**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:

# SELIMOGLU 9.33 MW Hydroelectric Power Plant Project, Turkey

**CONTENTS**

## SECTION A. General description of project activity

### A.1. Title of the project activity:

Title: SELIMOGLU 9.33 MW HYDROELECTRIC POWER PLANT
Version: 09
Date: 22/02/2011

### A.2. Description of the project activity:

Selimoglu Hydroelectric Power Plant Project is a run-of-river power project located in North East part of Turkey, at the East Black Sea Region. It is within the borders of Arsin, which is a district of Trabzon province.

The weir is located at 220 meters elevation, on the Yanbolu Creek, 500 meters northwest of Oguzzane village. Powerhouse is located at 120 meters elevation, 1200 meters east of Fındıklı village. The location would be given as $40^0$ 51' 28'' and $40^0$ 52' 10'' North Latitudes, and $39^0$ 56' 29'' and $39^0$ 58' 16'' East Longitudes.

The electricity generation license (EU/1069-1/787) for the project has been awarded to Hidro Kontrol Elektrik Üretim Sanayi A.Ş. by the Turkish Energy Market Regulatory Authority. The project will generate electrical energy from the Yanbolu Creek, by using the elevation difference between the weir and the powerhouse.

The water intake of the weir is from the left shore of the weir. The water is transmitted to Selimoglu HEPP powerhouse, located at 120 metres, through a 42 metres long 3.2m width and 2.37 height rectangular conveyance channel and a 2,748 meters long 312 meters diameter channel and a second channel between tunnel and loading pool having a length of 32 m, width of 3.2m and height of 2.37m. Penstock will have a length of 140m and diameter of 1.7 meter. The elevation difference will be about 100m. There shall be two horizontal axis Francis turbines at the power house.

The installed capacity of the Selimoglu power plant power plant will be 9.33 MW. Average yearly flow at the weir location is 4.82 $m^3$/sec. Maximum flow to the HEPP after the optimization studies is 10.25 $m^3$/sec. The annual estimated electricity generation will be 31.97 GWh, of which 7.36 GWh is firm energy. This will save about 3 million US $ worth of natural gas electricity generation. The generated electricity shall be transferred to the Arsin grid substation by a single circuit 10 km long 34.5 kV transmission line. The yearly expected carbon emission reduction of Selimoğlu HEPP, based on 2007 Turkish Electrical Statistical Tables, is around 17,954 tons of $CO_2$.

Main goals of the Selimoğlu HEPP include;

- Utilize the hydroelectric potential of Turkey to meet the increasing electricity demand and contribute to the security of energy supply. .
- Increase the share of run-of-river power plants in the electricity generation mix of Turkey, reducing dependency on imported fossil fuels and thereby reducing the GHG emissions

- Wider use of distributed energy generation systems which help to decrease the transmission loss in the grid and aids system stability,
- Contribute to the economic development by creating direct and indirect job opportunities

Project will contribute to sustainable development in the region through creating new job opportunities during construction and operational phase. About 40 local people will be employed during the construction stage. This number will be reduced during the operational stage.

## 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) | HidroKontrol Elektrik Üretim Sanayi A.Ş.<br>Global Tan Energy Ltd. | No |

## A.4. Technical description of the project activity:

### A.4.1. Location of the project activity:

Selimoğlu HEPP project is located in Trabzon Province, in the district of Arsin, in the East Black sea Region of Turkey. The weir is located at 500 meters northwest of the village of Oguzzane, at 220 meters elevation; powerhouse is located at 1200 meters east of Findikli County, at 120 meters elevation

The project site lies on Yanbolu Creek, between $40^0$ 51’ 28’’ and $40^0$ 52’ 10’’ North Latitudes, and $39^0$ 56’ 29’’ and $39^0$ 58’ 16’’ East Longitudes.

#### A.4.1.1. Host Party(ies):

Although Turkey, the Host Country, passed legislation in Parliament on 05/02/2009 to ratify the Kyoto Protocol - Turkey does not have yet a quantitative emission reduction limit and it is likely that it will not have a quantitative emission reduction limit until post 2012. As such, Turkey will in the interim period continue to be eligible for voluntary emission reduction projects.

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

East Black Sea Region of Turkey, Trabzon Province

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

Arsin District, Fındıklı Village.

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

| | Longitude | Latitude |
|---|---|---|
| **Selimoglu Weir** | E 39°56'28.86" | N 40°51'24.84" |
| **Powerhouse** | E 39°58'14.76" | N 40°52'12.25" |


**Figure 1. Selimoglu HEPP project location**

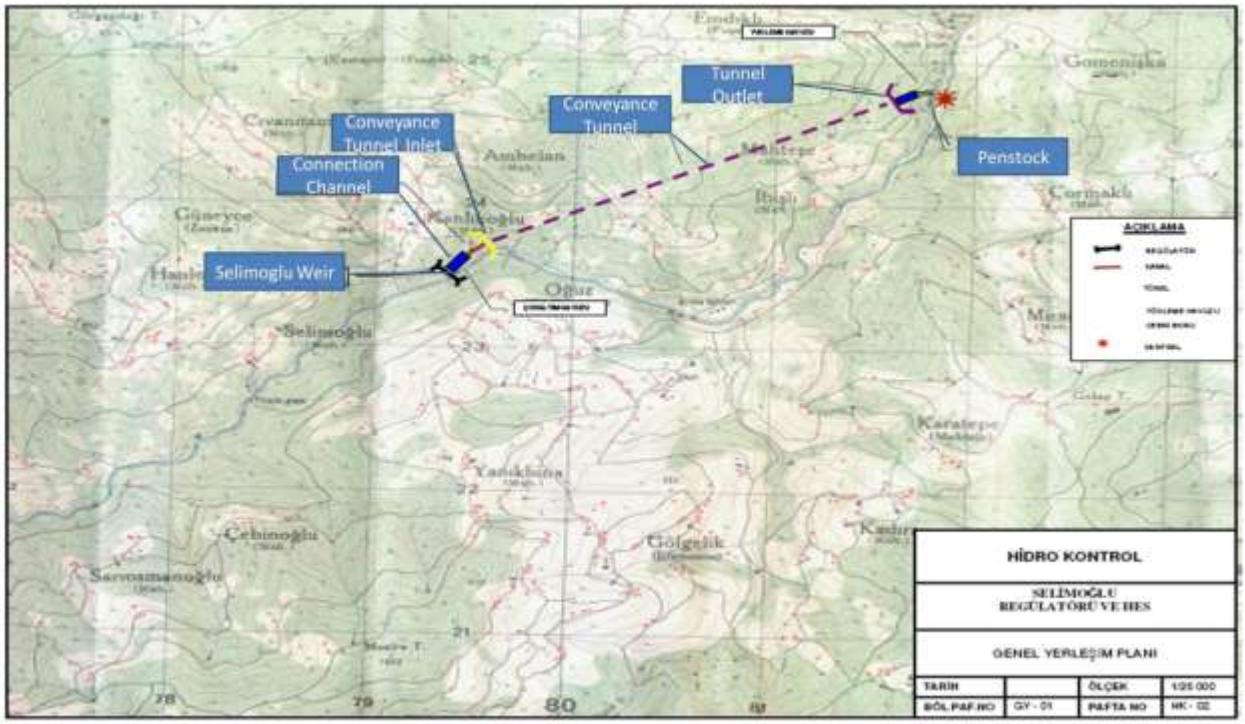


**Figure 2. Layout of Selimoglu HEPP Facilities**

### 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 turbine generators which are used first to convert the potential energy of water into mechanical energy and then to electrical energy.

### 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 | 17,954 |
| 2011 | 17,954 |
| 2012 | 17,954 |
| 2013 | 17,954 |
| 2014 | 17,954 |
| 2015 | 17,954 |
| 2016 | 17,954 |
| **Total emission reductions** (Tones of $CO_2$ e) | **125,677** |
| **Total number of crediting years** | 7 |
| **Annual average over the crediting period of estimated reductions** (tones of $CO_2$e) | 17,954 |

**Table 1. Estimated amount of emission reduction**

### A.4.5. Public funding of the project activity:

No public funding or ODA is used for the project.

## SECTION B. Application of a baseline and monitoring methodology

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

The United Nations approved consolidated baseline methodology applicable to this project is ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", Version 9[1].

ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 05.2, [2]and
- ''Tool to calculate the emission factor for an electricity system'', Version 01.1[3].

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

The choice of methodology ACM0002, Version 9, is justified as the project activity meets its applicability criteria:

- The Selimoğlu 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.

  Proposed project is a run-off-river type Hepp and power density of the reservoir is higher than 4 $W/m^2$

Since there exists no delineation of project electricity system or connected electricity systems by DNA, following criteria has been used to determine the existence of significant transmission constraints:

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

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1 http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_YOYKBRCBIK7TSPSB7MQT75SPX75PE8

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

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

Since the project output is fed to the Turkish electricity grid which does not involve any distinct electricity systems that applies different price, first criteria defined above is not applicable. Also, since the transmission line between the proposed projects and nearest substation is built within the scope of the project and there exist no information on grid capacity utilization, second criteria is also inapplicable. Based on assessment above, it is difficult to conclude with a significant transmission constraint or grid boundary. Since there is no dispatch grid system in Turkey, the project boundary is considered as the National Electricity Grid of Turkey according to applied tool. The geographical and physical boundaries of the Turkish grid and location of the power plants are well identified as given diagram below.

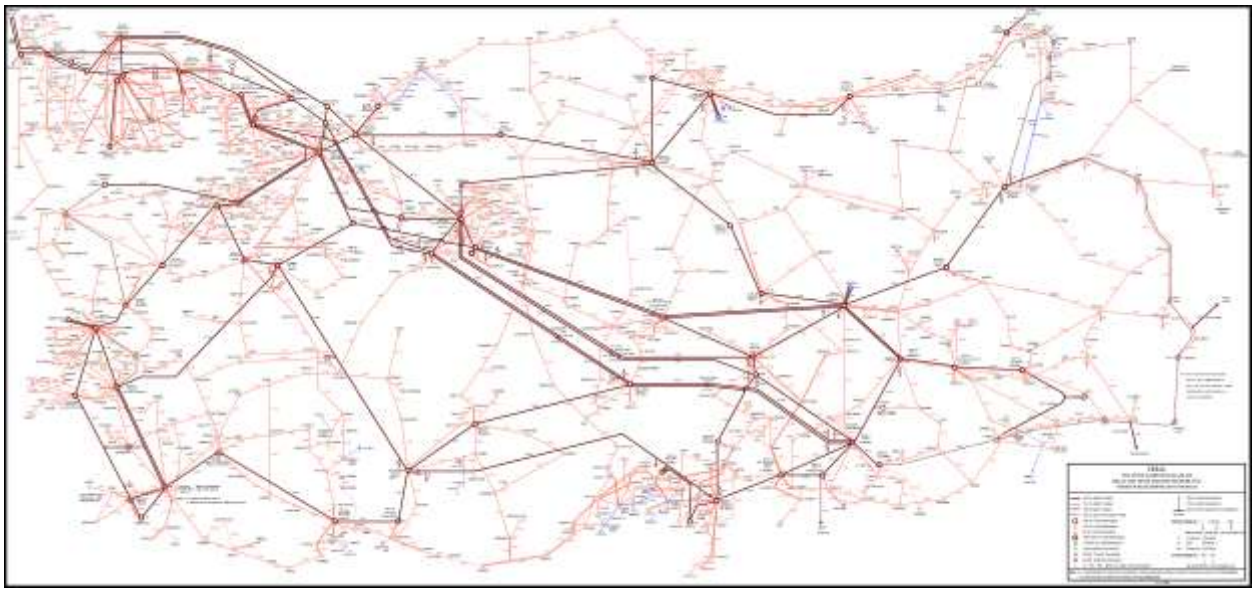

Figure 3. Turkish Electricity Grid

## 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 2. 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 09. 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 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 availability of large natural resource 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 new plants added to the grid. Since the Turkish grid is dominated by the thermal power plants, it will increase the total GHG emitted during electricity generation.

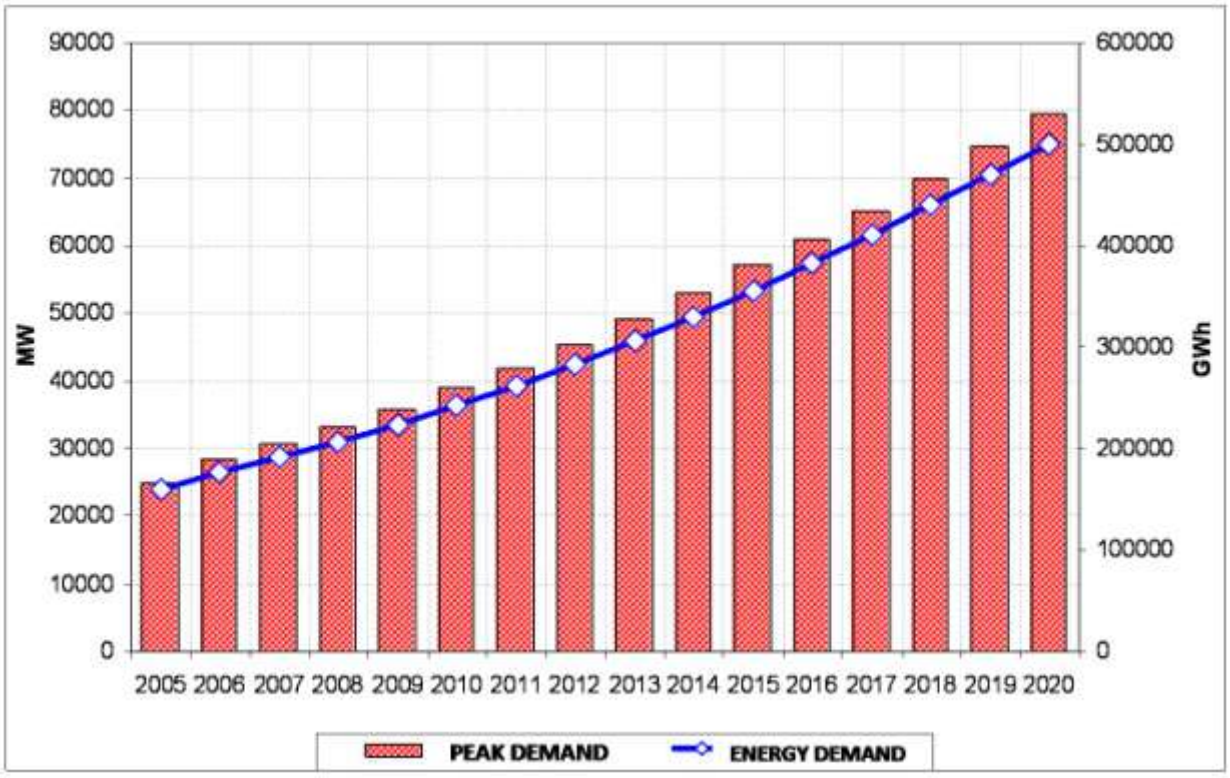


**Figure 4. Peak Load and consumption projection for Turkish electricity system between 2005-2020**[4]

**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):**

The carbon revenue has been considered since the consideration of the project for investment. Date of investment decision has been identified as the equipment purchase agreement date. The research on carbon certification and impact on project feasibility has been discussed during assessment of the project and finance manager of the investor company has been assigned for certification of carbon assets of the projects.

| Milestone | Date |
|---|---|
| License Issuance | 25/01/2007 |
| Carbon Certification Decision | 25/05/2007 |
| Equipment Purchase Agreement* | 11/07/2007 |
| Carbon Certification Agreement | 03/07/2008 |
| EIA Exemption Letter | 23/09/2008 |
| LSC Meeting | 28/11/2008 |
| Start of Construction | 10/12/2008 |

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

| | |
|---|---|
| Loan Agreement | 04/06/2009 |
| Updated Water Right Utilization Agreement | 15/06/2009 |
| System Connection Approval | 31/08/2009 |

**Table 3. Project Timeline**

*Date of investment decision

According to the applied methodology (ACM0002, version 09) 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 annually about 31.97 GWh of electricity and reduce about 17,954 $tCO_2$ 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 the 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 by the new plants built and connected to the grid

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

***Outcome of Step 1a***

Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand unless new plants are built and connected to the grid. Since the Turkish grid is dominated by thermal power generation plants, this would increase the cumulative emissions. Implementaiton of the project renewable electricity generation plant will enable supply of the demand by renewable resources thus avoiding GHG emissions. Proposed VER project will increase the profitability of the project and make the project more viable and attractive for the investors.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law[5]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[6]
3. Energy Efficiency Law [7]
4. Forest Law[8]
5. Environment Law[9]

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

***Outcome of Step 1b***

Mandatory legislation and regulations for each alternative are taken into account in sub-step 1b. Based on the above analysis, the proposed project activity is not the only alternative amongst the project participants that is in compliance with mandatory regulations. Therefore, the proposed VER project activity is considered as additional.

**Step 2 - Investment analysis**

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. Selimoğlu HEPP has been financed through loans from commercial banks and companies own resources.

***Sub-step 2a*** **- Determine appropriate analysis method**

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

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

Since 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***

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

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

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

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

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

Investment analysis for Selimoglu HEPP has been conducted considering the methodology applied and using parameters given below. The investment cost figures have been adopted from feasibility report and converted to € currency using average currency rates at time of investment decision which is determined as 11/07/2007, date of equipment purchase agreement. The investment 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. Electricity tariff has been used as 5.5€ Cent/kWh which is the maximum guaranteed price as stated in renewable energy law and also reference price in feasibility report(section 9) (whereas the average market price between 01/01/2008 and 31/12/2008 has fluctuated between 4.57€c(October 2008) and 9.85€c(July 2008) per kWh.

| Government Bond | Auction Date | Currency | Rate |
|---|---|---|---|
| TRT070312T14 | 15/05/07 | TRY | 17.75 |
| TRT150212T15 | 29/05/07 | TRY | 9.94 |
| TRT110608T11 | 12/06/07 | TRY | 18.50 |
| TRT070312T14 | 12/06/07 | TRY | 17.41 |
| TRT040209T13 | 26/06/07 | TRY | 17.12 |
| TRT260214T10 | 26/06/07 | TRY | 21.92 |
| TRB031007T16 | 03/07/07 | TRY | 16.20 |
| TRT060509T18 | 03/07/07 | TRY | 15.93 |
| TRT070312T14 | 03/07/07 | TRY | 16.61 |
| | | **Average** | **16.82** |

**Table 4. Sample of Government bond rates used for the benchmark analysis**

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

| Parameters | Unit | Data Value |
|---|---|---|
| Installed Capacity | MW | 9.33[10] |
| Grid Connected output | GWh | 31.97[10] |
| Capital Investment | Million € | 13.457[10] |
| Income tax rate | % | 20[11] |
| Loan | Million € | 10.092 |
| Expected Tariff | € Cents/kWh | 5.5[5] |
| Expected VERs price | €/ tCO2e | 10 |

**Table 5. Main financial parameters used for investment analysis**

[10] Selimoglu HEPP Feasibility Report, 01/07/2008

[11] http://www.izmirvdb.gov.tr/down_files/vergi_oranlari.doc (page 4, accessed on 30/01/2010)

According to the investment analysis made for Selimoglu HEPP, Equity IRR for the project has been calculated as 5.69% in the absence of carbon revenue. When carbon revenue is included to the project income, IRR increases to 7.44% and the project becomes more viable. This IRR value represents an optimistic scenario in terms of capital investment and electricity generation whereas electricity tariff is expected to increase due to increasing electricity demand so that the investment becomes attractive.
For benchmark analysis of the project, bond rates from web page of Central Bank of Turkey[12] have been used as given in table above and a relevant benchmark for an equity IRR has been derived from government bond rates increased by a suitable risk premium (to reflect private investment and/or project type). Considering the bond rates (Average is 16.82%) and estimated country risk premiums which are around 4.5% for Turkey[13], it can be concluded that expected return on investment for these types of projects should be around 21.32% for many investors. The expectation of many investors is returns around 25% for successful investments for some investment funds[14]. Another benchmark for similar project types have been defined by Worldbank as 15% [15] by a report generated in 2009, whereas an earlier World Bank report gives financial IRRs for several projects as 16% to 20% for similar projects.[16] Even if we consider the minimum benchmark IRR which is 15%, for Selimoglu HEPP, in order to reach this IRR values, average electricity tariff must be around 8€c/kWh in the absence of carbon revenue so that the investment will become reasonable.

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

Following figure is given in order to reflect the actual electricity prices realized obtained from monthly reports of Market Settling and Balancing Center[17] between 01/01/2009-31/01/2010. It should be considered that these prices are highest prices obtained and power plants which sell electricity through bilateral agreements have lower income. Figure shows that the actual prices have even been lower than guaranteed price in some cases therefore assumption of 5.5€cents per kWh (or 55€ /MWh) is a realistic scenario as demonstrated below.

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[12] [12] http://www.tcmb.gov.tr/evds/dibs/istihl.xls

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

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

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

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

[17] http://pmum.teias.gov.tr/UzlasmaWeb/

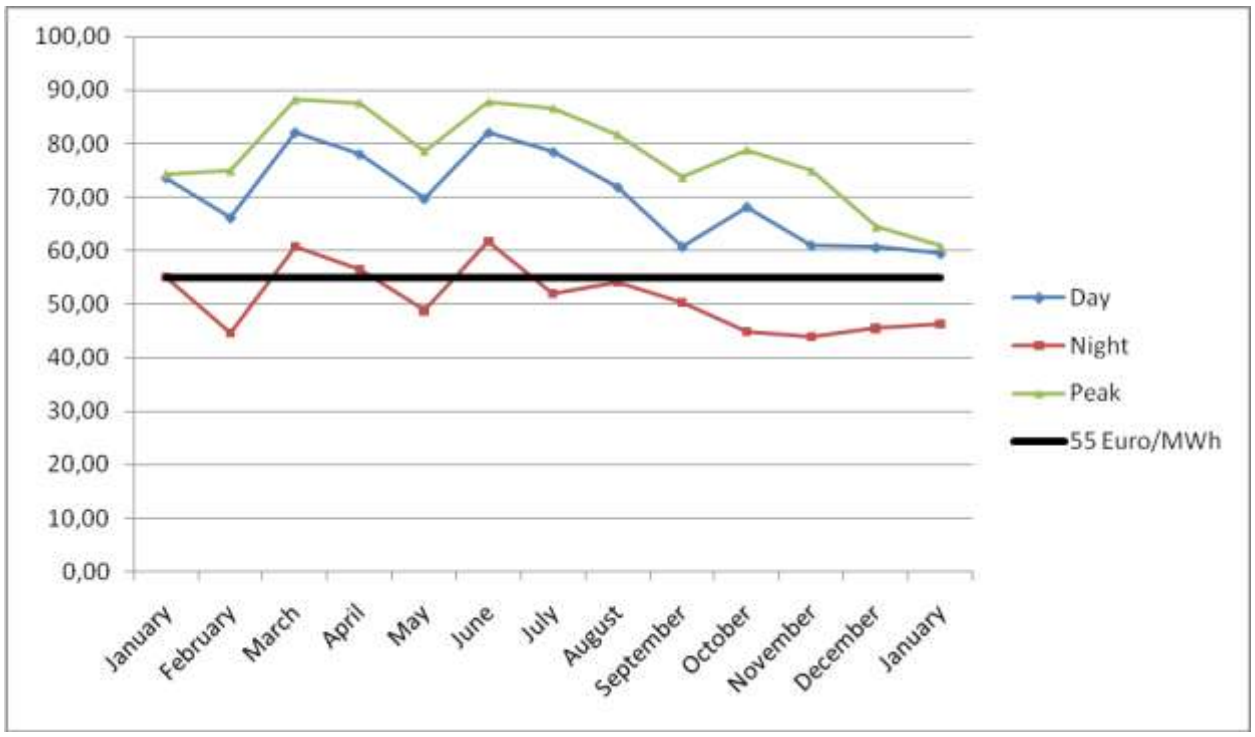


**Figure 5.** Highest tariffs observed between January 2009-January 2010 (€/MWh)

This IRR value represents the most optimistic scenario in terms of capital investment, electricity tariff and generation. This figure, when compared with Turkish bond yields in the market, it is seen that the project is not financially attractive for investors as bond rates guarantee the same income without any investment risk.

Considering that control of run-off-river hydroelectric power plants on generation period is limited and that Selimoglu HEPP has no storage capacity, expectation that the floor electricity prices will increase is the risk for investors whereas realization of this expectation will increase the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and minimizing investment risk.

***Sub-step 2d - Sensitivity Analysis***

Sensitivity analysis has been carried out for three main parameters 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 | | | | | | |
|---|---|---|---|---|---|---|---|
| | **-15** | **-10** | **-5** | **0** | **+5** | **+10** | **+15** |
| **Investment Cost** | 8.23 | 7.29 | 6.45 | 5.69 | 4.99 | 4.35 | 3.77 |
| **Operating Cost** | 6.13 | 5.98 | 5.83 | 5.69 | 5.54 | 5.39 | 5.24 |
| **Electricity Income** | 3.54 | 4.25 | 4.97 | 5.69 | 6.41 | 7.13 | 7.86 |

**Table 6. Sensitivity analysis for Selimoglu 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 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 favourable 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, the share of HEPPs in total installed capacity of Turkey is about 32.8%[18] whereas share of HEPPs in total generation is only 18.7%[19]. However, when we look at the historical data, it seen that total installed capacity of thermal power plants has shown a rapid growth in parallel with the demand for electricity whereas the increase in hydroelectric power generation has been much slower. This has decreased the share of hydroelectric power from 40% in the past to the current levels, as seen in the Figure below. [20]

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

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

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

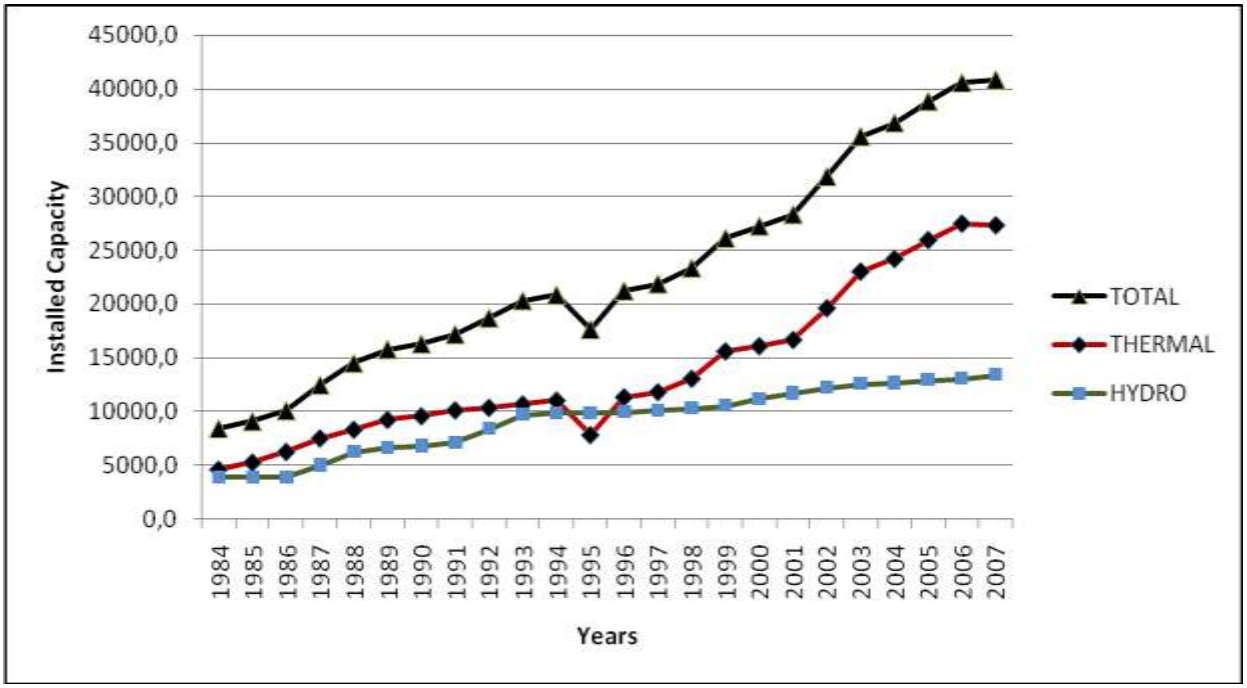


**Figure 6.** Annual Development of Turkey's Installed Capacity[21]

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

The main reason behind the decrease in share of hydro electricity power is due to the changes in government's economic policy which intends to encourage private companies to invest in energy generation and lower the weight of government on energy generation as a part of privatization efforts. On the other hand, private companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and uses conventional technologies. Installed capacity of thermal power plants owned by generation companies has increased from 123.4 MW in 1996 to 10,688.8 MW in 2007 whereas the total capacity of hydro electricity power plants has only increased from 75.3 MW to 1,345 MW(including autoproducers, generation companies, Build-Operate-Transfer(BOT)plants and concessionary companies) in the same period which show that private companies find more attractive to invest is thermal power plants[22,23,24].

When we look at the distribution of hydro power capacity by utilities, it is seen that total generation capacity of the hydroelectric power plants owned by generation companies is 1,503 GWh by end of 2007[25] which corresponds to 0.78% of the total generation capacity(191,558.1 GWh) of Turkey at that time. However, a detailed review of these has shown that majority of these plants have been initially licensed/implemented as Autoproducer or BOT power plants but later licenses have been revised as

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

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

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

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

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

Generation Company License during liberalization of Turkish Electricity Market and some of them have been built using VER revenue (See Annex 7 and 8 for details). When these plants are excluded, only two power plants (0.6MW Basaran HEPP and 12.5MW Tahta HEPP) could be identified. Some of generation capacities of these plants correspond to about 0.003% of total generation capacity at time of investment decision.

Out of these two projects, the Basaran Hepp (0.6 MW) is not of similar scale for the project or in the same region. The air line distance between proposed project and Basaran HEPP is more than 1,000km. Therefore it has been excluded from the common practice analysis. The other project, 12.5MW Tahta Hepp is at similar scale but is not in the same region (both geographical and administrative). The proposed project is in black sea region whereas Tahta Hepp is in Mediterranean region which shows different climate and topographic variation. The airline distance between two projects is more than 500km.

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

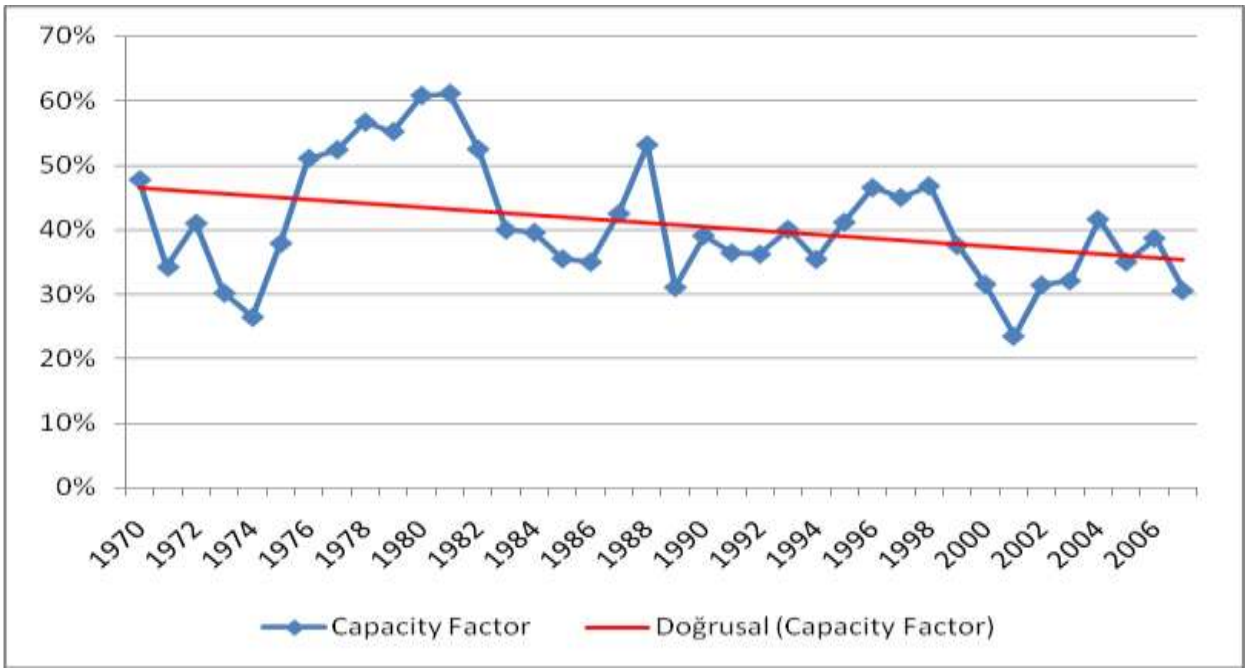


**Figure 5. Evolution of Capacity(Plant Load) Factor of HEPPs in Turkey.**Hata! Yer işareti tanımlanmamış.'Hata! Yer işareti tanımlanmamış.

The statement above has also been confirmed by the owner of Tahta HEPP (Özgür Elektrik AS) such that company has informed us that they have other projects applied for GS registration (GS681-Pasa HEPP). Although the PDD for Pasa Hepp is not publicly available, the project owner has stated that IRR of Tahta

Hepp is higher than many other projects and they have been using this project as an internal benchmark for their other projects.[26]

### Outcome of Common Practice Analysis:

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

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

As discussed above in detail, there exists no other project in the same region similar to the project built without carbon revenue whereas a countrywide assessment has resulted in a single project of similar size but with higher IRR.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

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

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

The additionality assessment of the project activity has been demonstrated using the latest version of the ‘Tool for assessment and demonstration of additionality’.

According the “Tool to calculate the emission factor for an electricity system”, ver. 01.1, the following four methods are applicable to calculate the operating margin:

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

Since the fuel consumption data is not available for each power plant, method (d) is eliminated. Also due to insufficient availability of 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.

[26] Mr Gultekin Keles, Ozgur Elektrik AS (www.ozgurelektrik.com.tr)

| | | 2007 | 2006 | 2005 | 2004 | 2003 | Average |
|---|---|---|---|---|---|---|---|
| **Total Generation** | **[GWh]** | 191,558.1 | 176,299.8 | 161,956.2 | 150,698.3 | 140,580.5 | 164,218.6 |
| **Low-cost / must run** | **[GWh]** | 36,361.9 | 44,464.7 | 39,713.9 | 46,234.6 | 35,479.5 | 40,450.9 |
| **Low-cost / must run** | **[%]** | 19.0% | 25.2% | 24.5% | 30.7% | 25.2% | 24.6% |

**Table 7. Breakdown by source of electricity generation for the five most recent years[27]**

**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 Selimoglu HEPP in year y |
| Source of data used: | Feasibility Report for the Selimoglu HEPP |
| Value applied: | 31.97 GWh |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data used for emission reduction calculation. |
| Any comment: | |

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

| **Data / Parameter:** | **$EF_{CO2, i, y i}$** |
|---|---|
| Data unit: | $tCO_2/TJ$ |
| Description: | $CO_2$ emission factor of fossil fuel type "i" in year "y" |
| Source of data used: | -For EF of fossil fuels, IPCC values at the lower limit has been used. |
| Value applied: | |

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

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

| **Data / Parameter:** | **$FC_{i,y}$** |
|---|---|
| Data unit: | Tons or 1000 $m^3$ for gases |
| Description: | Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y |
| Source of data used: | TEIAS web page (http://www.teias.gov.tr/ist2007/43.xls) |
| Value applied: | See table 14 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Data used for OM calculation |

| **Data / Parameter:** | **GE** |
|---|---|
| Data unit: | % |
| Description: | Generation efficiency of thermal power plants |
| Source of data used: | 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[28,29].

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

**Step 2. Select an operating margin method**

Since the fuel consumption data is not available for each power plant, method (d) is eliminated. Also due to insufficient data, methods (b) and (c) are not considered and thus (a) simple OM method is used in calculations. 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 | 34,465 | 39,714 | 36,235 | 35,480 | 36,451 |

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

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

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Low-cost / must run** | **%]** | **[** | 1 9 | 2 5 | 2 5 | 2 1 | 3 5 | 2 5 | 2 |
|---|---|---|---|---|---|---|---|---|---|

**Table 4. Breakdown by source of electricity generation for the five most recent years[30]**

The Simple Operating Margin (OM) emission factor ($\mathbf{EF}_{grid, OM, y}$) is calculated as the generation-weighted average $CO_2$ emissions per unit net electricity generation ($tCO_2/MWh$) of all the generating plants serving the system, excluding low-cost/must-run power plants. As electricity generation from solar and low cost biomass facilities is insignificant and there are no nuclear plants in Turkey, the only low cost /must run plants considered are hydroelectric, wind and geothermal facilities.

The tool gives two options for the calculation of $\mathbf{EF}_{grid, OM, y}$;

- *Ex-ante* option

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

- *Ex-post* option

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

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

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

The simple OM emission factor is calculated as the generation-weighted average $CO_2$ emissions per unit net electricity generation ($tCO_2/MWh$) of all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

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

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

$$EF_{Grid, OM\ Simple, y} = \sum FC_{i,y} * NCV_{i,y} * EF\ CO_{2\ i,y} / EG_y \qquad \textbf{(1)}$$

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

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[31,32,33,34], the official source of related data. Fuel consumption values for the relevant years are in table below.

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

**Table 5. Fuel Consumption in thermal power plants**

The NCV of the fuels consumed have been calculated using data from the TEIAS web page. The emission factors required for calculation of $CO_2$ emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories for fuels. Details of the data used for the calculations are given in Annex 3.

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

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

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

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

| | COEF($tCO_2$/kt) | Consumption (2005 - 2007) (tons or $1000m^3$) | Total Emission (2005 - 2007) ($tCO_2$) |
|---|---|---|---|
| Coal | 1,954 | 16,906,064 | 33,032,943 |
| Lignite | 601 | 160,126,774 | 96,197,334 |
| Fuel Oil | 3,026 | 6,002,955 | 18,165,198 |
| Diesel Oil | 3,112 | 140,176 | 436,185 |
| LPG | 2,830 | 12,941 | 36,623 |
| Naphtha | 3,061 | 109,375 | 334,828 |
| Natural Gas | 2,003 | 53,249,105 | 106,643,758 |
| **Total Emissions** | | | **254,846,869** |

**Table 6. Calculation of emission factors for fuels**

Net electricity generated and supplied to the grid by thermal plants has been calculated using data obtained from the TEIAS web page[35,36,37,38]. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,y}$ requires the inclusion of electricity imports with an emission factor of 0 $tCO_2$/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

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

**Table 7. Gross/Net electricity generation by Turkish Grid**

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

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

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

36 http://www.teias.gov.tr/istatistik2007/36(06-07).xls

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

38 http://www.teias.gov.tr/istatistik2007/35.xls

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

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

a) The set of five power units that have been built most recently, and
b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[39].

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 [40,41,42,43,4445]. 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.

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

40 http://www.teias.gov.tr/istat2004/7.xls
41 http://www.teias.gov.tr/istatistik2005/7.xls
42 http://www.teias.gov.tr/ist2006/8.xls
43 http://www.teias.gov.tr/ist2007/8.xls

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

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

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[46,47] and corresponding electricity generation[48, 49] which shows that values used are very conservative compared to actual situation.

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

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

**Table 8. Calculation of emission factor from most recent power plants**

The build margin emission factor has been determined for the most recent capacity additions as shown in table below. For electricity generation from 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 |

[46] http://www.teias.gov.tr/ist2007/45.xls

[47] http://www.teias.gov.tr/ist2007/45.xls

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

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

| | | | | |
|---|---|---|---|---|
| Renewable and wastes | 85 | 0.2% | 0.000 | 0.00 |
| Solid | 5 | 0.0% | 0.000 | 0.00 |
| Total Renewable | 2,999 | 7.3% | 0.000 | 0.00 |
| *TOTAL Capacity additions* | 41,056.3 | 100.0% | | |

**Table 9. Most recent capacity additions corresponding to 20% by fuel source**

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

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

**Table 10. List of plants identified as VER projects**
Source: http://www.markitenvironmental.com and http://cdmgoldstandard.org

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

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

**STEP 6 - Calculate the combined margin emission factor**

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

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

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 9.

**Project emissions**

The proposed project activity involves the generation of electricity by hydro electric power plant therefore project activity does not result in greenhouse gas emissions. Power density of the project(817.4 $W/m^2$) is much higher than 10 $W/m^2$ for 9.33 MW installed capacity and 11,414.3 $m^2$ maximum lake area.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad \textbf{(6)}$$

Where:

| | | |
|---|---|---|
| PD | = | Power density of the project activity ($W/m^2$) |
| $Cap_{PJ}$ | = | Installed capacity of the hydro power plant after the implementation of the project activity (W) |
| $Cap_{BL}$ | = | Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero |
| $A_{PJ}$ | = | Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full ($m^2$) |
| $A_{BL}$ | = | Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero |

For Selimoglu HEPP,

| | | |
|---|---|---|
| $Cap_{PJ}$ | = | 9,330,000 W |
| $Cap_{BL}$ | = | 0.0 W |
| $A_{PJ}$ | = | 11,414.3 ($m^2$) [50] |
| $A_{BL}$ | = | 0.0 ($m^2$) |

[50] Selimoglu Reservoir Map Area

Therefore PD is calculated as ;

$$PD = \frac{9330000 - 0}{11414.3 - 0}$$

$$PD = \underline{817.4\ W/m^2}$$

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:

$$PEFC_{,j,y} = \sum FC_{i,j,y} \times COEF_{i,y} \qquad \textbf{(7)}$$

Where:

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

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

$COEF_{i,y}$ = 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

The $CO_2$ emission coefficient $COEF_{i,y}$ will be calculated as follows(Option B):

The $CO_2$ emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and $CO_2$ emission factor of the fuel type i, as follows:

$$\boxed{\mathbf{COEF_{i,y}} = NCV_{i,y} \times EF\ CO_{2,i,y}} \qquad \textbf{(8)}$$

Where:

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

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = Is the weighted average $CO_2$ emission factor of fuel type *i* in year *y* ($tCO_2$/GJ)

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

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:

$$\mathbf{PEFC_{j,y} = \sum FC_{i,j,y} \times COEF_{i,y}} \quad \textbf{(9)}$$

Where:

$PEFC_{j,y}$ = Are the $CO_2$ emissions from fossil fuel combustion in process j during the year y (tCO2/yr);
$FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass /volume)
$COEF_{j,y}$ = Is the $CO_2$ emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
i = Is the fuel types combusted in process j during the year y

**Leakage**

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

$$\boldsymbol{LE_y = 0}$$

As a result: Total Emission Reduction is;

$$\boldsymbol{ERy = BE_y - PE_{FC_{j,y}}}$$

PEFCj,y = Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr);
FCi,j,y = Is the quantity of fuel type i combusted in process j during the year y (mass /volume)
$COEF_{j,y}$ = Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit)
i = Is the fuel types combusted in process j during the year y

## 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 | 17,954 |
| 2011 | 17,954 |
| 2012 | 17,954 |
| 2013 | 17,954 |
| 2014 | 17,954 |
| 2015 | 17,954 |
| 2016 | 17,954 |

| | |
|---|---|
| **Total emission reductions** (Tones of $CO_2$ e) | **125,677** |
| **Total number of crediting years** | 7 |
| **Annual average over the crediting period of estimated reductions** (tones of $CO_2$e) | 17,954 |

**Table 13. 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 Selimoğlu HEPP in year y |
| Source of data to be used: | Metering devices used in power plants, monthly records signed by TEIAS and the plant manager and the 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 31.97 GWh |
| Description of measurement methods and procedures to be applied: | Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the manager/electricity technician of the plant will record the readings and sign. This record will form the basis for monthly invoicing. |
| QA/QC procedures to be applied: | Two ammeters (ELSTER A1500) will backup each other. These meters will be chosen according to national regulations and approved and sealed by TEIAS at start up of the plant. Maintenance and calibration of the metering devices will be made by TEIAS periodically. In addition to invoices and metering devices, the electricity delivered to the grid can be cross checked through TEIAS web page(http://pmum.teias.gov.tr) using the ID and password of the project owner. All records will be kept for at least two years. |
| 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 used: | Project site |
| Measurement Procedure | Calculated from topographical surveys |
| Monitoring Frequency | Yearly |
| QA/QC procedures to be applied: | In case of difficulty in calculating reservoir area, maximum surface area will be calculated as is the reservoir is full. |
| Any comment: | The 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:

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.

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. All technical staff will be trained to have certified to work with high voltage equipment as required by the regulations[51].

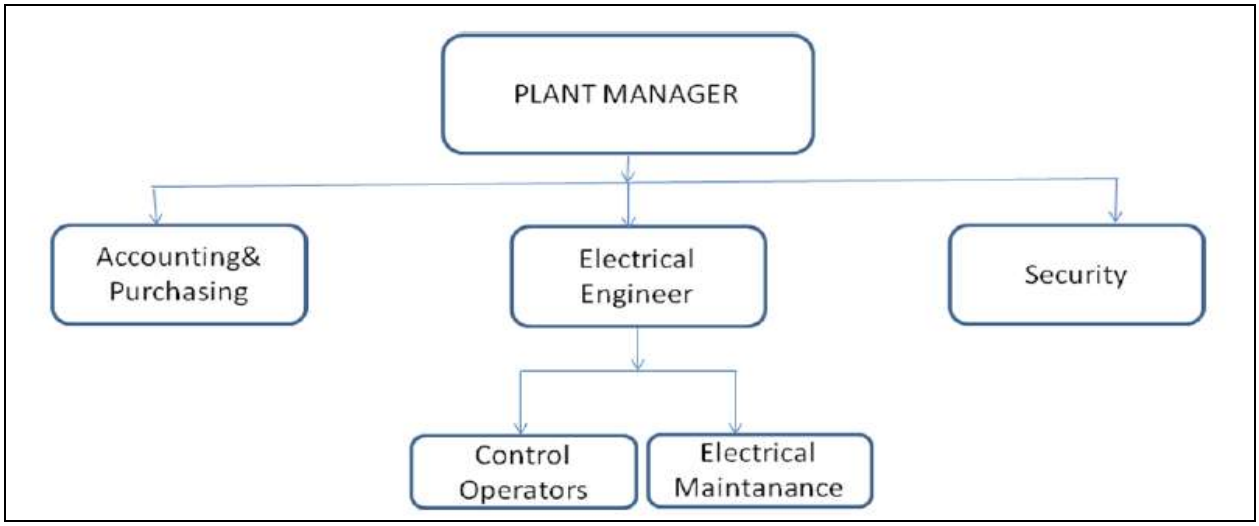


**Figure 6. Operational structure of Selimoglu HEPP**

VER Team Members is expected to include;
**Plant Manager:** Overall responsibility of compliance with VER monitoring plan
**Electrical Engineer:** Responsible for day to day running of plant, recording and monitoring of relevant data and periodic reporting
**Accounting Manager:** Responsible for keeping data about power sales, invoicing and purchasing.
**Control Operators Electrical Maintenance:** Staff will responsible for day to day operation and maintenance of the plant and equipments. All staff will be trained and have certificated for working with high voltage equipments.
**Global Tan Energy:** Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of meter and data monitoring will be carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) will be used for monitoring the electricity generated by the power plant. Readings will be done using main metering devices and spare metering device will be used for comparison only. Data from metering devices will be recorded by TEIAS monthly and form the basis for invoicing using the template formed by TEIAS[52] which will be used for cross checking of generation data. In addition to the two metering devices, generation of the Selimoglu 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

[51] Regulation For High Voltage Facilities, Article 60.

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

be multiplied by transmission loss factor of the grid. All data will be kept for at least two years after the crediting period for QA/QC purposes. Calibration and maintenance of the metering devices will be carried out by TEIAS as per the regulations. During commissioning of the plant, the meters will be calibrated and sealed by TEIAS staff so that the project owner will not have any access to the metering devices.

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

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

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

Baseline Calculated By:
Mehmet Kemal Demirkol (Date of Completion: 15/06/2009)
Global Tan Energy Limited (GTE- http://www.gte.uk.com)
Telephone: +90 312 472 35 00
Fax: +90 312 472 33 66
E-mail: kemal@gte.uk.com

## SECTION C. Duration of the project activity / crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

Project start date has been determined as 11/07/2007 date of equipment purchase agreement.

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

The expected operational lifetime of the project is about 46 years. Although the technical lifetime of Hydroelectric power plants are longer, the license issued to project owner is valid for 49 years including construction period. Plant will be delivered to the government at no cost at the end of the license period.

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

Renewable crediting period is chosen for the project activity.

#### C.2.1. Renewable crediting period:

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

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

**C.2.1.2. Length of the first crediting period:**

First crediting period will be valid for 7 years

## SECTION D. Environmental impacts

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

Run of river projects smaller than 10 MW are outside the scope of Environmental Impact Regulations. A letter has been sent by the Project owner to the Ministry of Environment and Forestry requesting that Selimoğlu Project be evaluated under the Environmental Impact Assessment Regulations.

However since the installed capacity of Selimoğlu power plant is below 10 MW, Ministry of Environment and Forestry have responded that the project is to be evaluated outside the scope of the Environmental Impact Assessment Regulations. However, Environmental impacts of the project has been assessed in feasibility report (Section 7) and no significant permanent negative impact of the project has been identified.

The letter which states that Selimoğlu weir and HEPP project is outside the scope of EIA Regulations are given in Annex 5.

**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 Selimoğlu HEPP project is a run of river energy generation project without any storage capacity. No negative impact of the project activities has 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 the relevant agencies and all the precautions have been applied strictly by the owners. As the installed capacity is below 10MW, project is exempted from pre-EIA and EIA as per the regulations. Since the project site do not involve any protected area or species and naturally/historically important area, upon initial evaluation by relevant Government Authorities, it has been concluded that project's environmental impacts are not significant. The EIA exemption letter has been included as Annex 6 of this document. Environmental impacts of Selimoglu HEPP project has been evaluated within the scope of feasibility study of the project all measures against identified environmental impacts have been addressed[53].

Main structures to be constructed for the proposed project are weir, access roads, tunnel, penstock, powerhouse, electricity transmission line and water conveyance line. Since the project is a small scale project, a tunnel of about 2.75 km will be constructed which is connected to loading pool by short channels on both side. The weir and powerhouse locations are near the existing village road. The road will be renovated after and paved by the company as a contribution to the village. The transmission line will have a length of 10 km. The only environmental impact of the project will be due to construction of

[53] Selimoglu HEPP Feasibility Study, Section 7.3

weir and powerhouse which may affect a few trees. All the construction permissions will be acquired by the relevant government authorities and all measures will be taken to minimize environmental impact. Excavation wastes obtained during tunnel construction will be used in concrete production and deposited on sites permitted if necessary.

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

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

## SECTION E. Stakeholders' comments

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

Local Stakeholder meeting of the project was organized and held on 28/11/2008, in Fındıklı Village, which is one of the closest locations to the Selimoğlu HEPP project location. As Turkey was not a party to Kyoto Protocol, there existed no officially designated national authority (DNA), instead the Ministry of Environment and Forestry who act as Focal Point of UNFCCC for Turkey and Ministry of Energy and Natural Resources were invited.

Local and international NGOs, Government Agencies and individuals were invited. Invitation letters were sent by mail and fax to local and national government institutions, NGOs and GS supporters. Local people have been invited through announcement published in newspaper (EKSPRES, a local newspaper, on 05/11/2008).

Stakeholder Feedback Round (SFR) has been organized through letters sent by mail, email or hand delivery. All participants identified and those who have participated have been involved in invitation list. Local people have been involved through hand delivery of LSC meeting summary in Turkish and invitation letter requesting their feedback. Local and National institutions have been invited through mail and fax message whereas GS supporter NGOs have been informed by email message. All project documents have been published on GTE web site (www.gte.uk.com) for more than 60 days.

KUZEY ekspres

'KARADENİZ'İN SESİ, BÖLGENİN GAZETE

5 Kasım 2008 Salı — Bağımsız Günlük Gazete — www.kuzeyekspres

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# DUYURU

Hidrokontrol Elektrik Üretim Sanayi A.Ş, Selimoğlu Hidroelektrik Santrali Projesi ile ilgili olarak, gönüllü anlaşmalar çerçevesinde kurban ticareti sertifikalandırması çalışmalarına başlamıştır. Bu konuya yönelik paydaşlar toplantısı 28 Kasım 2008 tarihinde gerçekleştirilecektir.

Toplantıya ilişkin detaylar ve toplantı programı aşağıda bilgilerinize sunulmuştur. Ilgili kişilerin toplantımıza katılmaları bizleri mutlu edecektir.

**Paydaşlar Toplantısı:**
**Tarih:** 28.11.2008
**Yer:** Fındıklı Belediye Binası altı, Fındıklı Çay Salonu
Arsin-Trabzon

**Toplantı Programı:**

| | |
|---|---|
| 14.00-14.20 | Açılış ve Tanıtım |
| 14.20-14.40 | Proje Tanıtımı |
| 14.40-15.00 | Iklim Değişikliği, Karbon Ticareti |
| 15.00-15.30 | Forum |
| 15.30-16.00 | Çevresel ve Sosyo-Ekonomik Değerlendirme |

**Figure 7. Newspaper announcement published in newspaper (EKSPRES, on 28/11/2008).**

Agenda of the meeting was scheduled as given below.

| **LOCAL STAKEHOLDER CONSULTATION MEETING** | |
|---|---|
| **Date** | 28/11/2008 |
| **Place** | Fındıklı Tea House, Fındıklı Village, Trabzon |
| | |
| **AGENDA** | |
| **14:00 – 14:20** | Opening of the meeting and Introduction |
| **14:20 – 14:40** | Introduction of the Project |
| **14:40 – 15:00** | Presentation of Climate Change and Carbon Offsetting |
| **15:00 – 15:30** | Forum (Q&A) |
| **15:30 – 16:00** | Discussion about Environmental & Sustainable Development Evaluation Form |


**Figure 8. Selimoğlu HEPP Stakeholders Meeting**

This Local Stakeholders Consultation Meeting was recorded on video and minutes of the meeting were noted.

## E.2. Summary of the comments received:

Local stakeholders' consultation meeting has been organised and held on 28/11/2008 in Fındıklı village, closest location to the Selimoğlu Project, in the Arsin district of Trabzon Province. In general stakeholders' comments were positive about the Project.

Four main issues raised by the participants during the meeting were:

- Job opportunities
- Effect on the Corn Flour Mill by the project
- Closing of the roads during transportation of excavation

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

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

Job opportunities: Project Owner's representatives confirmed that there would be no negative effect to locals during the project construction and operation phase. All the excavation and concrete construction works (except tunnel drilling) have been given to 'local construction company', namely 'Mutlu Construction Company'. 40 local employees work for Selimoglu HEPP. Tunnel drilling works have been subcontracted by 'TST Company'. TST Company has 15 local employees.

Effect on the Corn Flour Mill by the project: The project owner shall carry out the appropriate and probable works according to the views of the local people.

Closing of the roads during transportation of excavation: The problem of closing the roads shall be finished in 2 months. However the project owner is trying to shorten this phase and is helping people by assigning transportation.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
| Organization: | Hidro Kontrol Elektrik Üretim Sanayi A.Ş. |
| Street/P.O.Box: | Altunizade Kısıklı Cad. AKÖZ İş Merkezi USKUDAR |
| Building: | No:18 |
| City: | ISTANBUL |
| State/Region: | |
| Postcode/ZIP: | 34662 |
| Country: | Turkey |
| Telephone: | +90 216 474 1 474 |
| FAX: | +90 216 474 0 474 |
| E-Mail: | info@hidrokontrol.cc |
| URL: | www.hidrokontrol.cc |
| Represented by: | Manager |
| Title: | |
| Salutation: | Ms. |
| Last name: | Erdogdu |
| Middle name | - |
| First name: | Sara |
| Department: | Finance and Business Development |

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

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING WAS USED FOR FINANCING THE PROJECT ACTIVITIES.

## Annex 3

## BASELINE INFORMATION

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

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

**Table 11. Values used in calculation of OM** [54]

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

**Table 12. Amount of fuels used for electricity generation**[55,56,]

| 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** |

54 2007 Turkey National GHG Inventory, http://unfccc.int/national_reports/annex_i_ghg_inventories/items/2715.php

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

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

**Table 13. Net Electricity supply to the grid by thermal plants and imports (GWh)[57]**

**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 14. Net calorific values, generation efficiency and emission factor data used in calculations**

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

**Table 15.** Most recent capacity additions corresponding to 20%.[58,59,60,61]

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

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

59 http://www.teias.gov.tr/istatistik2005/7.xls

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

61 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

EPDK

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır

Lisans No : EÜ/1069-1/787

Tarih : 25/01/2007

Bu Lisans, **Hidro Kontrol Elektrik Üretim Sanayi Anonim Şirketi**'ne, Trabzon İli'nde kurulacak olan **Selimoğlu Regülatörü ve Hidroelektrik Santralı** üretim tesisinde 25/01/2007 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 25/01/2007 tarihli ve 1069-1 sayılı Kararı ile verilmiştir.

Yusuf GÜNAY
Başkan

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

## Annex 6

## EIA EXEMPTION LETTER

T.C
TRABZON VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Sayı: B.18.61.İÇO.03/299-4278 TRABZON
Konu: ÇED Yönetmeliğine göre görüş bildirme(HES) 22/09/2008

KARÇEV ÇEVRE YÖN. VE ARIT. TEK. SAN. MÜH. MÜŞ. LTD. ŞTİ.'NE
Kemerkaya Mah. Cumhuriyet Cad. 2 nolu Mektep Sok.
Gedikli Apt. No: 35/5/ TRABZON

İlgi : a) 29.05.2007 tarih ve 2007/86 ve 2007/87 sayılı yazılarınız.
b) 05.06.2007 tarih ve 1950 ve 1951 sayılı yazılarımız.
c)18.09.2008 tarih ve 2008/114 sayılı yazınız.

İlgi (a) ve (b) yazılarınızda, Trabzon İli Arsin İlçesi Yanbolu Deresi üzerinde Hidrokontrol A.Ş. tarafından yapılması planlanan "Selimoğlu Regülatörü ve Hidroelektrik Santrali" nin (8,79 MW kapasiteli) ve Trabzon İli Köprübaşı İlçesi Büyükdoğanlı Kasabası sınırlarında Manahoz Deresi üzerinde ÖZTAY Enerji Üretim San. A.Ş. tarafından yapılması planlanan "Günayşe Regülatörü ve Hidroelektrik Santrali" nin (7,9 MW kapasiteli) ÇED Yönetmeliği kapsamında değerlendirilmesi talep edilmiştir.

Yapılan inceleme-değerlendirme sonucunda, ilgili taleplerinizin 10 MW kapasiteden düşük olması nedeniyle o dönemde yürürlükte olan 16.12.2003 tarih ve 25318 sayılı Çevresel Etki Değerlendirmesi (ÇED) Yönetmeliği kapsamında yer almadığı sonucuna varılmış olup, ***projeler için ÇED Raporu veya Proje Tanıtım Dosyası hazırlanmasına gerek bulunmadığına dair ilgi (b )yazılarımızla tarafınıza bilgi verilmiştir.***

Ancak ilgi (c) yazınızda söz konusu ÇED kapsamı dışında kaldığına dair yazılarımızın bazı kurumlarca yeni ÇED Yönetmeliğe göre güncellenmesi istendiğinden bahisle, önceki yazımızın geçerli olup olmadığı sorulmaktadır.

İlgi (c) yazınızda da belirtildiği üzere, ÇED Yönetmeliği revize edilerek 17.07.2008 tarih ve 26939 sayılı Resmi Gazetede yayımlanarak yürürlüğe girmiştir. Her ne kadar da yeni yönetmelikte, HES projelerinde alt sınır 0,5 MW'a indirilmişse de, tarafınıza verilen önceki ÇED kapsamı dışında olduğunuza dair yazılar kazanılmış hak oluşturduğundan, projelerinizde kapasite artışı veya yer değişikliği olmadığı sürece geçeli olacaktır. Ancak kapasite artışları veya yer değişikliklerinin inşaata başlanmadan önce ÇED Yönetmeliği gereği mutlaka tarafımıza bildirilmesi ve verilecek karara göre hareket edilmesi gerekmektedir.

Bilgilerinizi ve gereğini rica ederim.

Fahrettin ULU
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**Annex 7**

**HEPPS OWNED BY GENERATION COMPANIES**

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

**Table 19. List of HEPPs Operational at time of investment decision**

## Annex 8

**Distances with existing plants**