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
Hydroelectric Power Plant Project, Turkey

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

Annex 5: Generation License

Annex 6: Project Single-Line Diagram

Annex 7: Project Work Schedule

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: SELALE HEPP
Version: 03
Date: 12/05/2011

A.2. Description of the project activity:

Background:

Selale HEPP is a run-of-river type of hydroelectric power plant (HEPP) owned by Muradiye Elektrik Üretim A.Ş. The project is located 5 km on the north of Muradiye District of Van Province in Turkey on Bendimahi Creek. Selale HEPP will have a capacity of 13,61 MWe, and will be composed of Selale Regulator and Selale Powerhouse with the expected electricity generation of 56.22 GWh per year.

The regulator of Selale HEPP will be built at an elevation of 1,790 meters from the thalweg and divert the water to the headpool at 1,792 m through 1,895 meters of conveyance channel and 4,400 meters of tunnel. 3 penstocks of 325 meters will transfer the water to the Selale Powerhouse at the 1,710 meters. Water will be turbined by three Francis-type horizontal turbines and then released to the riverbed. The project flow rate is determined as 19 m^3/sec (9.33 m^3/sec each) in total as a result of the optimization studies. The project does not have a storage capacity.[1]

Also called Muradiye II HEPP, Selale HEPP is part of the Muradiye Ayrancilar HEPP which involves Muradiye I HEPP composed of Ayrancilar Regulator and Ayrancilar Powerhouse. The two projects had been planned as one initially; however, the project design was changed to preserve Muradiye Waterfall and the projects were separated. Accordingly, Ayrancilar HEPP remains in the upstream of Selale HEPP which has a capacity of 27.28 MW with an expected electricity generation of 109.30 GWh. The distance between the two projects is about 1.1 km and will be working independently of each other. Electricity generated at Ayrancilar HEPP will be fed to the outlet of Selale HEPP where both are connected to the national grid at Muradiye Substation with a 5 km-long energy transmission line.

The volume of CO_2 which will be avoided from the atmosphere corresponds to 31,596 tonnes of CO_2 according to the 2007-2009 energy statistics as elaborated below.

Sustainable Development

Van Province is one of the least socio-economically developed provinces in Turkey. It is located in the Eastern Anatolia Region of Turkey on the border with Iran, where the geography and the climate is rough. Above 50% of the province area is mountainous, hence, cultivation remains difficult. The main economic activity is husbandry. Though, the industry related to husbandry is available, it has not developed much. As per Muradiye District, according the study carried out by the State Planning

[1] Muradiye Ayrancilar HEPP, Project Introduction File, page 16

Organization, Muradiye scores the 836th among 872 districts in Turkey.[2] Most of the land around the project site is state-owned land[3] and no significant agricultural activity has been practiced.

In this respect, the project is expected to contribute in the province's economic situation both directly and indirectly through creation of jobs, procurement of needs from the villages, construction and maintenance of roads. During the construction and operation 55 and 12 people will be employed, respectively. Employment of the locals will be prioritized according to their qualifications.

In terms of environmental sustainability (elaborated in Section D), the project will follow the environmental regulations in terms of handling of waste and other sources of pollution. The level of lifewater for the maintenance of ecosystem services is defined as 20-25% of the natural flow, higher than the regulation obliges.[4]

The main goals of the Selale HEPP Project can be summarized as below;

- Increase share of HEPPs in electricity generation mix of Turkey and reduction of GHG emissions.
- Contribute to the national economic development by creating direct and indirect job opportunities during construction and operation phases.
- Reduce import dependency of fossil fuel dominated electricity sector and diversify generation mix through use of local resources.
- Contribution to sustainable development through supporting local community and local economy.

Project Milestones

Project milestones of the project, including the necessary permits obtained and VER-related steps, is indicated below.

Milestone	**Date**
Feasibility Study Report	
Water Utilization Right Agreement	16/04/2007
License Issuance	14/06/2007
Project Introduction File	01/07/2007
EIA Exemption	08/08/2007
System Connection Agreement	03/10/2007
Construction Agreement*	26/11/2007
Electromechanical Equipment Agreement	02/01/2008
Loan Agreement	06/02/2008
Revised Feasibility Study	01/03/2009
Start of Construction	01/05/2008
Carbon agreement	10/02/2009
SFR 1 Meeting	16/04/2009

[2] Socio-economic development ranking of the districts (2004), State Planning Organization, Available; www.**dpt**.gov.tr/DocObjects/Download/3159/**ilce**.pdf (accessed on 12/12/2010)
[3] Muradiye Ayrancilar HEPP Feasibility Report, Chapter 2, page 2-7
[4] Muradiye Ayrancilar HEPP, Project Introduction File, page 15

Expropriation	13/05/2009
Submission of draft PDD to DOE	18/08/2009
SFR 2 Meeting	12/11/2009
Expected Commissioning Date	31/12/2009

*Investment decision date

Table 1. Selale HEPP 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)	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, became party to the Kyoto Protocol, she does not have a quantitative emission reduction limit yet and it is likely that she will not determine one beyond 2012. Thus, 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″

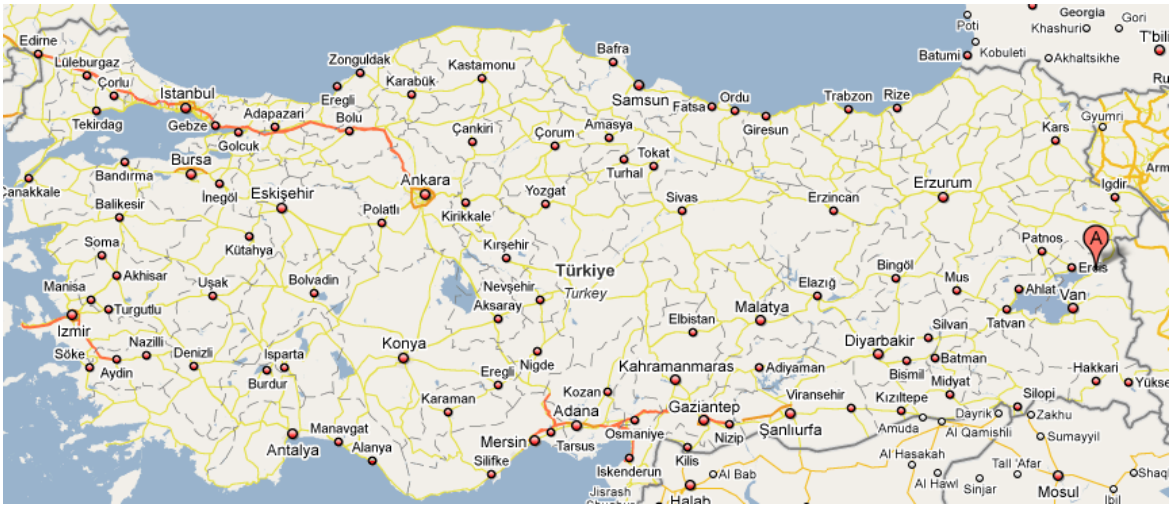


Figure 1. Location of the project on Turkish map

Figure 2. Selale HEPP Project Site

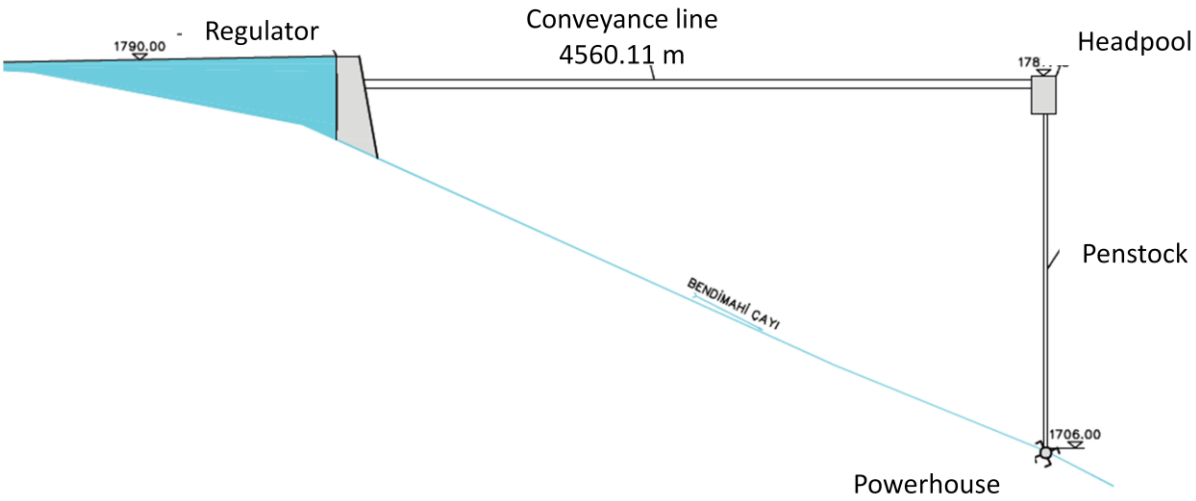


Figure 3. Layout of the project

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:

LOCATION:	ON BENDIMAHI RIVER COURSE, IN MURADIYE DISTRICT OF VAN PROVINCE
DESIGN DISCHARGE:	19.00 M^3/SEC (6.33 M3/SEC EACH)
TOTAL LENGTH OF CONVEYANCE LINE:	1,895 KM CHANNEL + 4,400KM TUNNEL
NET HEAD:	48.3 M
TOTAL INSTALLED CAPACITY:	13.61 MWe
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)
ENERGY TRANSMISSION LINE CAPACITY:	33 KV, 5 KM TRANSMISSION LINE TO MURADİYE SUBSTATION
NUMBER OF PENSTOCKS:	3

LENGTH OF PENSTOCKS:	325 M EACH
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[5].

Table 2. Technical Characteristic of SELALE HEPP project[6]

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	31,596
2011	31,596
2012	31,596
2013	31,596
2014	31,596
2015	31,596
2016	31,596
2017	31,596
Total emission reductions (Tons of CO_2 e)	**221,172**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	31,596

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.

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

[6] Muradiye Ayrancilar HEPP Project Introduction File, pages 8-12

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[7].

ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 05.2, [8] and,
- ''Tool to calculate the emission factor for an electricity system'', Version 01.1[9].

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.
- The project does not involve construction of a reservoir, thus, power density criteria is met as per the tool.

[7] Consolidated methodology for grid-connected electricity generation from renewable sources, Version 10. Available: http://cdm.unfccc.int/UserManagement/FileStorage/NF9EDAOV5K382HW0JR14GS7XYQUMCP (accessed on: 02/02/2011)

[8] Tool for the demonstration and assessment of additionality, Version 05.2. Available: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v2.2.pdf (accessed on 02/02/2011)

[9] Tool to calculate the emission factor for an electricity system, Version 01.1 Available: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf (accessed on 02/02/2011)

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 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.

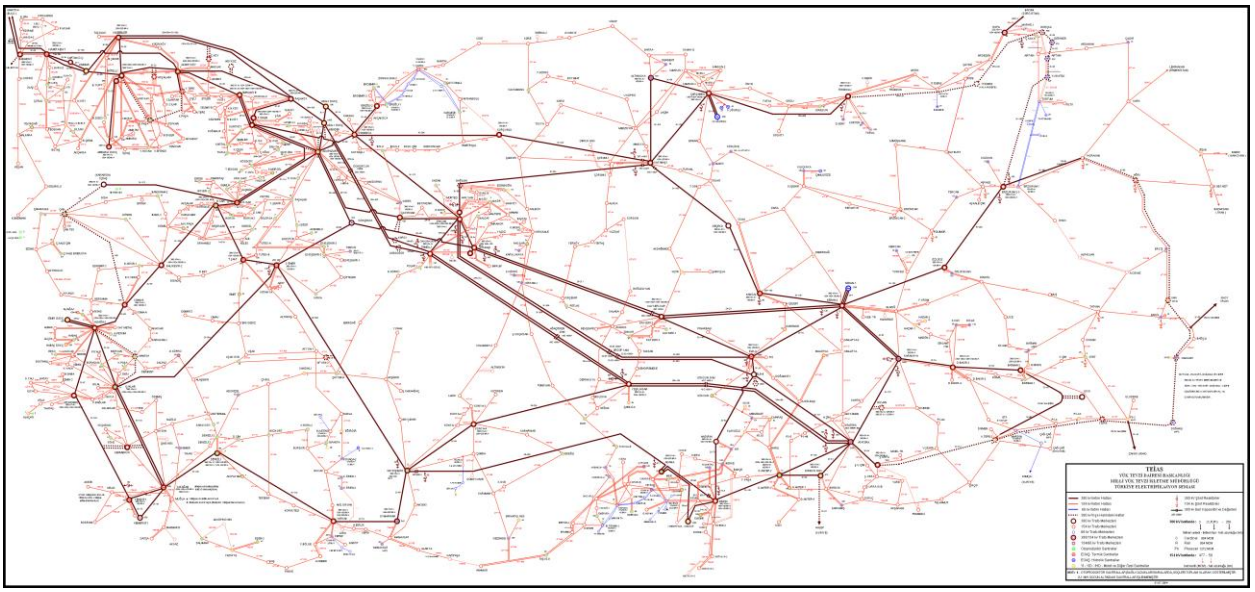


Figure 4. Turkish Electricity Grid[10]

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 composed mainly of thermal power plants as shown in Table 5 which tops the electricity sector as the biggest contributor of the GHGs as Figure **5** depicts. The share of hydroelectric power plants has decreased significantly in recent years, due to the reduction of the economically feasible hydraulic resources.

[10] http://www.teias.gov.tr/eBulten/makaleler/2008/t%C3%BCrkiye%20elektrik%20sistemi.pdf

	Capacity MW	Production GWh	Capacity Factor
Thermal	29,339.1	156,923.4	0.61
Hydro	14,553.3	35,958.4	0.28
RES (Geo+ wind)	868.8	1,931.1	0.25

Table 5. Electricity generation in Turkey in 2009, TEİAS, 2010[11]

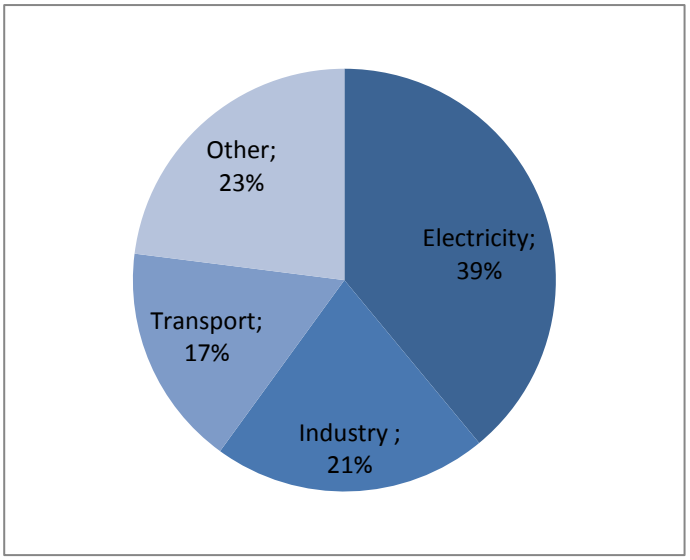


Figure 5. Sectoral contributions in GHGs in Turkey

Since Turkey is an advanced developing country, there is an increasing demand for electricity which is fully expected to continue in the foreseeable future. As depicted in Figure 6, until 2020, energy demand is expected to realise as 4% increase per year.[12]

[11] www.teias.gov.tr
[12] Ministry of Energy, 2008, Available: http://www.enerji.gov.tr/index.php?sf=webpages&b=enerji (Accessed on: 01/12/2010)

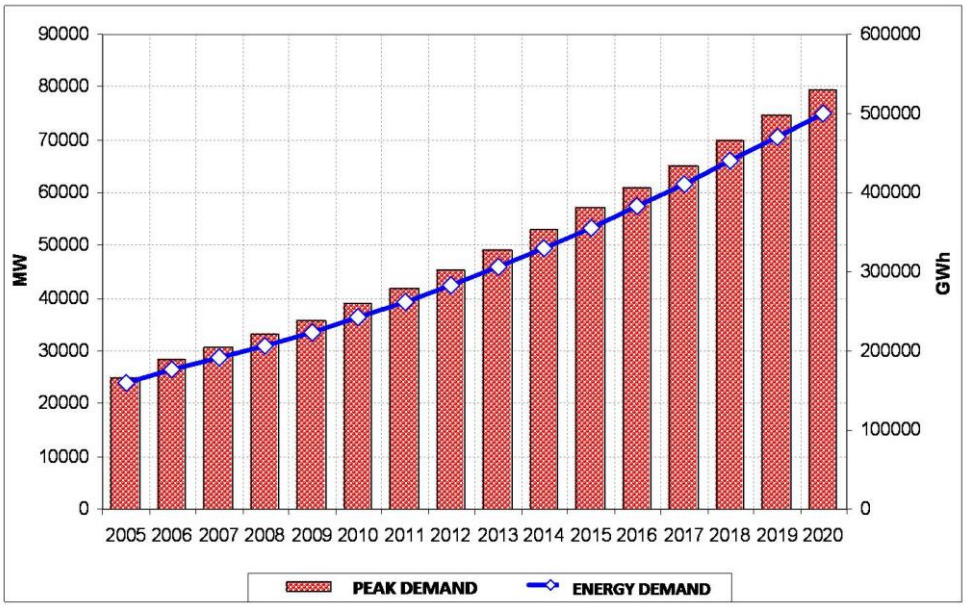


Figure 6. Peak Load and consumption projection for Turkish electricity system between 2005-2020[13]

The trend in Turkey to date, given the historically slow development of alternative energy resources, is to build an increasing number of thermal power plants in the future, to cover the annual growth in energy consumption demand. As such, Turkey as an advanced developing country has to date dealt with energy security by constructing high capacity coal and natural gas power plants. The development of thermal power plants has been also encouraged by the abundance of economically accessible lignite.

According to the capacity projections of the Energy Market Regulating Authority, thermal power plants will increasingly continue to dominate electricity generation.[14] Thus, in the absence of the proposed project activity, same amount of electricity would be supplied via either the current power plants or by the new energy mix from the grid which continues to be predominated by fossil fuels[15], and cause in increasing GHG emissions.

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 36,940 tCO_2 emissions through replacing the electricity that

[13] http://www.teias.gov.tr/apkuretimplani/veriler.htm
[14] Turkey's Electricity Capacity Projection 2009-2018 (2009,) Energy Markey Regulating Authority, Available on: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (Accessed: 23/02/2011)
[15] http://www.epdk.gov.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp

would need to be supplied via the national grid in the absence of the project activity. Additionality of the proposed project has been assessed according to the applied tool for demonstration of additionality as shown in following steps.

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

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

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. In the absence of project scenario, the electricity will be supplied by the grid and in order to meet the increasing demand, new power plants should be built and connected to the grid which means implementation of new thermal power plants also.

The last alternative is considered as 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.

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[16]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[17]
3. Energy Efficiency Law [18]
4. Forest Law[19]
5. Environment Law[20]

[16] Law number 4628, enactment date 03/03/2001. Available: http://www.epdk.gov.tr/documents/10157/e209fc41-ca97-4285-8fa6-9b85eeae5931 (accessed on 02/02/2011)
[17]Law number 5346, enactment date 18/05/2005. Available: http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf (accessed on 02/02/2011)
[18]Law number 5627, enactment date 02/05/2007. Available: http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc(accessed on 02/02/2011)
[19] Law number 6831, enactment date 31/08/1956
[20]Law number 2872. Published in official gazette No. 18132 on 11/08/1983

The resultant alternatives to the project as outlined in Step (1a) are in compliance with the applicable laws and regulations which are assessed by EMRA before issuing license. The renewable energy generation license for Selale HEPP has been issued considering Electricity Law and Law in utilization of Renewable Energy Resources for the purpose of generating electricity energy. The proposed project is also within the scope of and in compliance with Energy Efficiency Law (Article 2 of Part One). Environment and Forest Laws are also satisfied in terms of sustainable development principles and EIA conducted for the proposed project activity.

Outcome of Step 1b

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

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 rates at time of investment decision (02/01/2008) from web page of Central Bank of The Republic of Turkey (TCMB)[21] have been used as given in table below.

Government Bond	Maturity Date	Currency	Rate
US900123AT75	14/02/2034	USD	6.99

[21] http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx

US900123AY60	17/03/2036	USD	6.91
Average			6.95

Table 6. Government bond rates used for the benchmark analysis Hata! Yer işareti tanımlanmamış.

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

Parameters	Unit	Data Value
Installed Capacity[22]	MW	13.61
Grid Connected output[23]	GWh	56.22
Capital Investment[24]	Million €	23,471,00
Corporate tax rate	%	20
Loan	Million €	17,603,000
Expected Tariff	€ Cents/kWh	5.5
Expected VERs price	€/ tCO2e	8

Table 7. Main financial parameters used for investment analysis

Equity IRR of the SELALE HEPP has been calculated as 6.51% 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 6.95 % for government bonds at time of investment decision) it is seen that the project is not financially attractive for investors as Government bond guarantee almost 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 8.06% 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 9.41% for Turkey[25], it can be concluded that expected return on investment for these types of projects should be around 16%. The 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.

[22] Muradiye HEPP Revised Feasibility, page 1-9
[23] Muradiye HEPP Revised Feasibility, page 1-9
[24] Muradiye HEPP Revised Feasibility, page 8-12
[25] http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem06.xls (accessed on 19/02/2010)

Furthermore, Bendimahi River performs an irregular flow regime during dry and rainy seasons, as well as from year to year (Please, see Annex 9 for the flow regime between 1972-2001). This fact puts the project owner into a more vulnerable situation vis-à-vis income generation through sales of electricity, let alone benefiting from the higher prices during the peak season. In this respect, carbon revenues provide better resilience to such fluctuations and increase the financial sustainability of the project.

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.

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	7.81	6.93	7.12	6.51	6.23	5.96	5.48
Operating Cost	6.81	6.74	6.62	6.51	7.5	7.38	7.15
Electricity Income	4.95	5.72	6.11	6.51	6.9	7.3	8.11

Table 8. 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 was skipped as additionality is demonstrated in step 2.

Step 4. Common Practice Analysis

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

According to the TEIAS statistics[26], 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 2007[27]. 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.

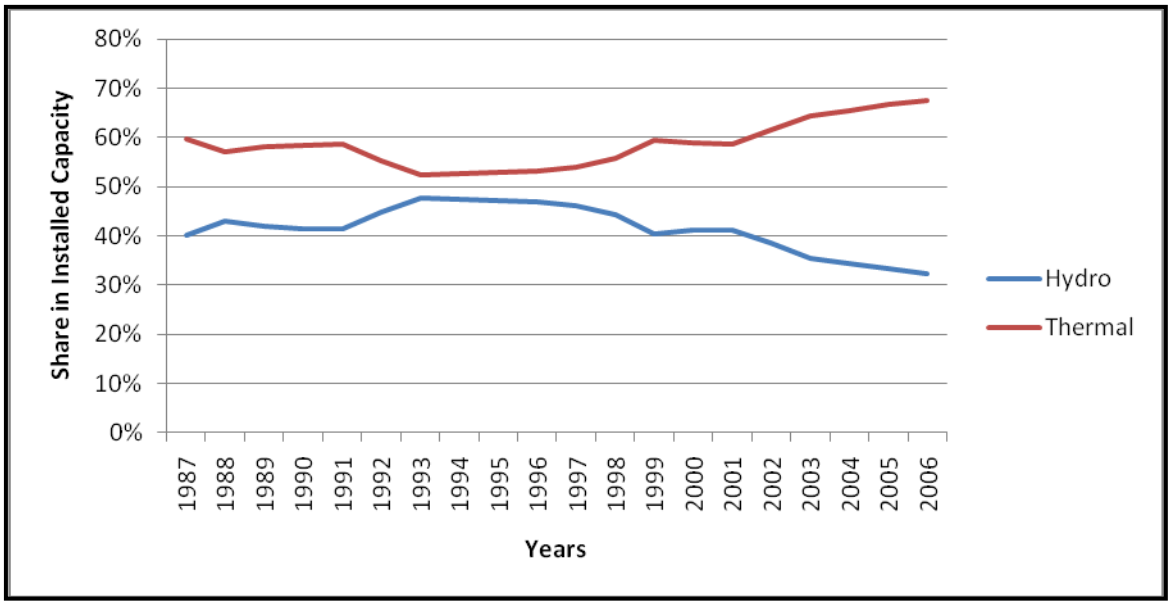


Figure 7 Annual Development of Turkey's Installed Capacity[28]

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

The main reason behind the decrease in share of hydro electricity power is due to the changes in government's economic policy which intends to encourage private companies to invest in energy generation and lower the weight of government on energy generation as a part of privatization efforts. On the other hand, private companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and uses conventional technologies. Installed capacity of thermal power plants owned by generation companies has increased from 123.4 MW in 1996 to 10,688.8 MW in 2007 whereas the total capacity of hydro electricity power plants has only increased from 75.3 MW to 1,345 MW in the same period which show that private companies find more attractive to invest is thermal power plants[29,30,31]. When we look at the distribution of hydro power 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 companies[32].

[26] http://www.teias.gov.tr/ist2007/1.xls
[27] http://www.teias.gov.tr/ist2007/13.xls
[28] http://www.teias.gov.tr/ist2007/1.xls
[29] http://www.teias.gov.tr/ist2007/5(1984-05).xls
[30] http://www.teias.gov.tr/ist2006/8.xls
[31] http://www.teias.gov.tr/ist2007/8.xls
[32] http://www.teias.gov.tr/ist2006/5.xls

When we review the HEPPs built or planned to be built the same region, we see that there exist only one hydroelectric power plant on the same region (Ayrancilar HEPP) which is being built by the same company and being developed as a VER project[33] also. Besides the two projects implemented by the same company, there exist no other similar activity in the region.[34]

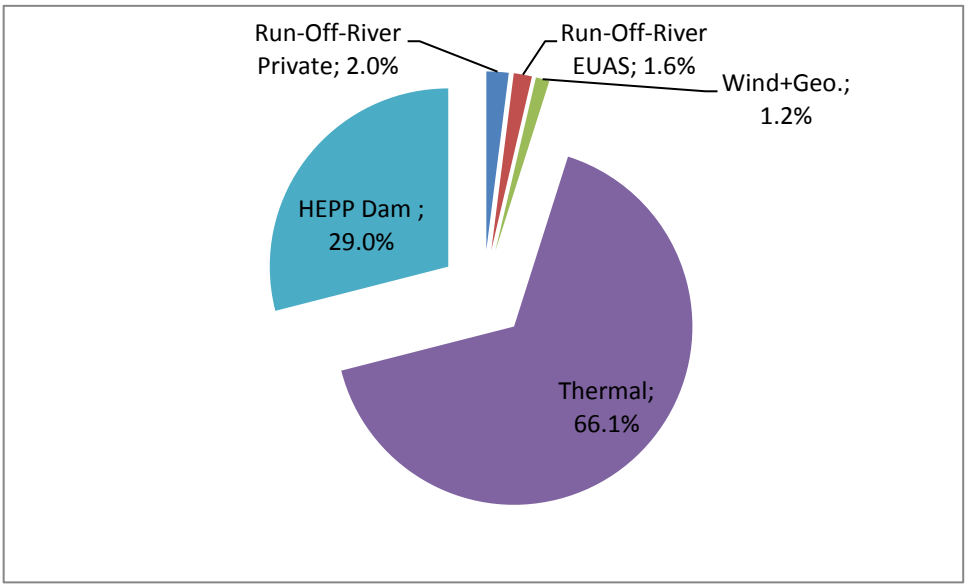


Figure 8. Share of Run-off-river type HEPPs in Turkey's installed capacity[35]

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 of the Government involvement, as mentioned and illustrated from the above facts, the proposed type of project is not considered as a common practice in Turkey.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

- Emission factor will remain same over the crediting period,

[33] https://gs1.apx.com/myModule/rpt/myrpt.asp
[34] Revised Feasibility Report, Section 3.2
[35] 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 9 Breakdown by source of electricity generation for the five most recent years[36]

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:	**$EG_{y, Total}$**

[36] 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, IPCC values at the lower limit has been used.
Value applied:	**Fuel Source** / **EF(tCO2/Tj)** Coal 89.5 Lignite 90.9 Fuel Oil 75.5 Diesel 72.6 LPG 61.6 Naphta 69.3 Natural Gas 54.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.
Any comment:	

Data / Parameter:	**$FC_{i, y}$**
Data unit:	Tons or $1000m^3$ 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 22
Justification of the choice of data or description of measurement methods and procedures actually	Data used for OM calculation

applied :	
Any comment:	

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

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

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

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

Step 1. Identification of the relevant electrical power system

According to the ‘‘Tool to calculate the emission factor for an electricity system’’, Version 01, a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity, and that can be dispatched without significant transmission constraints. Therefore, in this project activity the project electricity system includes the project site and all power plants attached to the Interconnected Turkish National Grid, which has an installed capacity of 40,835.7MW and gross generation about 191,558.1 by 2007[37,38].

[37] http://www.teias.gov.tr/ist2007/1.xls
[38] http://www.teias.gov.tr/ist2007/13.xls

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

Step 2. Select an operating margin method

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

		2007	2006	2005	2004	2003	Average
Total Generation	**GWh**	191,558	176,300	161,956	150,698	140,58	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 10. Breakdown by source of electricity generation for the five most recent years[39]

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.

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

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:

(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[40,41,42,43], the official source of related data. Fuel consumption values for the relevant years are given in table below:

[40] http://www.teias.gov.tr/ist2007/42.xls
[41] http://www.teias.gov.tr/ist2007/43.xls
[42] http://www.teias.gov.tr/ist2007/44.xls
[43] http://www.teias.gov.tr/ist2007/45.xls

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

Table 11. 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 IPCC 2006 Guidelines 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	1,954	16,906,064	33,032,943
Lignite	601	160,126,774	96,197,334
Fuel Oil	3,026	6,002,955	18,165,198
Diesel Oil	3,112	140,176	436,185
LPG	2,830	12,941	36,623
Naphtha	3,061	109,375	334,828
Natural Gas	2,003	53,249,105	106,643,758
Total Emissions			**254,846,869**

Table 12. 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[44,45,,46]. 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

[44] http://www.teias.gov.tr/ist2007/35(2001-2005).xls
[45] http://www.teias.gov.tr/ist2007/36(06-07).xls
[46] http://www.teias.gov.tr/ist2007/35(2001-2005).xls

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 13. Gross/Net electricity generation by Turkish Grid

Net electricity generated and supplied to the grid by thermal plants has been calculated using data obtained from the TEIAS web page[47,48,49,50]. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,y}$ requires the inclusion of electricity imports with an emission factor of 0 tCO_2/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

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

Table 14. Gross/Net electricity generation by Turkish Grid

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

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

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

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

47 http://www.teias.gov.tr/ist2007/35(2001-2005).xls
48 http://www.teias.gov.tr/istatistik2007/36(06-07).xls
49 http://www.teias.gov.tr/ist2007/35(2001-2005).xls
50 http://www.teias.gov.tr/istatistik2007/35.xls

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 recently51.

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

The list of the most recent capacity additions to the grid and their average and actual generation capacities are available at the TEIAS web page [52,53,54,55,5657]. For determination of plants that comprise 20% of the system's generation, gross generation in year 2007 which is 191,558.1 GWh has been taken as reference and its 20% has been determined as about 38,311.6 GWh. Since 20% of the most recent year's generation (38,311.6 GWh) falls partly on capacity of a power plant, this plant was fully included in the calculations as requested by the methodological tool applied. Thus, total capacity included in BM calculation has increased to 41,056 GWh which reduces to 40,519.3 GWh after excluding plants benefitting from VER revenue.

Step 5. Calculate the build margin emission factor

The Build Margin emission factor $\mathbf{EF}_{grid,\ BMs,\ y}$ is calculated as the generation-weighted average emission factor of a sample of power plants *m* for a specific year, as follows:

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

Where:

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

"Tool to Calculate the Emission Factor for an Electricity System" has been used for plant efficiency data although this approach is very conservative. Since tool does not contain any specific data for plants with LPG, Naphta etc. all of the plants consuming liquid fuels have been considered as open cycle plants. Plants using lignite and coal have been assumed as suing subcritical technology, whereas natural gas plants have been assumed as combined cycle plants. The assumptions have been based on TEIAS statistics which gives heating values of fuels consumed in thermal power plants[58,59] and corresponding electricity generation[60, 61] which shows that values used are very conservative compared to actual situation.

51 If 20% falls on part capacity of a unit, that unit is fully included in the calculation
52 http://www.teias.gov.tr/istat2004/7.xls
53 http://www.teias.gov.tr/istatistik2005/7.xls
54 http://www.teias.gov.tr/ist2006/8.xls
55 http://www.teias.gov.tr/ist2007/8.xls
56 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf
57 http://www.teias.gov.tr/projeksiyon/CAPACITY%20PROJECTION%202008-2017.pdf
58 http://www.teias.gov.tr/ist2007/45.xls
59 http://www.teias.gov.tr/ist2007/45.xls
60 http://www.teias.gov.tr/ist2007/36(06-07).xls
61 http://www.teias.gov.tr/ist2007/35(2001-2005).xls

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

	EF CO_2 (tCO2/Tj)	Generation Efficiency	EF (tCO_2/MWh)
Coal	89.5	39.0%	0.826
Lignite	90.9	39.0%	0.839
Fuel Oil	75.5	39.5%	0.688
Diesel	72.6	39.5%	0.662
LPG	61.6	39.5%	0.561
Naphtha	69.3	39.5%	0.632
Natural Gas	54.3	60.0%	0.326

Table 15. Calculation of emission factor from most recent power plants

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

Fuel Source	Generation (MWh)	Percent Generation	EF	Weighted EF
Coal	1,463	3.6%	0.826	0.03
Lignite	11,482	28.0%	0.839	0.23
Fuel Oil	675	1.6%	0.688	0.01
Diesel oil	2	0.0%	0.662	0.00
LPG	50	0.1%	0.561	0.00
Naphtha	323	0.8%	0.632	0.00
Natural Gas	23,974	58.4%	0.326	0.19
Renewable and wastes	85	0.2%	0.000	0.00
Solid	5	0.0%	0.000	0.00
Total Renewable	2,999	7.3%	0.000	0.00
TOTAL Capacity additions	41,056.3	100.0%		

Table 16. Most recent capacity additions corresponding to 20% by fuel source

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

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

Table 17. List of plants identified as VER projects
Source: http://www.markitenvironmental.com and http://cdmgoldstandard.org

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

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

STEP 6 - Calculate the combined margin emission factor

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

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

Where:

$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2/MWh) as calculated from equation 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, respectively. These default values have been used in calculating CM emission factor together without rounding the values of EF_{OM} and EF_{BM}.

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

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

The combined margin emission factor is therefore **562 tCO_2/GWh.** Emission factor will remain same during the first crediting period as recommended by the methodology ACM0002, version 10.

Project emissions

The proposed project activity involves the generation of electricity by a run-of-river hydroelectric power plant without reservoir[62] therefore project activity does not result in greenhouse gas emissions.

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	31,596
2011	31,596
2012	31,596
2013	31,596
2014	31,596
2015	31,596
2016	31,596
2017	31,596
Total emission reductions (Tons of CO_2 e)	**221,172**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	31,596

Table 18.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.

[62] Project Introduction File, page 16

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:	-

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Site visit and Equipment purchase agreement.
Measurement Procedure	Determine the installed capacity based on recognized standards during on site visits
Monitoring Frequency	Yearly
QA/QC procedures to be applied:	
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be	Project site

used:	
Measurement Procedure	Calculated from topographical surveys
Monitoring Frequency	Yearly
QA/QC procedures to be applied:	In case of difficulty in calculating reservoir area, maximum surface area will be calculated as is the reservoir is full.
Any comment:	The maximum reservoir level has been defined in the Feasibility Report already. There is no possibility that the reservoir level can exceed this level since the excess water will flow from spillway when the water level exceed maximum operating level. The area can be calculated from topographical surveys however in an y case it will be less than maximum value.

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.

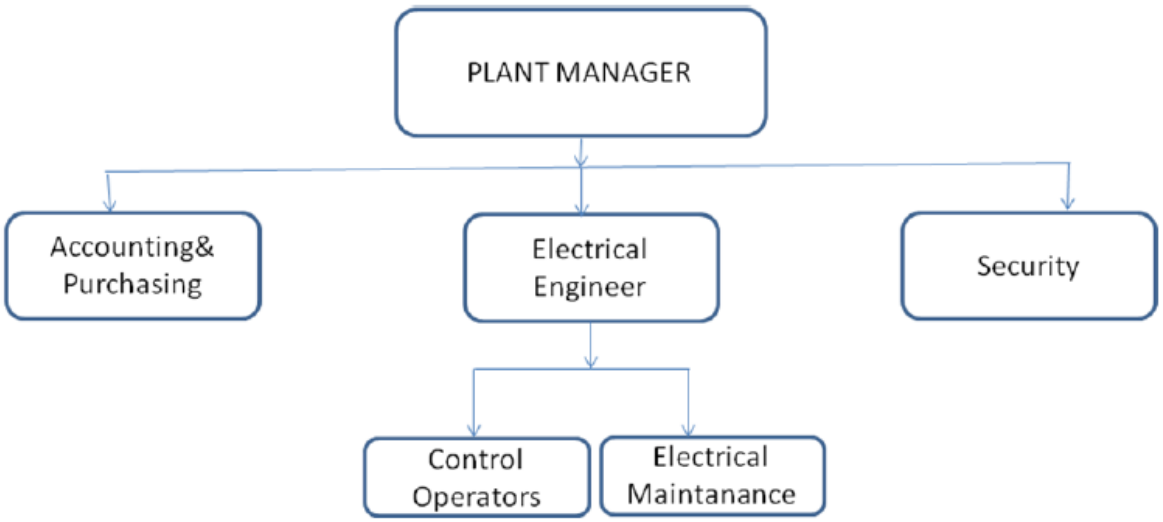


Figure 9. Operational structure of SELALE HEPP

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[63]. 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.

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

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[64] or upon request by either project owner or TEIAS[65].

The features of the meters are given below:

Registration Period	April 2011
Meter ID	184376
Meter Location	VAN Province
Meter Registration No	330390
Meter Serial No	53099071
Reading Authority	17. İletim Tesis ve İşletme Gurup Müdürlüğü
Metering Type	Combined (give + take)
Meter Etso Code	40Z000000184376T
Producer	ACTARIS
Bara Gerilimi (kv)	154.0
Connection Point Tension (kv)	154.0
Meter Reading Type	Per hour

Table 19. Features of electricity meters

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):

Date of completion: 01/05/2009

Baseline Calculated By:
Mehmet Kemal Demirkol
Global Tan Energy Limited (GTE- http://www.gte.uk.com)
Telephone: +90 312 472 3500
Fax: +90 312 472 3366
E-mail: kemal@gte.uk.com

[64] http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/DAG02.xls
[65] 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 01/03/2011.

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 01/03/2011.

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 domestic solid waste will be handled in line with the relevant law.[66] Waste-water will be stored in impermeable containers, which will be built according to the laws[67], and will be removed by the municipality.[68] The hazardous waste such as tires, waste oil, batteries will be preserved on the site in line with the "Bylaw on the Management of the Hazardous Waste" and will be removed to closest the appropriate incineration or recycling centre.

The dust from the construction and the emissions from the vehicles are estimated in the Project Introduction File[69] and emission levels are found to be below the levels identified by law. Nevertheless, to minimize disturbance caused by dust, the site will be watered regularly. The acoustic evaluation report also concludes that the noise during construction is below the upper limits defined by the "Bylaw on the Assessment and Management of the Environmental Noise"

Section (e)[70] of the PIF introduces the measures to handle the project's environmental impacts under the light of the relevant regulations from handling the waste to noise.

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. 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.

It is important to highlight that an irrigation lake built and owned by DSI lies in the downstream of Selale Project. The irrigation lake already constitutes a barrier for the fish to commute to the project area. However, the project owner will build a fish passage as a precautionary approach.

SECTION E. Stakeholders' comments

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

Initial Feedback Round Meeting for SELALE project was held on 16/04/2009 in Muradiye District of Van Province. Invitation list for the meeting has been based on Gold Standard Toolkit. Local and international NGOs, Government Agencies and individuals were invited.

Invitation list for the 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 14/04/2009 and 15/04/2009).

[66] Muradiye HEPP, Project Introduction File, page 19, Handling and Control of Solid Waste, Official Gazette date and number: 14/03/1991 and 20814
[67] Muradiye HEPP, Project Introduction File, page 17
[68] Muradiye HEPP Project Introduction File, page 17-19
[69] MuradiyeHEPP, Project Introduction File, page 20-38
[70] Muradiye HEPP Project Introduction File, page 49

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.


Egemenlik kayıtsız şartsız milletindir.

muradiye

Günlük Siyasi Müstakil Gazete

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

DUYURU ve DAVET

Muradiye Elektrik Üretim A.Ş. tarafından yürütülmekte olan Ayrancılar ve Şelale Hidroelektrik Santrali 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 10. 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.

Figure 11. 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.
Street/P.O.Box:	Yıldız Posta Cad. Dedeman Ticaret Merkezi Esentepe - İstanbul
Building:	No: 52/7
City:	Istanbul
Postfix/ZIP:	34340
Country:	Turkey
Telephone:	+90 212 267 42 06
Fax:	+90 212 267 42 09
E-Mail:	Arda.aksaray@muradiyeelektrik.com
URL:	
Represented by:	
Title:	Business Development Manager
Salutation:	Mr.
Last Name:	Aksaray
Middle name:	-
First name:	Arda
Department:	Management
Direct fax:	+90 212 267 42 06
Direct tel:	+90 212 267 42 09
Personal E-Mail:	Arda.aksaray@muradiyeelektrik.com

Organization:	Global Tan Energy Limited
Street/P.O.Box:	Ehlibeyt Mah. 1259. Sokak
Building:	No. 7/2
City:	Balgat
State/Region:	Ankara
Country:	Turkey
Telephone:	+90 312 472 3500
Fax:	+90 312 472 3366
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:	+90 312 472 3500
Direct tel:	+90 312472 33 66
Personal e-mail:	kemal@gte.uk.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING WAS USED FOR FINANCING THE PROJECT ACTIVITIES.

07.03.2011
ŞELALE HEPP

To: Gold Standard Foundation

Declaration of Non-Use of Official Development Assistance by Project Owner

MURADİYE ELEKTRİK ÜRETİM A.Ş.
As Project Owner of the above-referenced project, acting on behalf of all project participants, I now make the following representations:

BEHZAT AKSARAY
I hereby declare that I am duly and fully authorised by the project owner 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. 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.

III. 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:
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/İST.
Tel:(0212) 267 42 06 Fax:(0212) 267 42 09

MURADİYE ELEKTRİK ÜRETİM A.Ş.
Yıldız Posta Cad. No:52/7 Esentepe – İSTANBUL Tel: (0212) 2674206 - Fax: (0212) 2674209
bilgi@muradiyeelektrik.com www.muradiyeelektrik.com

Annex 3

BASELINE INFORMATION

Data Used in calculation of OM for Turkish Electricity Grid

	NCV (Tj/kt) (1000m³ for gas)	EF (tCO_2/Tj)	COEF(tCO2/kt)
Coal	21.83	89.5	1,954
Lignite	6.61	90.9	601
Fuel Oil	40.08	75.5	3,026
Diesel Oil	42.86	72.6	3,112
LPG	45.94	61.6	2,830
Naphtha	44.17	69.3	3,061
Natural Gas	36.88	54.3	2,003

Table 20. Values used in calculation of OM [71]

	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 21. Amount of fuels used for electricity generation[72,73,]

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

Table 22. Net Electricity supply to the grid by thermal plants and imports (GWh)[74]

[71] 2007 Turkey National GHG Inventory, http://unfccc.int/national_reports/annex_i_ghg_inventories/items/2715.php
[72] http://www.teias.gov.tr/istatistik2005/46.xls
[73] http://www.teias.gov.tr/ist2007/43.xls
[74] http://www.teias.gov.tr/ist2007/49.xls

Data Used in calculation of BM for Turkish Electricity Grid

	NCV	EF $_{CO2}$	Generation Efficiency	EF
	(Tj/kt or m^3 for gas)	(tCO_2/Tj)	%	(tCO_2/MWh)
Coal	21.83	89.5	39.0%	0.826
Lignite	6.61	90.9	39.0%	0.839
Fuel Oil	40.08	75.5	39.5%	0.688
Diesel	42.86	72.6	39.5%	0.662
LPG	45.94	61.6	39.5%	0.561
Naphtha	44.17	69.3	39.5%	0.632
Natural Gas	36.88	54.3	60.0%	0.326

Table 23. Net calorific values, generation efficiency and emission factor data used in calculations

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

Table 24. Most recent capacity additions corresponding to 20%.[75,76 ,77,78]

[75] http://www.teias.gov.tr/istat2004/7.xls
[76] http://www.teias.gov.tr/istatistik2005/7.xls
[77] http://www.teias.gov.tr/ist2006/8.xls
[78] 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

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

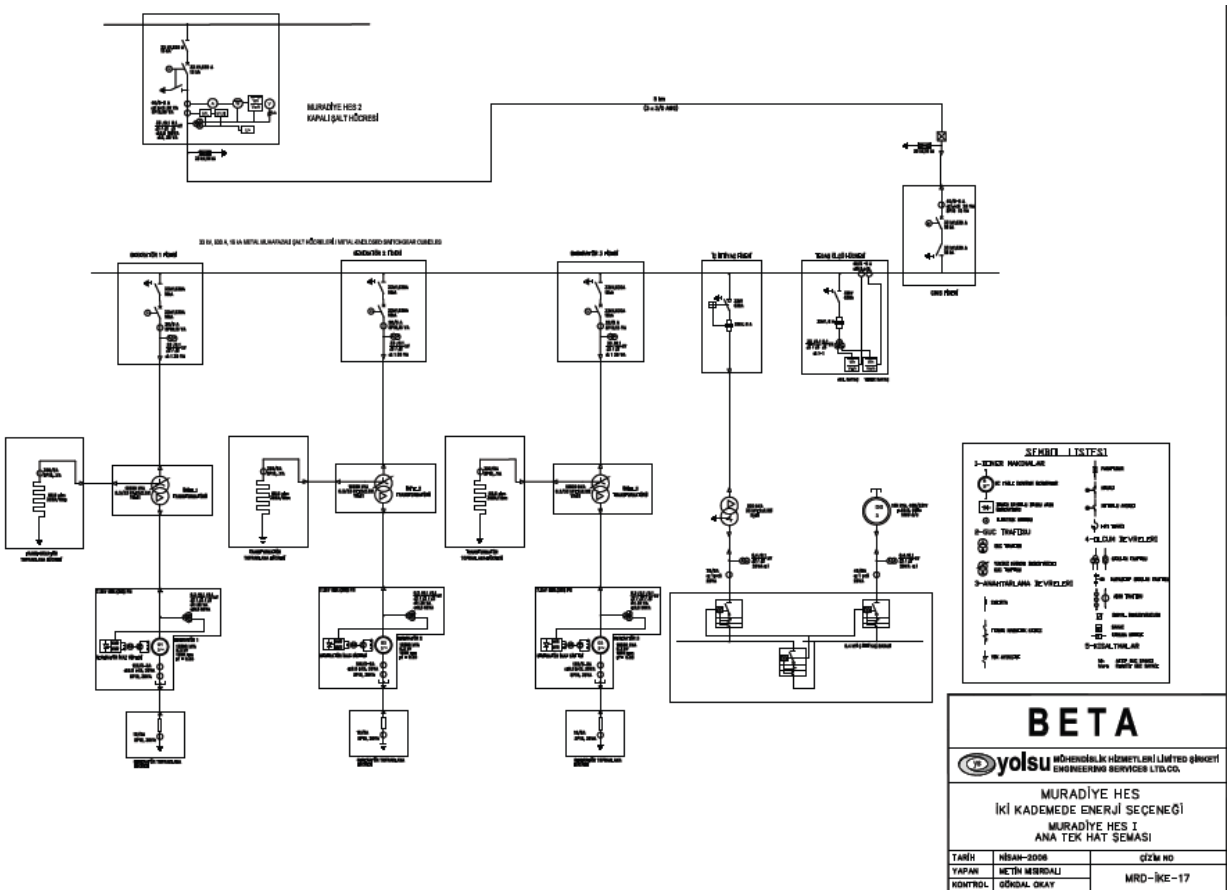
Bu Lisans, **Muradiye Elektrik Üretim Anonim Şirketi**'ne, Van İli'nde kurulacak olan **Muradiye Ayrancılar Hidroelektrik Santralı** üretim tesisinde 14/06/2007 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji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

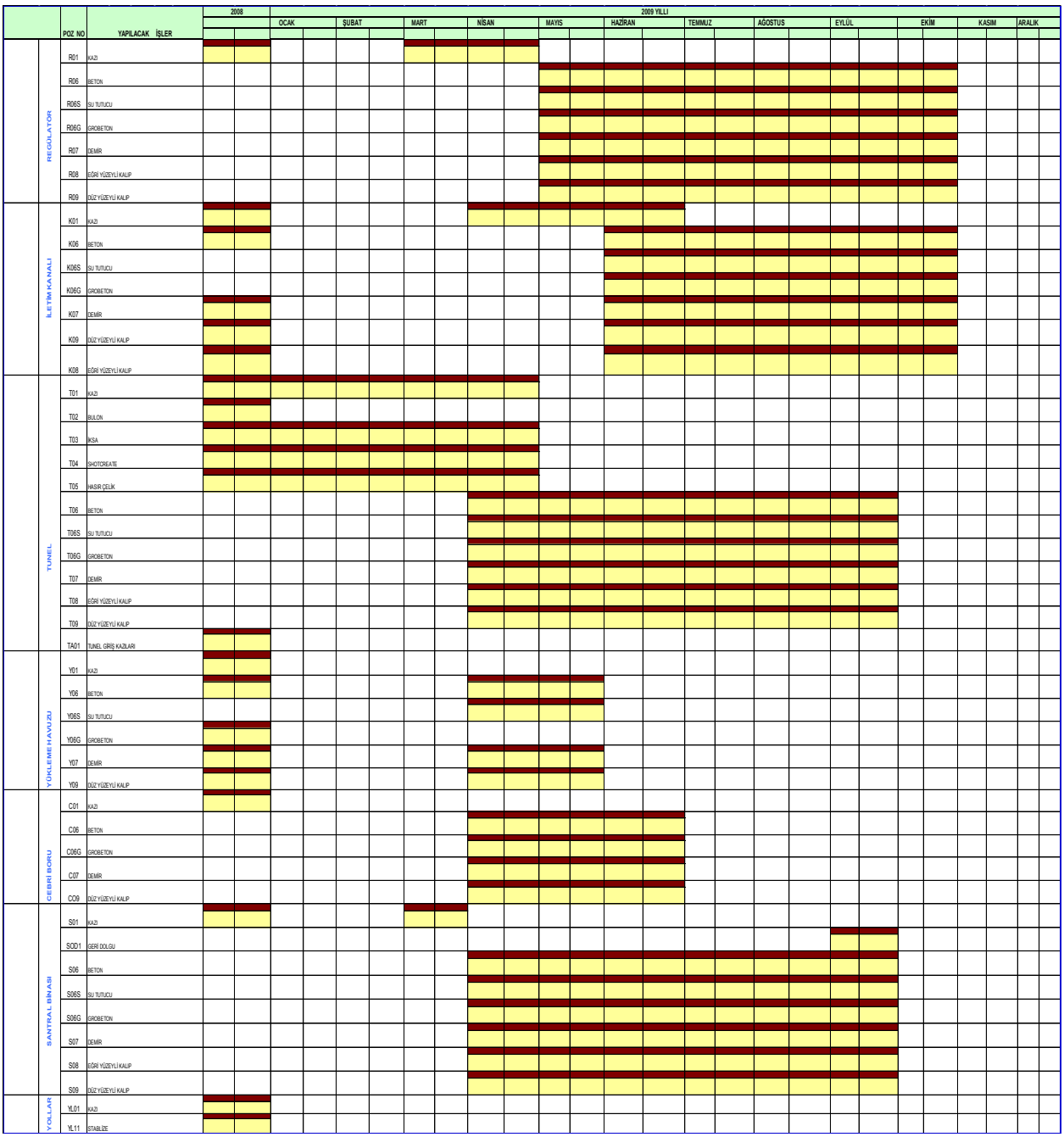
Annex 6

PROJECT SINGLE-LINE DIAGRAM



Annex 7

PROJECT WORK SCHEDULE



Annex 8

HEPPS OWNED BY GENERATION COMPANIES
Power Plants Considered for Common Practice Analysis

Company/Project Name	Installed Capacity (MW)	Generation Capacity (GWh)	Status	Link
BEREKET (DENİZLİ)	3,7	12	Built As Autoproducer	http://www.teias.gov.tr/istatistikler/12-13.xls
BEREKET (DALAMAN)	37,5	179	Built As Autoproducer	http://www.teias.gov.tr/istatistikler/12-13.xls
BEREKET (FESLEK)	9,5	41	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
BEREKET (GÖKYAR)	11,6	43	Built As Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htmhttp://www2.dsi.gov.tr/skatablo/Tablo1.htm
BEREKET (MENTAŞ)	39,9	163	Built As Autoproducer	http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/sonaerdirilen.asp
AKKOY I HEPP (Gümüşhane)	101,9	408	Dam Type/BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Seyrantepe Dam and HEPP (Elazığ)	49,7	182	Dam Type/Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Tınaztepe HEPP	7,7	29	Built As Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Cansu Elektrik (Artvin)	9,2	47	Generation Company	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 131)
Caldere HEPP (Muğla)	8,7	35	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Degirmenustu HEPP (Kahramanmaraş)	25,7	69	VER (VCS) Project	Developed by GTE
Hamzali HEPP (Kırıkkale)	16,7	117	VER (GS) Project	www.cdmgoldstandard.org

Keklicek HEPP (Malatya)	8,7	18	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Yukarı Manahoz HEPP (Trabzon)	22,4	79	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 157)
Calkısla HEPP (Erzincan)	7,7	18	Generation Company	http://www.dsi.gov.tr/bolge/dsi8/erzincan.htm#calkisla
KALEN II HEPP	15,7	50	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
FIRNIS HEPP	7,2	36	VER+	http://www.mozturk.net/Upload/karbon.pdf
SARMASIK I HEPP (Trabzon)	21,0	96	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
SARMASIK I HEPP (Trabzon)	21,6	108	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
TAYFUN HEPP	0,8	5	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Murgul HEPP (Artvin)	4,6	8	Built As Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
Gozede HEPP (Bursa)	2,4	10	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
BASARAN HEPP (Aydın)	0,6	5	Not at Similar Capacity	http://www2.dsi.gov.tr/skatablo/Tablo1.htm
ENERJISA - BİRKAPILI	48,5	171	Initially Built as autoproducer	http://www.ere.com.tr/enerji_birkapili.html
ENERJISA - AKSU – ŞAHMALLAR (Antalya)	14,0	45	Built As Autoproducer	http://www.ere.com.tr/enerji_gazipasa.html
ENERJISA - SUGÖZÜ - KIZILDÜZ	15,4	55	Built As Autoproducer	http://www.ere.com.tr/enerji_gazipasa.html
EŞEN-II (GÖLTAŞ) (Muğla)	43,4	170	Built As Autoproducer	http://www.teias.gov.tr/istat2004/13-14.xls
ELTA (DODURGA)	4,1	12	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
İÇTAŞ YUKARI MERCAN (Erzincan)	14,2	44	Built As Autoproducer	http://www.epdk.org.tr/lisans/elektrik/lisansdatabase/sonaerdirilen.asp

İSKUR (SÜLEYMANLI HES) (Kahramanmaraş)	4,6	18	Built As Autoproducer	http://www.teias.gov.tr/istat2004/7.xls
KURTEKS Karasu Andırın HES (Kahramanmaraş)	2,4	19	Concessionary Company	http://www.kahramanmaras.bel.tr/hizmetler/ustyapi-hizmetleri/1392-hidro-elektrik-santrali.html
MOLU ENERJİ (BAHÇELİK HES) (Kayseri)	4,2	30	Built As Autoproducer	http://www.teias.gov.tr/istat2004/13-14.xls
ÖZGÜR ELEK. Tahta HES (Kahramanmaraş)	12,5	54	Generation Company	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 112)
PAMUK (Toroslar)	23,3	112	Build-Operate-Transfer	http://www.limak.com.tr/index.php?lang=tr&pid=420
SU ENERJİ (ÇAYGÖREN HES) (Balıkesir)	4,6	19	Built As Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 11)
TEKTUĞ-KARGILIK	23,9	83	Built as VER Project	www.markitenvironmental.com
TEKTUĞ-KALEALTI HES (Osmaniye)	15,0	52	Built AS VER Project	www.markitenvironmental.com
TEKTUĞ-KEBANDERESİ (Elazığ)	5,0	32	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 11)
YAPISAN HACILAR	13,3	90	Built As Autoproducer	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 61)
YPM ALTINTEPE HES (Sivas)	4,0	18	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 95)
YPM BEYPINAR HES (Sivas)	3,6	18	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 96)
YPM KONAK HES (Sivas)	4,0	19	BOT	http://www2.dsi.gov.tr/skatablo/Tablo1.htm (Row 101)
BEYKÖY (Eskişehir)	16,8	87	Built by DSI & Privatized	http://www.dsi.gov.tr/bolge/dsi3/eski%C5%9Fehir.htm#beyköy
KUZGUN (Erzurum)	20,9	36	Built by DSI & Privatized	http://www.aduas.gov.tr/dosyalar/2008faaliyet.pdf
TERCAN (Erzincan)	15,0	51	Dam Type& Built by DSI	http://www.dsi.gov.tr/baraj/detay.cfm?BarajID=114
ATAKÖY (Tokat)	5,5	8	Dam Type& Built	http://www.dsi.gov.tr/baraj/detay.cfm?BarajID=62

			by DSI	
CILDIR (Kars)	15,4	30	Built by DSI & Privatized	http://www.dsi.gov.tr/bolge/dsi24/kars.htm#cildir
IKIZDERE (Artvin)	18,6	110	Built by DSI & Privatized	http://www.aduas.gov.tr/dosyalar/2008faaliyet.pdf
MERCAN (Erzincan)	20,4	78	Built by DSI & Privatized	http://www.dsi.gov.tr/bolge/dsi9/tunceli.htm
TOTAL	**807,1**	**3219**		

Table 25. List of hydro power plants operational at time of investment decision[79]

[79] Turkey's Electricity Capacity Projection 2009-2018 (2009,) Energy Markey Regulating Authority, Page 93. Available on: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (Accessed: 23/02/2011)

Annex 9

FLOW RATE OF BENDİMAHİ RİVERTHROUGHOUT YEARS

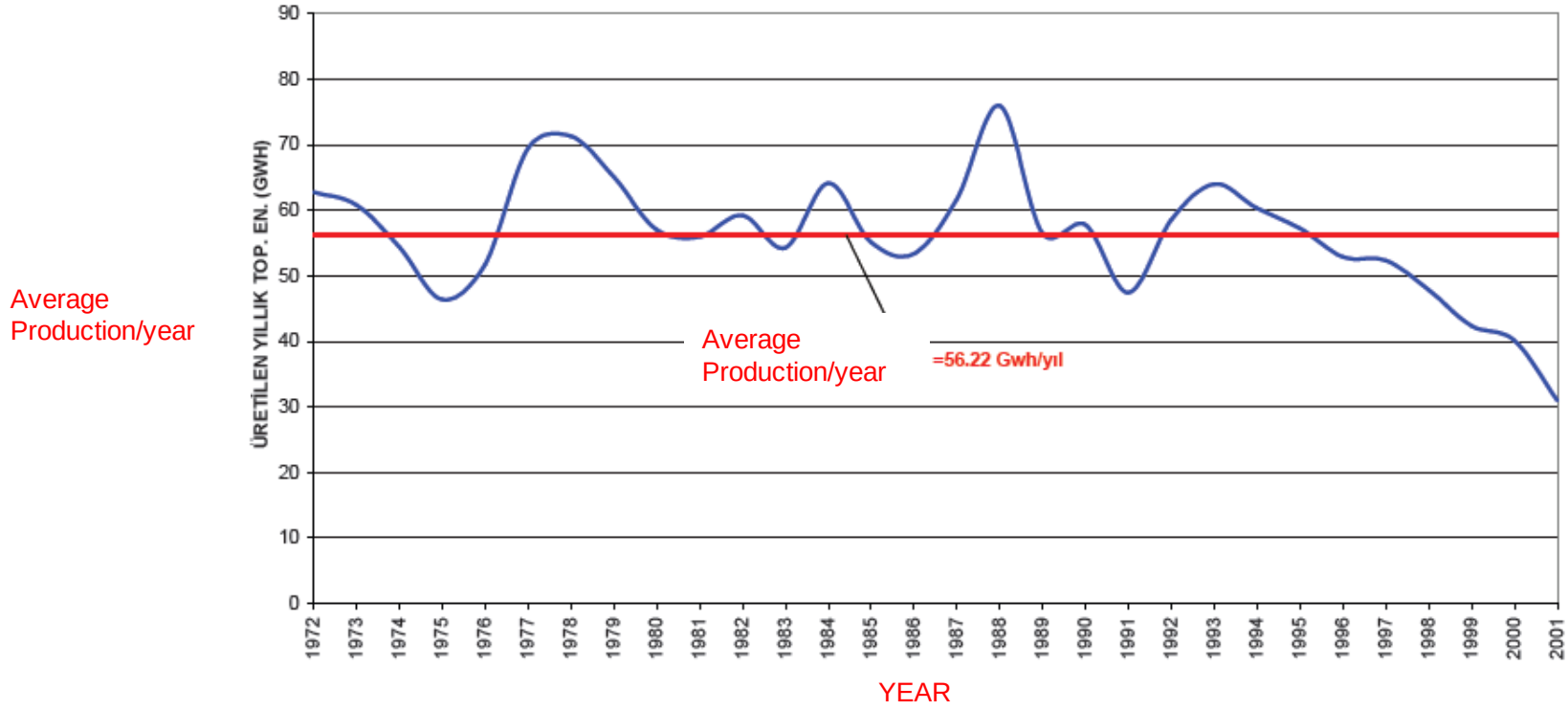


Figure 12. Flow regime of Bendimahi River between 1972 and 2001[80]

Annex 10

[80] Revised Project Feasibility Report,Şekil 4/EK2.2, page 4/EK2-34

Exemption from Environmental Impact Assesment

T.C.
Çevre ve Orman
Bakanlığı

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

Karar Tarihi : 28/08/2007
Karar No :

ÇED GEREKLİ DEĞİLDİR BELGESİ

16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 17. maddesi gereğince; " Muradiye Ayrancılar Hidroelektrik Santralı (Ayrancılar Regülatörü ve Ayrancılar HES ile Şelale Regülatörü ve Şelale HES Kurulu Gücü toplam 40,89 MW) " projesi hakkında "*Çevresel Etki Değerlendirmesi Gerekli Değildir*" kararı verilmiştir.

Osman TÜZÜN
Bakan a.
Genel Müdür

Proje Sahibi : Muradiye Enerji Üretim Ltd.Şti.
Projenin Yeri : Van İli, Muradiye İlçesi, Bendimahi Çayı