDE
BENDIMAHI WEIR	E 43° 45′ 38″	N 39° 03′ 01″
POWERHOUSE	E 43° 44′ 38″	N 39° 01′ 02″

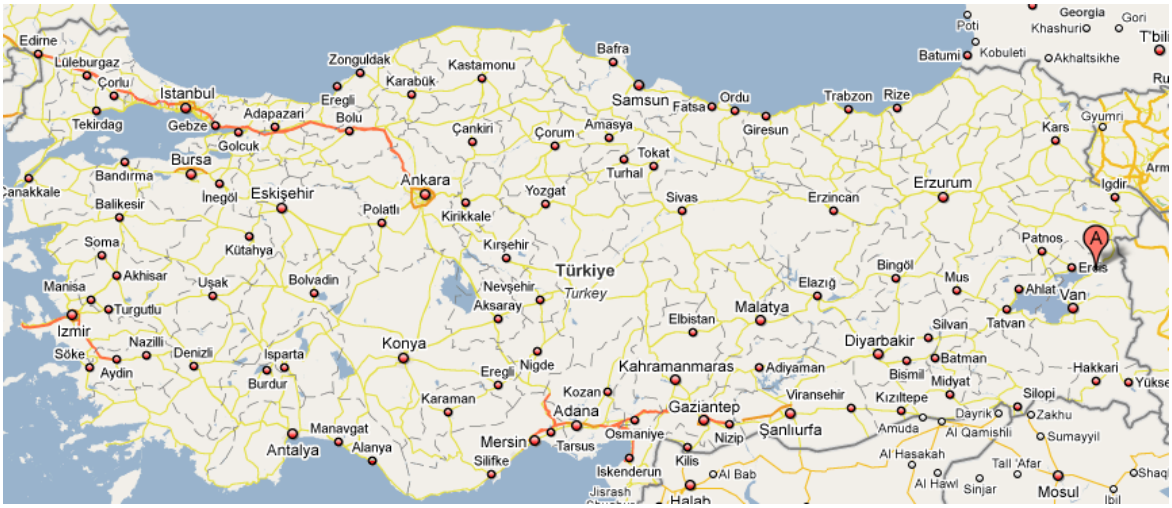

Figure 1. Location of the Project Activity

Figure 2. SELALE HEPP Project Site

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

The project category is included in the sectoral scope 1 "Energy Industry – Renewable Sources" according to the UNFCCC definition.

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

Hydroelectric power plants are structures that generate electricity utilizing the energy of flowing water. The project consists of two turbines and generators which are used to transform the potential energy of water to mechanical energy at a first stage and later into electrical energy.

LOCATION:	ON BENDIMAHI RIVER COURSE, IN MURADIYE DISTRICT OF VAN PROVINCE
DESIGN DISCHARGE:	19.00 M^3/SEC
TOTAL LENGTH OF CONVEYANCE LINE:	1.895 KM
NET HEAD:	48.3 M
TOTAL INSTALLED CAPACITY:	13.61 MWm
NUMBER OF UNITS:	3 EACH 4.55 MW
TURBINE TYPE:	FRANCIS TYPE –HORIZONTAL AXIS
TURBINE MANUFACTURER:	ORIENT ENGINEERING (CHINA)
GENERATOR TYPE:	HORIZONTAL AXIS GENERATORS WITH 5.059 KVA APPARENT POWER,
GENERATOR MANUFACTURER:	ORIENT ENGINEERING (CHINA)
TRANSFORMER MANUFACTURER:	MAKSAN (TURKEY)
LENGTH OF CONVEYANCE LINE AND TUNNELS:	4.56 KM
ENERGY TRANSMISSION LINE	6 KM 33 KV and 50 KM 154 KV

CAPACITY:	
NUMBER OF PENSTOCKS:	1
LENGTH OF PENSTOCKS:	287.85 M
AVERAGE ANNUAL POWER GENERATION:	56.22 GWH
TYPE OF METERING DEVICES	To be determined later according to local regulations of Energy Market Regulatory Authority(EMRA) of Turkey[3].

Table 2. Technical Characteristic of SELALE HEPP project.

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

Years	**Annual estimation of emission reductions in tones of CO_2 e**
2010	36,712
2011	36,712
2012	36,712
2013	36,712
2014	36,712
2015	36,712
2016	36,712
2017	36,712
Total emission reductions (Tons of CO_2 e)	**256,984**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	36,712

Table 3 Estimated amount of emission reduction

A.4.5. Public funding of the project activity:

No public funding or ODA is used for the project.

[3] http://www.epdk.gov.tr/english/regulations/electric/meters.doc

SECTION B. Application of a baseline and monitoring methodology

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

The United Nations approved consolidated baseline methodology applicable to this project is ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", Version 10[4].

ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 05.2, [5] and,
- ''Tool to calculate the emission factor for an electricity system'', Version 01.1[6].

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

The choice of methodology ACM0002, Version 10, is justified as the project activity meets its applicability criteria:

- The SELALE HEPP is a grid connected renewable electricity generation project,
- The project does not involve switching from fossil fuel use to renewable energy at the site of the project activity; and
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

[4] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_YOYKBRCBIK7TSPSB7MQT75SPX75PE8

[5] http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

[6] See: http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf

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

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

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in baseline (Turkey Grid)	CO_2	Yes	Main Emission Source
		CH_4	No	Minor emission source. Excluded for simplification
		N_2O	No	Minor emission source. Excluded for simplification
Project Activity	Emission from the reservoir of the proposed project is excluded as per the tool applied requires.	CO_2	No	Zero-emission electricity generation
		CH_4	No	Zero-emission electricity generation
		N_2O	No	Zero-emission electricity generation

Table 4 GHG gases included in the project boundary

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

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

This project follows the methodology described in the ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 10. Selected methodology has been applied together with the "tool to calculate the emission factor for an electricity system, version 01.1" and "tool for assessment and demonstration of additionality, version 5.2".

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

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

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

development of thermal power plants has been also encouraged by the large natural resource availability in Turkey, especially the abundance of economically accessible lignite.

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

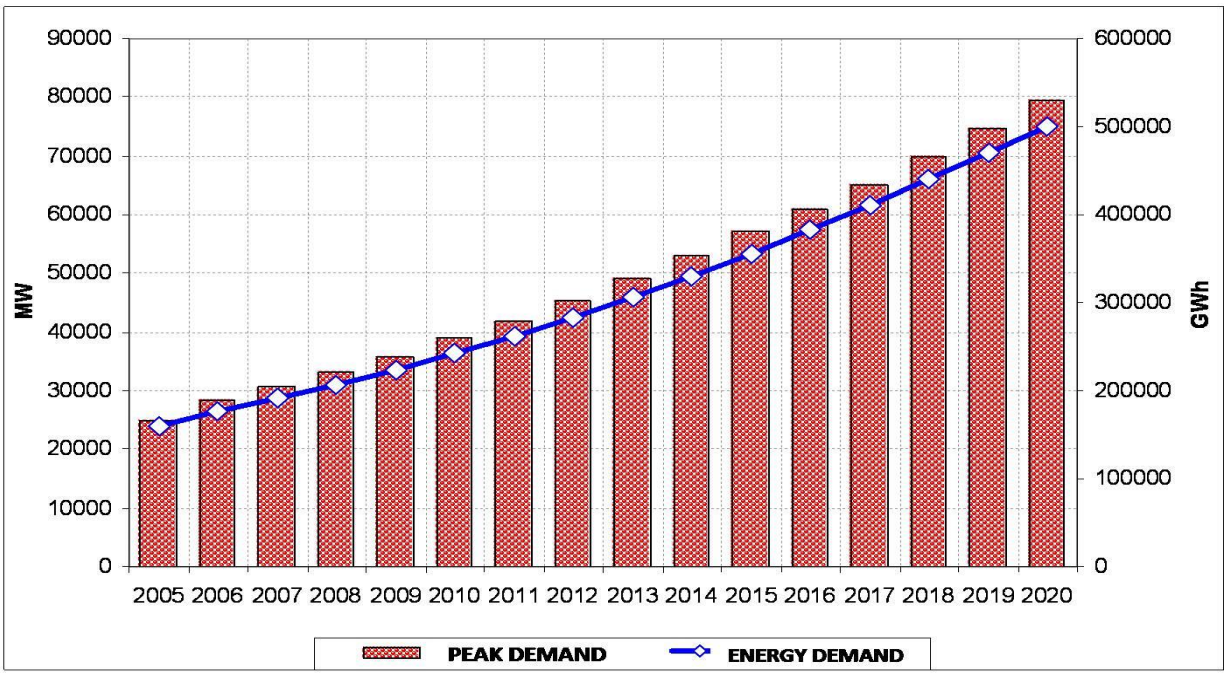

Figure 3. Peak Load and consumption projection for Turkish electricity system between 2005-2020[7]

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

According to the applied methodology (ACM0002, version 10) 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 56.22 GWh electricity and reduce about 36,712 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 applied tool for demonstration of additionality as shown in following steps.

[7] http://www.teias.gov.tr/apkuretimplani/veriler.htm

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

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

The 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
3. Construction of a thermal power plant with the same installed capacity or the same annual power output.

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.

The last alternative is considered a significant alternative to the project activity 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 first and third alternatives need to happen.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law[8]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[9]
3. Energy Efficiency Law [10]
4. Forest Law[11]
5. Environment Law[12]

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

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[8] Law number 4628, enactment date 03/03/2001 http://www.epdk.gov.tr/english/regulations/electricity.htm

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

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

[11] Law number 6831, enactment date 31/08/1956

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

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

An investment analysis has been carried out in order to make an economic and financial evaluation of the project. No public funding or ODA are available in Turkey for the finance of this type of project. SELALE HEPP has been financed through loans from commercial banks (75%) and companies own resources (25%).

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 the 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[13] rates from web page of Central Bank of The Republic of Turkey (TCMB) have been used as given in table below.

Government Bond	Maturity Date	Currency	Rate
TRB190706T14	19.07.2006	TRY	14.49
TRT070911T19	07.09.2011	TRY	22.75
TRT190111T13	14.02.2007	TRY	18.64
TRB200808T18	20.08.2008	TRY	16.10
TRT130110T10	13.01.2010	TRY	20.75

Table 5 Government bond rates used for the benchmark analysis[14]

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

Parameters	Unit	Data Value
Installed Capacity	MW	13.61
Grid Connected output	GWh	56.22
Capital Investment	Million €	23,031,000
Corporate tax rate	%	20
Loan	Million €	17,273,000
Expected Tariff	€ Cents/kWh	5.5
Expected VERs price	€/ tCO2e	8

Table 6 Main financial parameters used for investment analysis

Equity IRR of the SELALE HEPP has been calculated as 6.31% based on the parameters given above without considering the carbon revenue. IRR has been calculated without considering the interest payments for the loan 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 56.22 GWh. This IRR value represents the most optimistic scenario in terms of capital investment and electricity generation whereas electricity tariff is expected to increase so that the investment becomes attractive. As the IRR value calculated is compared with Turkish bond yields in the market, (average interest rates have been realized as 16.53% for government bonds sold since 2006[14]) it is seen that the project is not financially attractive for investors as Government bond guarantee the same income without any investment risk.

Acceptable IRR values for energy investments in Turkey are, given the present international recession and consequent economic uncertainty, are expected at yields in excess of 15% per annum. When we include the carbon revenue in the cash flow, equity IRR increases to nearly 7.94% 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.

Although it is difficult to calculate the risk premium for these types of projects as it shows a great diversion depending on type of investment, company and investment size, country risk etc. Considering the Government bond rates and estimated country risk premiums which are around 4.5% for Turkey[15], it can be concluded that expected return on investment for these types of projects should be around 18% to 20%. Expectation that the electricity prices will increase is the risk for investors whereas realization of this expectation will be the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and risk of investment decision. Considering the rapidly increasing electricity demand of Turkey and recovering carbon prices, both electricity tariff and VER price is expected to increase to € cents 8/kWh and €10/ tCO2e respectively.

Sub-step 2d - Sensitivity Analysis

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

- Investment Cost,
- Operating Cost,
- Electricity Sales Revenue.

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

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

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

	% Fluctuation						
	-10	**-5**	**-2.5**	**0**	**+2.5**	**+5**	**+10**
Investment Cost	7,63	6,93	6,61	6,31	6,03	5,77	5,28
Operating Cost	6,81	6,56	6,44	6,31	6,19	6,07	5,82
Electricity Income	4,69	5,49	5,90	6,31	6,73	7,15	7,99

Table 7. Sensitivity analysis for SELALE HEPP project (without carbon revenue)

Outcome of Step 2:
The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the project and make the project more attractive for investors and funding institutions.

Considering that figures above are based on the highest governmental guarantee price rather than average price, optimistic estimations for yearly generation and that those figures do not reflect the investment risk, the role of the carbon income is significant to enable the project to proceed and for a favorable investment and funding decision taken.

Based on the analysis and information above, it is concluded that investing in the project is not the most attractive option considering the alternative investment opportunities. Therefore, project is considered as additional to the baseline scenario.

Step 3. Barrier analysis

This step is used to determine whether the proposed project activity faces barriers that:

a) Prevent the implementation of this type of proposed project activity; and
b) Do not prevent the implementation of at least one of the alternatives.

The following sub-steps are pursued:

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity

<u>Investment barriers</u>

The lack of financial incentives and facilities is the primary barrier for renewable energy investments in Turkey. The carbon market provides an innovative mechanism enabling an environment to emerge for sources of renewable electricity generation. 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 find loan funds from financial institutions and creditors[16].

- *Limited incentives for renewable energy:*

  The Renewable Energy Law permits trading at competitive prices above the € .055/kWh 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" 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).

- *Construction Barriers*

  Location of hydroelectric plants is determined according to the topography of the region therefore faces barriers in terms of difficulties for construction, auxiliary structures like new access roads and connection to the grid (transmission line). For SELALE HEPP the design of the project was revised to protect and preserve a natural waterfall in the region which resulted in higher construction costs and lower electricity revenue.

Sub-step 3 b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

The above presented barriers are largely specific to hydroelectric power projects. They have minimal impact on the alternatives that are included in the baseline scenario of ACM0002, namely the electricity generation by existing grid-connected power plants and the addition of new thermal power plant.

Thermal power plants (especially natural gas power plants) require lower initial investment compared to renewable energy investments since they can be built anywhere in shorter periods and operated or shut down easily depending on the market price and demand. However, hydroelectric power plants low marginal generation costs and considered as loss cost/must-run resources A recent study made for comparison of thermal and hydroelectric investments in Turkey has shown that initial investment required for unit electricity output by hydroelectric power plants is nearly twice as much of thermal power plants case[17].

Step 4. Common Practice Analysis

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

According to the TEIAS statistics[18], 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

[16] http://www.ieahydro.org/reports/Hydrofut.pdf (page 5)

[17] Turkey's hydroelectric potential and energy policies, http://www.stradigma.com/english/july2003/07_2003_03.pdf

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

rate - the energy generation proportion decreasing from 40% historically to current levels as shown in the figure below [19,20].

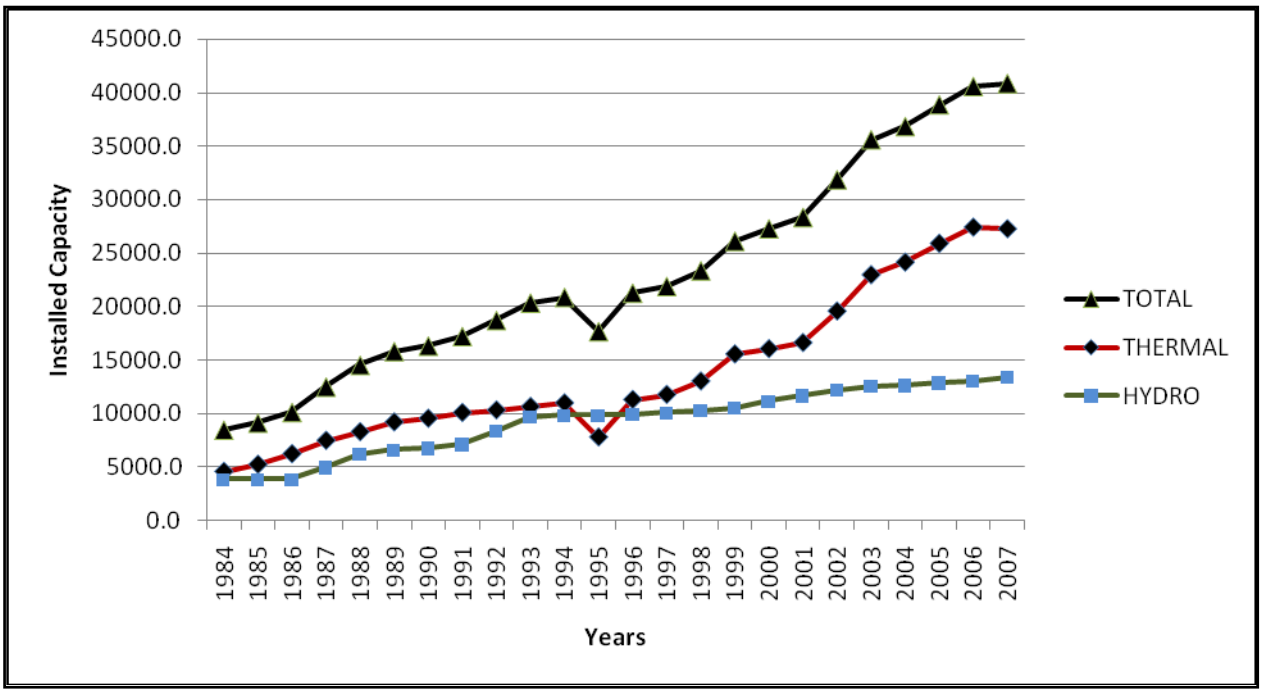

Figure 4. Annual Development of Turkey's Installed Capacity

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

The main reason behind the decrease in share of hydroelectric 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 and publicly quoted companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and use conventional technologies. Installed capacity of thermal power plants owned by private sector generation companies has increased from 123.4 MW in 1996 to 10,688.8 MW in 2007 whereas the total capacity of hydroelectric power plants has only increased from 75.3 MW to 1,345 MW in the same period which show that private and public companies find it more attractive to invest in thermal power plants. When we look at the distribution of hydro power capacity by utilities, it is seen that 85% percent of total installed hydroelectric power capacity is still owned by the Government by year 2007, whereas the remaining 15% are shared by auto producers, private generation companies and concessionary companies[21,22,,23,24].

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

20 IEA Turkey Country Report, 2005

21 http://www.teias.gov.tr/ist2006/5.xls

22 http://www.teias.gov.tr/ist2007/6.xls

23 http://www.teias.gov.tr/ist2006/8.xls

The Turkish Government's strategy historically was that hydroelectric plants were mainly built and financed by the Government in order to secure energy supply and as such the Government's role in the development of electricity was the principle and most important criteria in the decision process.

Whereas for private companies, project profitability; financial return on equity; funding costs and; other commercial risk factors are considered as being of more important relevance in the investment decision process. When the share of hydroelectricity power plants are assessed in detail, it is seen that the share of run-off-river type HEPPs are only 3.7% (1,568.2 MW) within Turkey's total installed capacity and about two thirds of the total run-off-river type HEPPs (1062 MW) belong to private companies which shows that share of run-off-river type HEPPs owned by private companies is less than 2.5%[25].

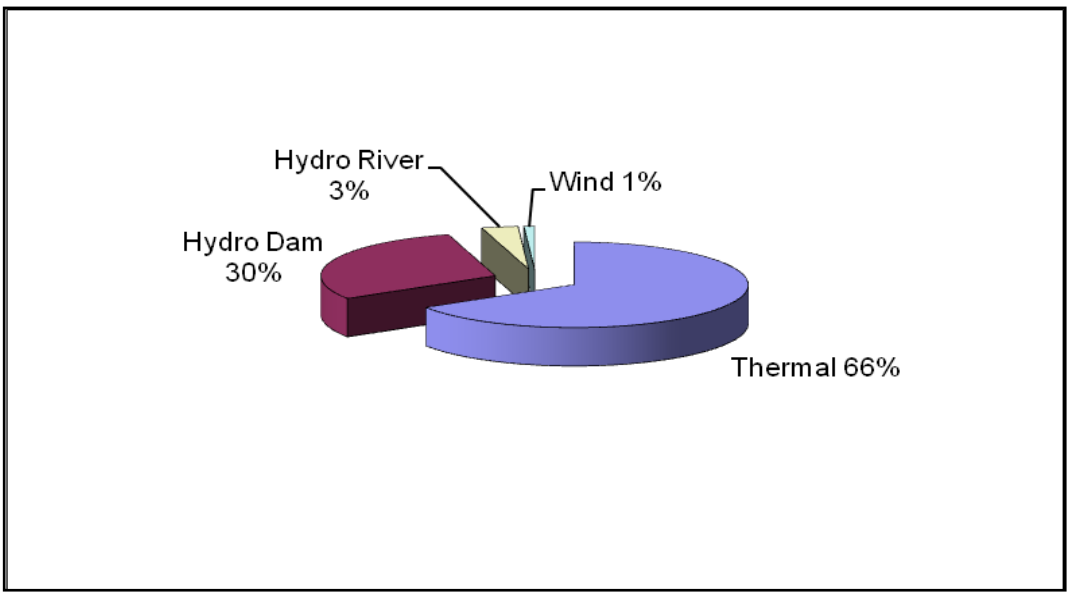

Figure 5. Share of Run-off-river type HEPPs in Turkey's installed capacity[22]

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 is not considered as a common practice.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

- Emission factor will remain same over the crediting period,

24 http://www.teias.gov.tr/ist2007/8.xls

25 http://www.teias.gov.tr/yukdagitim/kuruluguc.xls

- 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.

Due to insufficient availability of data, methods (b), (c) and (d) could not be applied. 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 8 Breakdown by source of electricity generation for the five most recent years[26]

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 SELALE HEPP in year y
Source of data used:	Feasibility Report for SELALE HEPP
Value applied:	56.22 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:	**$EG_{y, Total}$**

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

Data unit:	MWh
Description:	Net Electricity generated 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:	**Fuel Source** / **EF(tCO2/Tj)** Coal 94.60 Lignite 101.20 Fuel Oil 72.60 Diesel 72.60 LPG 63.07 Naphtha 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 $1000m^3$ 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 16
Justification of the choice of data or	Data used for OM calculation

description of measurement methods and procedures actually applied :	
Any comment:	

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) and EC Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Large Combustion Plants
Value applied:	See table 18
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, 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[27,28].

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

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:

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

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

(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)
$EF_{CO2, i,}$	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[29,30,31,32], the official source of related data. Fuel consumption values for the relevant years are given 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

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

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

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

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

Table 9 Fuel Consumption in thermal power plants

The NCV of the fuels consumed have been calculated using data from the TEIAS web page. The emission factors required for calculation of CO_2 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.

	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 10 Calculation of emission factors for fuels

Net electricity generated and supplied to the Grid by thermal plants has been calculated using data obtained from the TEIAS web page[33,34,,35]. 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.		**391,403**	**2,073**	**394,739**

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

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

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

Table 11 Gross/Net electricity generation by Turkish Grid

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

$\mathbf{EF}_{grid, OM, y}$ = 270,487,217 tCO_2 / 394,739 GWh
= 685 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
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[36].

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[37,38,39,40.] 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 $\mathbf{EF}_{grid, BMs, y}$ 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)

36 If 20% falls on part capacity of a unit, that unit is fully included in the calculation
37 http://www.teias.gov.tr/istat2004/7.xls
38 http://www.teias.gov.tr/istatistik2005/7.xls
39 http://www.teias.gov.tr/ist2006/8.xls
40 http://www.teias.gov.tr/ist2007/8.xls

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 Turkey[41] (p197). For LPG and Naphtha whose weights are not very significant, IPPC best available techniques (EF_{BAT}) data has been used (p405)[42]. For EF values of fuels consumed, IPCC default values at lower limit of 95% confidence interval have been used.

	EF CO_2 (tCO2/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
Naphtha	73.33	45.0%	0.587
Natural Gas	56.10	46.0%	0.439

Table 12 Calculation of emission factor from most recent power plants

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

Fuel Source	Generation (MWh)	Percent Generation	EF	Weighted EF
Coal	1,463	3.6%	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
TOTAL Capacity additions	41,056.3	100.0%		**0.621**

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

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

Table 13 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:

$$\mathbf{EF_{grid, BM, y} = 621\ tCO_2/GWh}$$

STEP 6 - Calculate the combined margin emission factor

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

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

Where:

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

$EF_{grid,OM,y}$ = 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}.

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

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

The combined margin emission factor is therefore **653 tCO_2/GWh.** Emission factor will remain same during the first crediting period as recommended by the methodology ACM0002, version 10.

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

$$ERy = BEy - PEy - LEy \quad (\mathbf{4})$$

Where:

ERy = Emission reductions in year *y* (tCO_2)

BEy = Baseline emissions in year *y* (tCO_2)

PEy = Project Emissions in year *y* (tCO_2)

LEy = Leakage emissions in year *y* (tCO_2)

Baseline emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:

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

EFy = Emission factor calculated according to selected methodology

Project emissions

The proposed project activity involves the generation of electricity by a hydroelectric power plant therefore project activity does not result in greenhouse gas emissions. 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 combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PEFC, j, y = \sum FCi, j, y \times COEFi, y$$

Where:

$PEFC, j, y$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);

FCi, j, y = Is the quantity of fuel type i combusted in process j during the year y (mass /volume)

$COEFi, y$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process j during the year y

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;

$$ERy = BE\ y - COEFi,y$$

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

Years	Annual estimation of emission reductions in tones of CO_2 e
2010	36,712
2011	36,712
2012	36,712
2013	36,712
2014	36,712
2015	36,712

2016	36,712
2017	36,712
Total emission reductions (Tons of CO_2 e)	**256,984**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	36,712

Table 14 Estimated emission reduction by the proposed project

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

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the SELALE Hydroelectric 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 56.22 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 calibrated ammeters will act as backup for each other. 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.
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.

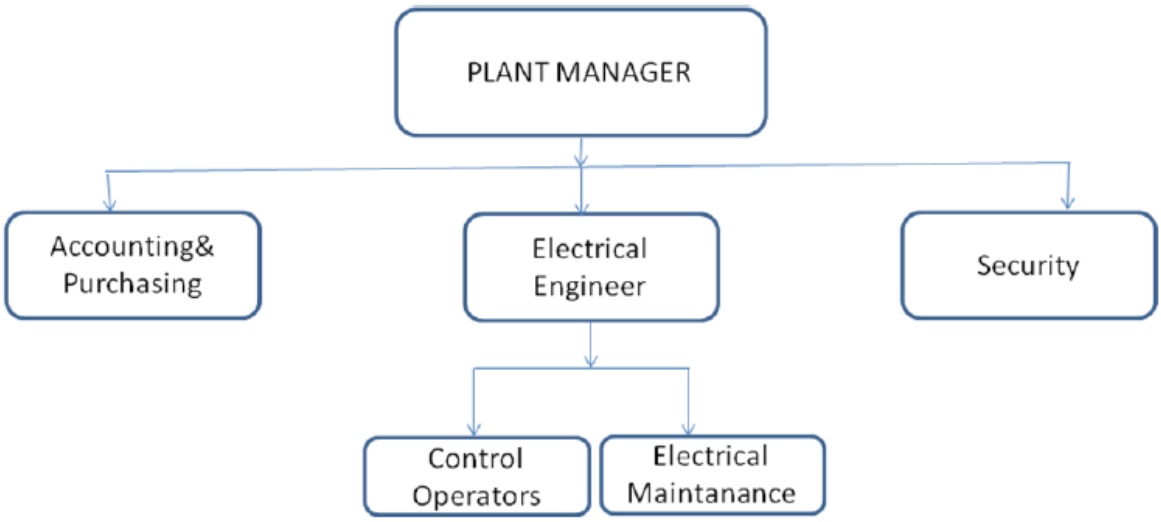

Figure 6 Operational structure of SELALE HEPP

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 will have certificate 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 TEIAS[43]. In addition to the two metering devices, generation of the SELALE 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.

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.

The net electricity fed to the grid will be measured continuously and recorded monthly by the TEIAS and plant staff. For consistency, recorded data will be compared with electricity sale receipts. All data collected will be recorded daily and archived both as electronically and as hard copy for at least two years.

Calibration of the metering devices will be made by TEIAS and sealed during first operation of the plant. The meters will be calibrated by TEIAS when there is a significant inconsistency between two devices using a fixed template[44] or upon request by either project owner or TEIAS[45].

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

Baseline Calculated By:
Mehmet Kemal Demirkol
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

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

[44] http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/DAG02.xls

[45] http://www.epdk.gov.tr/english/regulations/electric/balancing/balancing.doc

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 implementation has started in 01/05/2008. Project is expected to start operation by 31/12/2009.

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

The license has been issued to project owner for 49 years starting from the date of issue. The plant will be delivered to the government at the end of operation period at no cost. Considering the implementation period, the expected operational lifetime of the project is estimated as at least 46 years.

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 01/01/2010

C.2.1.2. Length of the first crediting period:

First crediting period will be valid for seven years.

SECTION D. Environmental impacts

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

The EIA assessment for SELALE HEPP project has been prepared by *En-Cev Ltd. Şti.* as defined by the regulations. The Report was approved by the Ministry of Environment and Forestry (MoEF) on 08/08/2007.

The 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.

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 considered positive for the project activities. The EIA approval letter has been included as Annex 5 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:

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

SECTION E. Stakeholders' comments

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

Initial Stakeholder Meeting for SELALE project was held on 16/04/2009 in Muradiye District of Van 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.

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 "Muradiye" and distributed in Muradiye and surrounding areas, on 15/04/2009).

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 along with non-technical summary and evaluation forms were sent by mail and faxed to local and national government institutions, NGOs, GS supporters.

muradiye

Günlük Siyasi Müstakil Gazete

15 Nisan 2009 Çarşamba Yıl:4 Sayı 865 Fiyatı 25 Krş

Egemenlik kayıtsız şartsız milletindir.

DUYURU ve DAVET

Muradiye Elektrik Üretim A.Ş. tarafından yürütülmekte olan Ayrancılar ve Şelale Hidroelektrik Santralı projesine ilişkin paydaşlar toplantısı 16 Nisan 2009 tarihinde gerçekleştirilecektir.
Toplantıya ilişkin program aşağıda sunulmuştur.
Halkımız ve ilgili kişiler paydaşlar toplantısına davetlidir.

Paydaşlar Toplantısı

Toplantı Tarihi	16 Nisan 2009
Toplantı yeri	Muradiye Kaymakamlığı Toplantı Salonu
Toplantı Programı	
14:00-14:20	Açılış ve Takdim
14:20-14:40	Proje Tanıtımı
14:40-15:00	İklim Değişikliği ve Karbon Ticareti sunumu
15:00-15:30	Soru-Cevap
15:30-16:00	Sürdürülebilir Kalkınma Değerlendirmesi

Figure 7. Newspaper announcement for Local SC meeting of SELALE HEPP Project

The meeting was held in Muradiye District. Agenda of the meeting was scheduled as requested by GS toolkit. Meeting schedule was published in local newspaper/s as given above. Meeting was recorded on video also.

Figure 8 Participants of SELALE HEPP Projects Local Stakeholders Consultation

This Initial Stakeholders Consultation Meeting was recorded on video and minutes of the meeting were noted. Comments were also requested from Government Agencies and invitees by postal letters.

E.2. Summary of the comments received:

In general stakeholders' comments were positive about the Project. Stakeholder comments have not required any change in the project design. Additionally, local stakeholders have asked for various contributions from the company to improve their village and the investor company will assess proposals within social responsibility policies.

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

All comments from stakeholders are taken into account and promptly responded as given below.

Project impact on agriculture in the region:

The project will not have an impact on the agriculture in the region. A minimum flow of water will always be maintained for irrigation purposes. The water usage rights are regulated and use of water for agriculture has priority over the use of water for energy generation. The minimum flow amount and regime is monitored by state authorities through the operation of the plant.

Job opportunities for local people:
The company recognizes that there is an interest in job opportunities associated with the plant The company representatives gives priority in employing local people since they are more familiar with the region and there is no need for relocation. However some roles require specific talents and education and it could be hard to find local personnel with the required skill set.

Contributions to local community:
During the construction phase Muradiye Elektrik Uretim A.S. has made the following contributions to the local community in the region. When the project has started implementation, the company intends to continue to contributing social and economic development in the region through educational, cultural and economical activities as a part of corporate social responsibility.

- Keeping the village roads and motorways open in winter times
- Cleaning (the fuel spread on) the motorway, donating material and equipment taking necessary precautions and assisting security forces
- Providing equipment and material assistance to several residents around project site to rehabilitate their lands and vineyards
- Construction of an overpass on BendiMahi creek.
- Construction of Gümüştepe Village mosque
- Renovation of existing roads in Muradiye Village
- Donation of vehicle for Police Department.
- Implementation of MOBESE (City Security Watch Cameras) for Muradiye Village.
- Donating construction material for watch booths in Muradiye Gendarme station
- Donating construction material for foundation built on Muradiye
- Building new access roads and overpasses for maintenance of forests
- Building new archive room for Muradiye Courthouse

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Muradiye Elektrik Üretim A.Ş.
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URL:	
Represented by:	
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Salutation:	Mr.
Last Name:	Aksaray
Middle name:	-
First name:	Arda
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Direct tel:	+90 212 267 42 09
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Fax:	(0090) 232 465 21 29
E-Mail:	email@gte.uk.com
URL:	www.gte.uk.com
Represented by:	
Title:	Project Development Manager
Salutation:	Mr.
Last name:	Demirkol
Middle name:	Kemal
First name:	Mehmet
Department:	Management
Direct fax:	+90 232 465 21 29
Direct tel:	+90 232 465 21 87
Personal e-mail:	kemal@gte.uk.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING WAS USED FOR FINANCING THE PROJECT ACTIVITIES.

MURADİYE ELEKTRİK ÜRETİM A.Ş.

30.07.2009
Muradiye Ayrancılar and Şelale HEPPs
To: Gold Standard Foundation
Declaration of Non-Use of Official Development Assistance by Project

Proponent
Muradiye Elektrik Üretim A.Ş.
As Legal Owner ("Project Proponent") of the above-referenced project, acting on behalf of all project participants, I now make the following representations:
Mr.Behzat AKSARAY
I hereby declare that I am duly and fully authorised by the legal owner ("Project Proponent") of the above-referenced project, acting on behalf of all project participants, to make the following representations on Project Proponent's behalf:

I. Gold Standard Documentation
I am familiar with the provisions of Gold Standard Documentation relevant to Official Development Assistance (ODA). I understand that the above-referenced project is not eligible for Gold Standard registration if the project receives or benefits from Official Development Assistance under the condition that some or all credits coming out of the project are transferred to the ODA donor country. I now expressly declare that no financing provided in connection with the above-referenced project has come from or will come from ODA that has been or will be provided under the condition, whether express or implied, that any or all of the credits [CERs, ERUs or VERs] issued as a result of the project's operation will be transferred directly or indirectly to the country of origin of the ODA.

II. Financier Declarations
I hereby declare that I have submitted declarations of Non-Use of ODA,representing declarations from all project financiers. If additional financiers are added to the project, I will promptly notify the Gold Standard Foundation and ensure that additional declarations are promptly submitted.

III. Financing Plan
I agree to complete and submit a sufficiently clear and transparent financing plan for the project so that during validation the Validator can assess compliance with the Non-Use of ODA requirement.

IV. Duty to Notify Upon Discovery.
If I learn or if I am given any reason to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the project, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the credits generated from the project as a condition of investment, I will make this known to the Gold Standard immediately.

V. Sanctions.
I am fully aware that under Section 10 of the Gold Standard Terms and Conditions sanctions and damages may be incurred for the provision of false information related to Projects and/or Gold Standard credits.

Signed: **30.07.2009**
Name: **Behzat AKSARAY**
Title: **Board Member**
On behalf of:

MURADİYE ELEKTRİK ÜRETİM A.Ş.

MURADİYE ELEKTRİK ÜRETİM A.Ş
Yıldız Posta Cad. No:52/7 Esentepe - İSTANBUL Tel.: (0212) 267 42 06 - Fax: (0212) 267 42 09
bilgi@muradiyeelektrik.com www.muradiyeelektrik.com

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(tCO2/kt)
Coal	21.83	94.6	2,065
Lignite	6.61	101.2	669
Fuel Oil	40.08	72.6	2,910
Diesel Oil	42.86	72.6	3,112
LPG	45.94	63.1	2,897
Naphtha	44.17	73.3	3,239
Natural Gas	36.88	56.1	2,069

Table 15 Values used in calculation of OM [46]

	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	34,215,968
Lignite	48,319,143	50,583,810	61,223,821	160,126,774	107,097,582
Fuel Oil	2,005,899	1,746,370	2,250,686	6,002,955	17,467,462
Diesel Oil	28,442	61,501	50,233	140,176	436,185
LPG	12,908	33	0	12,941	37,495
Naphtha	84,481	13,453	11,441	109,375	354,315
Natural Gas	15,756,764	17,034,548	20,457,793	53,249,105	110,178,911

Table 16 Amount of fuels used for electricity generation[47,48,]

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	0.949	155,195.2	147,274.7	864.3	148,139
Total Net Thermal Gen.					**391,403.1**	**2,073**	**393,476.5**

46 2006 IPCC Guidelines for National Greenhouse Inventories

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

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

Table 17. Net Electricity supply to the grid by thermal plants and imports (GWh)[49]

Data Used in calculation of BM for Turkish Electricity Grid

	NCV	EF $_{CO2}$	Generation Efficiency	EF [50]
	(Tj/kt or m^3 for gas)	(tCO_2/Tj)	%	(tCO_2/MWh)
Coal	21.83	94.6	33.6	1.014
Lignite	6.61	101.2	32.8	1.112
Fuel Oil	40.08	72.6	35.1	0.745
Diesel	42.86	72.6	27.5	0.949
LPG	45.94	63.1	45.0	0.505
Naphtha	44.17	73.3	45.0	0.587
Natural Gas	36.88	56.1	46.0	0.439

Table 18 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	1.014	3.6%
Lignite	11,482	1.112	28.0%
Fuel Oil	675	0.745	1.6%
Diesel oil	2	0.949	0.0%
LPG	50	0.505	0.1%
Naphtha	323	0.587	0.8%
Natural Gas	23,974	0.439	58.4%
Renewable and wastes	85	0.000	0.2%
Solid	5	0.000	0.0%
Total Renewable	2,999	0.000	7.3%
TURKEY'S TOTAL	41,056.3		100.0%

Table 19 Most recent capacity additions corresponding to 20%.[51,52,53,54]

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

50 IPPC Reference Document on Best Available Techniques for Large Combustion Plants

51 http://www.teias.gov.tr/istat2004/7.xls

53 http://www.teias.gov.tr/ist2006/8.xls

54 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 APPROVAL LETTER & TRANSLATION

Figure 9. EIA Approval Letter provided by Ministry of Environment and Forestry

Republic of Turkey
Ministry of Environment and Forestry
General Directorate of Environmental Impact Assesment Evaluation and Planning

No: B 18 0 CED 0 01.03/228-07/1470
Subject: SELALE Regulator and HEPP Project

Annex 6

GENERATION LICENSE

T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

E P D K

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/1224-3/870

Tarih : 14/06/2007

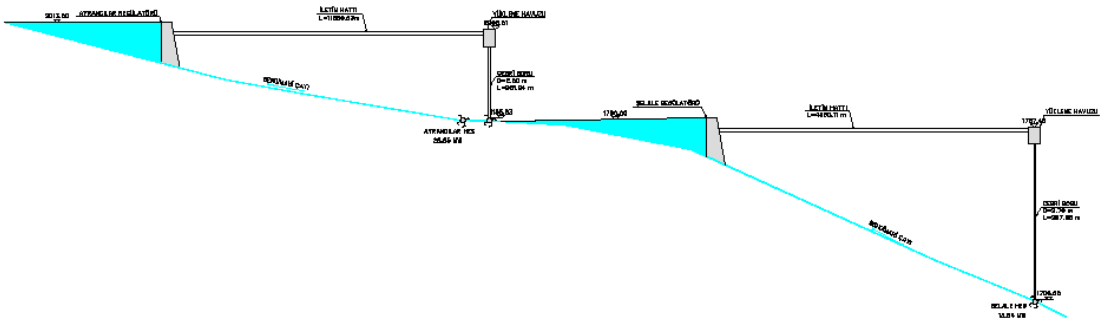
Bu Lisans, **Muradiye Elektrik Üretim Anonim Şirketi**'ne, Van İli'nde kurulacak olan **Muradiye Ayrancılar Hidroelektrik Santralı** üretim tesisinde 14/06/2007 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 14/06/2007 tarihli ve 1224-3 sayılı Kararı ile verilmiştir.

Hasan KÖKTAŞ
Başkan

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

Annex 7

PROJECT LAYOUT



Annex 8

PROJECT WORK SCHEDULE