# KİRAZLIK HYDROELECTRIC POWER PLANT PROJECT

Document Prepared By Ekobil Environmental Services and Consulting Ltd.

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| | |
|---|---|
| **Project Title** | Kirazlık Hydroelectric Power Plant Project |
| **Version** | 2.02 |
| **Date of Issue** | 24-05-2013 |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

The Kirazlık Hydroelectric Power Plant (Kirazlık HPP from this point onward) project is to be constructed at the Eastern Anatolia Geographical district of Turkey over the Botan Stream that is one of the major tributaries of the River Tigris.

The Kirazlık HPP will be at the downstream of the following energy projects, counting from the closest to the upstream direction: Alkumru, Çetin, Pervari, Narlı, Olur and Keskin. The Kirazlık HPP is designed with a small reservoir with a downstream regulation power plant. The dam is an earth fill dam with central clay core and concrete gravity type with a 16.80 m height above thalweg.

At the initial design the project was designed with a capacity of 37.62 $MW_e$, later the electromechanical equipment producers proposed to increase the capacity to 43.62 $MW_e$, by improving turbine and generator efficiencies. In addition to this another turbine is added along the way of lifeline water discharge to make use of the energy of the water before it would be discharged to support the downstream aquatic life. And this additional unit improved the capacity by adding a capacity of 2.50 $MW_e$ and the total capacity of the project has ended up as 46.11 $MW_e$.[1]

With the latest designed capacity the project is estimated to produce 150,610 MWh of electricity per year[1].

The Major milestones at the project development history can be summarized as shown in the following table (Table 1):

Table 1: Major Milestones of Kirazlık HPP Project

| Date | Milestone | Reference |
|---|---|---|
| **1-Jul-2007** | Feasibility Study Report | Feasibility Study Report |
| **1-Sep-2012** | Revised Feasibility Report | Revised FSR |
| **12-Aug-2008** | Water Usage Agreement Signed with DSI | Water Usage Agreement |
| **9-Oct-2008** | Electricity Production Licence issued by Energy Market Regulatory Authority (EMRA) and the revised special | EMRA Licence granted to the Project Owner |
| **19-Aug-2009** | EIA Affirmative certification | EIA Certification |
| **29-Apr-2010** | Amendment to Water Usage Agreement | Amendment Agreement |
| **29-Apr-2010** | Licence modifications approved by EMRA | EMRA Specified conditions Amendment pages |
| **28-Jun-2010** | Construction Started | Baren Enerji-Limak Insaat Construction Contract |
| **19-Jan-2011**[2] | Signing of the Kirazlık HPP Contract for Supply and Erection of Electromechanical Equipment | The Kirazlık HPP EM contract |

[1] The capacity change of the project is documented in the official correspondences made between the project ower, DSI and EMRA (DSI letter dated 24/04/2013) .
[2] This date is marked as the investment decision date.

| Date | Milestone | Reference |
|---|---|---|
| **14-Mar-2011** | Siirt Governance Approved the land use change of the Pasture portion | Expropriation memorandum |
| **4-Jan-2012** | TEIAS system connection agreements signed | TEIAS Connectivity Agreement |
| **27-Feb-2012** | The pasture land is designated as land of treasury | Expropriation memorandum |
| **1-May-2012** | The start of the construction of the TEIAS electricity transmission line | Kirazlik transmission line installation contract |
| **September - 2012** | The feasibility report is revised and finalized to exhibit final design of the project activity | Revised FSR |
| **24-September 2012** | The revised feasibility report is presented to DSI to inform about the design change | Letter Sent to DSI |
| **25-September-2012** | Application to DSI to inform about the September 2012 Feasibility Report that explains the addition of the 4th unit | Letter sent to DSI |
| **24-April-2013** | DSI correspondence to EMRA, stating that they recognize the "Feasibility Study Report" and they wait for EMRA to update the "Production License" so that they can amend 2008 Water "Usage Agreement" | Letter of DSI sent to EMRA |
| **25-April-2013** | Application to EMRA For the addition of the Fourth Turbine | Baren Letter Sent to EMRA |

The following figure shows the relationship of the Project Activity with respect to other energy project activities over the Botan Stream (Figure 1). Note that not all of these projects are yet commissioned.

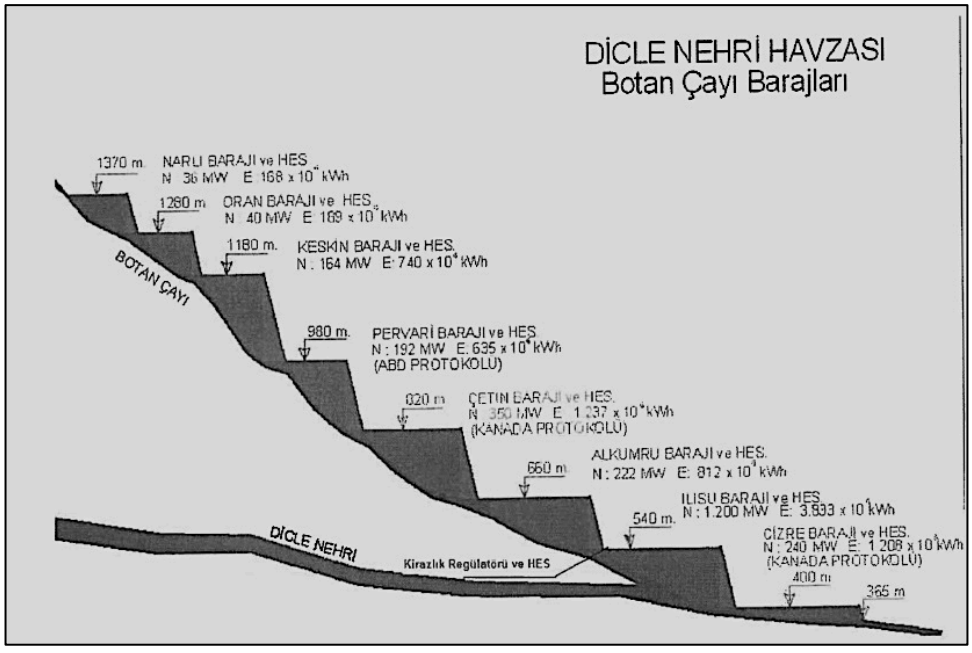



**Figure 1:**The Project Activity and its position on Botan River with respect to other energy project activities.

The following figure (Figure 2) schematically summarizes how the project activity will be operating and what needs to be considered within the physical project boundary.

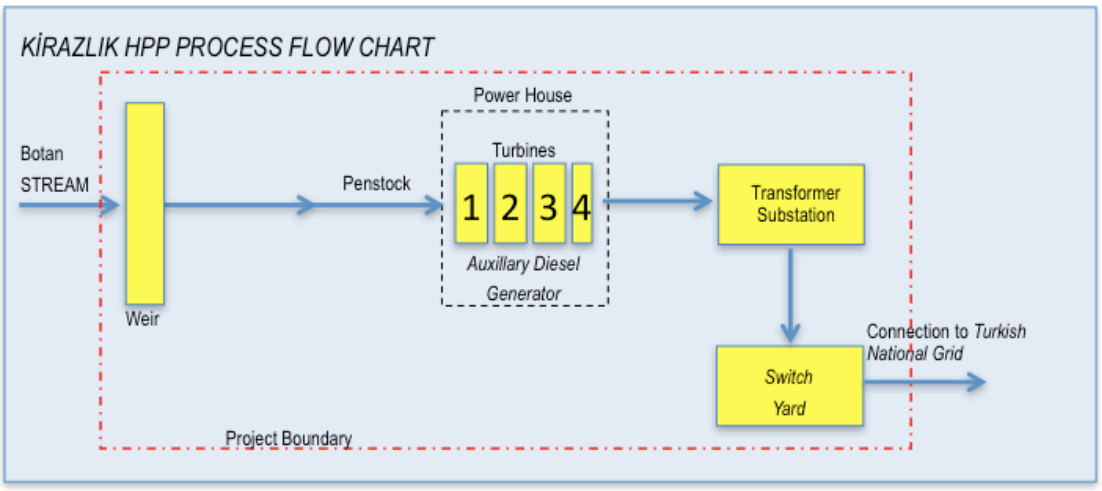



Figure 2: Flow chart showing the basic operational principles of the project activity.

## 1.2 Sectoral Scope and Project Type

The project category is Sectoral Scope 1: Energy industries (renewable-/non -renewable sources). The project type is grid connected electricity generation from renewable sources. The project is a non-grouped, stand-alone project.

## 1.3 Project Proponent

| Project Proponent | Role and Responsibility | Contact Information |
|---|---|---|
| Baren Enerji Üretim San. ve Ticaret A.Ş.[3] | Project Owner – Implementation of the Project | Hafta Sokak No:9 G.O.P. Çankaya/Ankara-Turkey<br>Tel: +90 312 446 88 00<br>Fax: +90 312 437 38 46 |

## 1.4 Other Entities Involved in the Project

| Other Entities Involved | Role and Responsibility | Contact Information |
|---|---|---|
| Ekobil Environmental Services and Consulting Ltd.[4] | Preparation of the Project Description Document | Güneykent Sitesi 51. Cad. 1839. Sk. No: 56 Ahlatlıbel-ANKARA<br>T:+90 312 489 13 38<br>E-mail:info@ekobil.com |

[3] The project owner Baren Enerji Üretim San. Ve Ticaret A. Ş. was initially a Limited Liability Company, with the title: Baren Enerji Üretim Sanayi ve Ticared Limited Şirketi. The company status has changed to a Corporation on 26 April 2013, with an announcement at the Trade Registry Gazette dated 26 April, 1013 and numbered: 8308, Published by Ankara Chamber of Commerce.

[4]Registered to the Ankara Chamber of Trade, with the full name of "Ekobil Çevre Hizmetleri Danışmanlık Eğt.Tar. Hayv. Mad. İnş. İth. İhr.Tur. ve Tic. Ltd. Şti."

## 1.5 Project Start Date

Project start date is: 22nd of October, 2013[5], or when the project will be commissioned (which ever will be earlier).

## 1.6 Project Crediting Period

The project crediting period is 10 years: 22.10.2013 or when the project will be commissioned - which ever will be earlier) to 21.10.2023 (both dates inclusive). The crediting period is renewable twice.

## 1.7 Project Scale and Estimated GHG Emission Reductions or Removals

| | |
|---|---|
| Project | ☑ |
| Large project | ☐ |

| Years | |
|---|---|
| Year 0: 22.10.2013 to 31.12.2013 | 15,815 |
| Year 1: 2014 | 81,307 |
| Year 2: 2015 | 81,307 |
| Year 3: 2016 | 81,307 |
| Year 4: 2017 | 81,307 |
| Year 5: 2018 | 81,307 |
| Year 6: 2019 | 81,307 |
| Year 7: 2020 | 81,307 |
| Year 8: 2021 | 81,307 |
| Year 9: 2022 | 81,307 |
| Year.10: 2023 (01.01.2023 to 21.10.2023) | 65,492 |
| **Total estimated ERs** | 813,070 |
| **Total number of crediting years** | 10 |
| **Average annual ERs** | 81,307 |

## 1.8 Description of the Project Activity

The main technical characteristics obtained from the DSI Approved, final feasibility report are provided below (Table 2):

Table 2: Technical characteristics of the Kirazlık HPP.

| ***Hydrology*** | | |
|---|---|---|
| Catchment Area of ($km^2$) | : | 7590.8 |
| Annual average flow rate ($m^3/s$) | : | 131.27 |

[5] In the Verified Carbon Standard project start date is defined as the first date the project is going to start removing GHG, thus this is the date the project is expected to produce electricity.Therefore, the project start date is considered to be 22nd of October 2013. This date is provided as the expected date of commissioning by the project owner, based on the E&M installation work plan provided by the E&M contractor (Zhejiang Orient Engineering Co., Ltd, Zhejiang,China and ABS Elektrik Sanayi A.ş , Istanbul ,Turkey (Orient and ABB in short) designated as Kirazlık Consortium, in the E&M Contract). The work schedule of the E&M manufacturers indicate the last date for the wet test of the first turbine to be commissioned as 22nd of October 2013. (The E&M manufacturers work schedule is provided to the validating DOE).

| | | | |
|---|---|---|---|
| Annual water income to the reservoir ($hm^3$) | : | 4082.86 | |
| Project Flow Rate ($m^3/s$) | : | 300+14 | |
| Flood Rate ($Q_{100}$) ($m^3/s$) | : | 2292.7 | |
| ***Dam*** | | | |
| Type | : | Earth fill with central clay core | |
| River bed elevation | : | 525.00 m | |
| Radial gate spillway sill elevation | : | 526.41 m | |
| Radial gate upper elevation | : | 542.11 m | |
| Radial Gate Dimensions (W x H) | : | 15.7 m x 10.5 m x 2 units | |
| Crest elevation | : | 544.00 m | |
| Maximum water elevation | : | 541.80 m | |
| Normal water level | : | 541.80 m | |
| ***Penstock*** | | | |
| Dimensions and number of units | : | 3 rectangular units with 6 m x 8m and 1 circular unit 2.30 m radius. | |
| Length | : | 3 units with 34.50 m length and 1 unit with 38 m length | |
| Thickness | : | 16/18 mm | |
| ***Power House*** | | ***Main Units*** | |
| Turbine type | : | Vertical Axis Kaplan | Vertical Axis Kaplan |
| Capacity | : | 43.62 $MW_e$ (14.54$MW_e$X3) | 2.50 $MW_e$ **(One Unit)** |
| Project flow rate | : | 300 $m^3/s$ | 14 $m^3/s$ |
| Unite number | : | 3 identical | 1 unit |
| Tail water elevation | : | 525 m | 525.20 m |
| Gross head | | 16.8 m | 21.00 m |
| Net head | | 16.4 m | 20.80 m |
| ***Energy Production*** | | | |
| Firm (GWh) | : | 110.21 | |
| Secondary (GWh) | : | 40.40 | |
| Total (GWh) | : | 150.61 | |

The project will be using three identical vertical Kaplan turbines, and one smaller capacity vertical axis Kaplan turbine. The Kaplan turbine is a propeller-type water turbine, which has adjustable blades. It was developed in 1913 by the Austrian professor Viktor Kaplan, who combined automatically adjusted propeller blades with automatically adjusted wicket gates to achieve efficiency over a wide range of flow and water level.

The Kaplan turbine was an evolution of the Francis turbine. Its invention allowed efficient power production in low-head applications that was not possible with Francis turbines. The head ranges from 10–70 meters and the output from 5 to 120 MW. In case of the project activity the net head is about 20 m, and the capacity of all the turbines sums up to 46.11 $MW_e$.

The following simplified drawing shows the working principle of a Kaplan turbine (Figure 3).

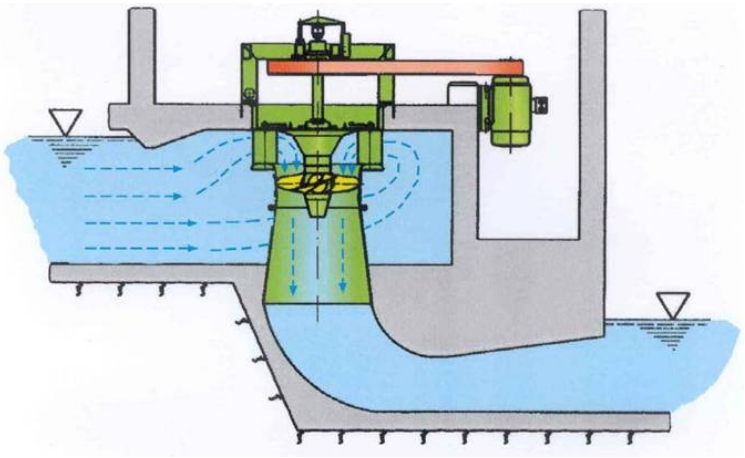


Figure 3: The drawing showing the simplified working principles of a Kaplan turbine (http://www.renewablesfirst.co.uk/kaplan-turbines.html)

The project owner is granted a production license for 49 years[6] including the 48 months of project design and construction phase. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report[7] on energy under the 8th development plan published by the Turkey's State Planning Organization. Even if the facility can last for 50 years the major equipment needs to be replaced at least partially in every 20 years[8].

The project is expected to produce an average of 150,610 MWh of electricity per year. The annual 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. Based on this a combined margin emission reduction factor is calculated as detailed below in Chapter 3 of this document.

## 1.9 Project Location

The Project Activity is located on the Botan River in the Eastern Anatolia region of Turkey, within the Siirt city borders. It is located between the elevations of 541.80 m and 525.00 m between (Figure 4).

The Following (Table 3) gives the coordinates of the Kirazlık HPP Dam location and Powerhouse location.

Table 3: Coordinates of the Weir and Powerhouse:

| | Latitude | Longitude |
|---|---|---|
| Dam | 37°55'28.43"N | 42° 3'40.31"E |
| Powerhouse | 37°55'25.73"N | 42° 3'41.28"E |

[6] According to the production licence dated 09/10/2008 and numbered EÜ/1785-1/1265
[7] http://ekutup.dpt.gov.tr/enerji/oik585.pdf (page 4.25 –p72 of PDF document Last visited on 22/07/2012)
[8] http://ekutup.dpt.gov.tr/enerji/oik585.pdf (page 4.26 - p73 of PDF document Last visited on 22/07/2012)


Figure 4: Map showing the location of Kirazlık HPP (red dot within the inset map) on the Botan River, Siirt, Turkey.

## 1.10 Conditions Prior to Project Initiation

There was no other hydroelectric power plant installation at the project location. The project activity does not generate greenhouse gas emissions, so it can be excluded that the implementation has been made only in order to generate GHG emissions with their subsequent reduction.

## 1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity additions are in compliance with host country legislation regulates addition of a new power generation capacity to the grid. The list of the rules and regulations of the host country that a new electricity generation project has to comply with is given in Annex 1.

## 1.12 Ownership and Other Programs

### 1.12.1 Right of Use

Ownership of the plant, equipment and electricity generation licence belongs to Baren Enerji Üretim San. ve Tic. A.Ş. and all emission reductions/removals are granted to the company. The

production license and the operating certification of the company given by the Chamber of Commerce are provided to the validating DOE as proof of the Title.

### 1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable

The Project Activity is not embedded under any kind of Emission trading programs. Turkey is not an Annex-B country under Kyoto Protocol, neither has its set national emission reduction targets nor any related obligations.

### 1.12.3 Participation under Other GHG Programs

Not applicable

The project is a voluntary project and the host country; Turkey cannot host CDM or JI projects.

### 1.12.4 Other Forms of Environmental Credit

Not applicable

The project will not generate other form of environmental credits such as Green Power Certificates.

### 1.12.5 Projects Rejected by Other GHG Programs

Not applicable

The project has not been rejected by any other Green House Gas programme.

## 1.13 Additional Information Relevant to the Project

### Eligibility Criteria

The Project is eligible to be a VCS Project because:

- VCS v.3.3 has taken effect on 04.10.2012; accordingly the Project is eligible to use this version.

- VCS v.3.3 requires project crediting period start date earliest to be 01.01.2002, besides, the Project must also complete the validation within two years of the Project Start Date. Both conditions are satisfied for the Project activity.

- VCS v.3.3 accepts all six Kyoto gases. The Project aims to reduce CO2, which is one of these six Kyoto gases.

- VCS v.3.3 accepts all technologies supported by an approved VCS program. The Project is a hydropower plant, the technology of which is included in the UNFCCC- CDM sectoral scope 1.

- VCS v.3.3 requires the use of one of the VCS program approved project methodologies. The Project activity uses the tools and methodologies of approved by UNFCCC CDM executive board, which is a VCS approved program.

- The project does not benefit from any kind of Official Development Assistance.

- In addition to the above, the project is not a grouped project activity, nor de-bundled part of a grouped project activity

### Leakage Management

Not Applicable as the project is a green field project.

### Commercially Sensitive Information

A detailed excel workbook summarizing the financial analysis is provided to the validating DOE with relevant evidences that are commercially sensitive, these will not be disclosed to public.

### Further Information

No further information to be added.

# 2 APPLICATION OF METHODOLOGY

## 2.1 Title and Reference of Methodology

The following UNFCCC methodology and its related tools are utilised:

Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources." Version 13.0.0.

The Approved Methodology refers to the following tools:

"Combined tool to identify the baseline scenario and demonstrate additionality" (Version 5.0.0)[9]

"Tool for the demonstration and assessment of additionality" (Version 07.0.0)

"Tool to calculate the emission factor for an electricity system". (Version 03.0.0)

"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02).

"Methodological Guideline on common Practice" (Version 2.0)

## 2.2 Applicability of Methodology

The ACM0002 (version 13.0.0) methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The choice of methodology ACM0002, Version 13.0.0, is justified as the project activity meets the following applicability criteria:

| Reference page in ACM0002 (version 13.0.0) | Applicability Criteria | Justification |
|---|---|---|
| **2** | The project activity is the installation, capacity addition, | The project activity is the Installation of a new hydro power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant) |

[9] This tool is not applied, as the project is a greenfield project that produces electricity that would otherwise be supplied by the existing host country electricity grid. In compliance with the last paragraph of the footnote 1 in the tool: "However, the tool is, for example, not applicable in the following situation: the CDM project activity is the installation of a Greenfield facility that provides a product to a market (i.e. electricity, cement, etc.) where the output could be provided by other existing facilities or new facilities that could be implemented in parallel with the CDM project activity. "

| | | |
|---|---|---|
| | retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; | |
| **3** | In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity. | Not applicable as the project is not a capacity addition |
| **3** | In case of hydro power plants, one of the following conditions must apply: | |
| **3** | The project activity is implemented in an existing single or | Not Applicable as the project activity is the addition of a new hydro power plant thus a new reservoir. |

<table>
<tr><td></td><td>multiple reservoirs, with no change in the volume of any of reservoirs; or</td><td></td></tr>
<tr><td>3</td><td>The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m2; or</td><td>Not Applicable as the project activity is the addition of a new hydro power plant thus a new reservoir.</td></tr>
<tr><td>3</td><td>The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m$^2$.</td><td>The project activity results in new reservoirs and the power density of the project activity is 46.11 W/m$^2$ which is greater than 4 W/m$^2$ as shown in the following calculation:
<table>
<tr><th>Project Activity</th><th>Installed Capacity</th><th>/</th><th>Reservoir Area[10]</th><th>=</th><th>Power Density</th></tr>
<tr><td>Kirazlık HPP</td><td>46,110,000 W</td><td>/</td><td>1,000,000 m$^2$</td><td>=</td><td>46.11 W/m$^2$</td></tr>
</table></td></tr>
<tr><td>3</td><td>In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m$^2$ all the following conditions must apply:<br>The power density calculated for the entire project activity using equation 5 is greater than 4 W/m$^2$;<br>Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project[11] that</td><td>Not Applicable as the project activity is going to result in only one single reservoir.</td></tr>
</table>

[10] The reservoir volume Area curve that indicates the aerial extent of the reservoir at maximum operation level is provided in Annex 4.
[11] This requirement can be demonstrated, for example: (i) by the fact that water flow from upstream power units spilling directly to the downstream reservoir; or (ii) through the analysis of the water balance. Water balance is the mass balance of water fed to

| | | |
|---|---|---|
| | collectively constitute the generation capacity of the combined power plant;<br>Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity;<br>Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/$m^2$, is lower than 15 MW;<br>Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/$m^2$, is less than 10% of the total installed capacity of the project activity from multiple reservoirs. | |
| **4** | The methodology is not applicable to the following:<br>Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;<br>Biomass fired power | The project activity is eligible because:<br>• It is not involving switching from fossil fuel at the site of the project activity,<br>• It is not a biomass powered power plant<br>• Project activity is resulting in the creation of a new reservoir but the power density is not less than 4 W/$m^2$. But instead it is greater than 4 W/$m^2$. |

power units, with all possible combinations of multiple reservoirs and without the construction of reservoirs. The purpose of such water balance is to demonstrate the requirement of specific combination of multiple reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum three years prior to implementation of CDM project activity.

| | | |
|---|---|---|
| | plants;<br>A hydropower plant[12] that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m$^2$. | |
| **c4** | In the case of retrofits, replacements, or capacity additions, the ACM0002 (version 13.0.0) methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance". | Not applicable as the project activity is the installation of a new hydro power plant and all the equipment that will be installed will be brand new. |
| **Footnote 3 pg.4** | The condition in the "Combined tool to identify the baseline scenario and demonstrate additionality that all potential alternative scenarios to the proposed project activity must be available options to project participants" does not apply to this methodology, as this methodology | |

[12] The ACM002 (version 13.0.0) indicates that "…project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology"; In the case of the project activity as the power density is greater than 4 W/m$^2$, there is no need for such a claim or revision request. .

| | | |
|---|---|---|
| | only refers to some steps of this tool. | |

## 2.3 Project Boundary

Table 4 exhibits the gases included in the project boundary. $CO_2$ emission is included in the baseline but the project activity does not emit any of the gases listed, in Table 4.

The project boundary includes net electricity generated and supplied to the Turkish national grid.

Table 4: Main gases included in the project boundary

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Electricity generation in baseline (Turkey's Grid) | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor emission source |
| | | $N_2O$ | No | Minor emission source |
| | | Other | N.A. | N.A. |
| Project | Emission from the reservoir of the proposed project | $CO_2$ | No | Minor emission source |
| | | $CH_4$ | No | Minor emission source (Power density greater than 10W/$m^2$) |
| | | $N_2O$ | No | Minor emission source |
| | | Other | N.A. | N.A. |

## 2.4 Baseline Scenario

Since the proposed project activity is the installation of a new grid-connected hydroelectric, that is renewable power plant and therefore, the baseline scenario is defined as the following based on ACM0002 (Version 13.0.0):

"Electricity delivered to the grid by the project activity 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 (v.3.0.0)."

Since the proposed project activity is going to be connected to the Turkish national grid, the baseline scenario of the proposed project is the supply of the equivalent amount of annual power output by the existing Turkish national grid, which is the continued operation of existing power plants and the addition of new sources to meet electricity demand. As clearly described in chapter 3 the power grid of the host country is dominated (about 75 %) by thermal power plants (see table 9). Therefore in the absence of the project activity the same amount of electricity is to be produced by the existing grid, where 75 % of it will be power plants with the primary source of electricity will be coal, and natural gas.

Based on ACM002, baseline emissions are equal to power generated by the project activity that is delivered to the Turkish national grid, multiplied by the baseline emissions factor. This baseline emissions factor (EFy) is calculated as the Combined Margin (CM), of which the breakdown and detailed description is given below in chapter 3.

## 2.5 Additionality

The proposed project activity reduces GHG emissions by substituting fossil fuel based electricity generation by renewable resources (hydro) based electricity generation.

This part refers to the "Tool for the Demonstration and Assessment of Additionality Version 7.0.0" and the numbering in this section reflects the Tool's Guidelines provided at EB 70,Annex 8.

**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 project alternatives can be defined as follows:

a. The proposed project activity undertaken without being registered as a VCS project activity. This alternative is very unlikely as it is not financially attractive, please refer to step 2 for details.

b. Potential alternatives with the output of renewable electricity such as a geothermal, solar or wind power plants. These alternatives are very unlikely as, wind or geothermal resources do not exist in the project area and the solar plants are technologically not available and are not technically feasible to implement.

c. Continuation of the current situation (No project activity or other alternatives undertaken). This alternative is the most likely scenario, since there are no legal obligations to implement such a project and without VCS support the project implementation is financially not attractive.

**Outcome of Step 1a:** The only realistic and credible alternative scenario to the project activity is Scenario (c) Continuation of the current situation, without any project undertaken (a) is not realistic as shown below by the financial analysis that exhibits that the project is not viable without VER revenues.

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

The project alternative, the baseline scenario, which is the continuation of the existing situation, is in compliance with all mandatory applicable and legal and regulatory requirements. Also Energy Market Regulatory Authority (EMRA) who issues the licenses for electricity generation and is responsible for ensuring that new capacity complies with host country regulates the alternative scenario of addition of a new power generation capacity to the grid. The list of the rules and

regulations of the host country that a new electricity generation project has to comply with is given in Annex 1.

**Outcome of Step 1b:** The alternative scenario to the project activity is the supply of electricity by the existing grid with additional capacity is in compliance with mandatory legislation and regulations.

**Step 2 - Investment analysis**

At this step it will be demonstrated that "the proposed project activity is not the most economically and financially viable" option without the VER revenue. Please note that, at this step, the "Guidelines on the assessment of investment analysis" (EB 62 Report Annex 5) Version 05 is taken into account.

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

There are three options for investment analysis method:

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

"Simple Cost Analysis" is not applicable for this project activity as the project generates economical benefits from sale of electricity to the Turkish national grid". Investment Comparison Analysis is also eliminated since the baseline for the project is "the generation of electricity by the existing grid" and no similar investment alternatives exist. Therefore, Benchmark Analysis is the most appropriate approach for the evaluation of the project activity.

**Sub-step 2b - Option III-Apply benchmark analysis**

Internal Rate of Return (IRR) on equity is taken for this project to be the financial indicator for assessing the financial viability of the project activity..

Equity IRR is the cash flow returns to equity shareholders after debt repayments. And therefore also takes into account the debt repayments. Equity IRR takes into consideration that you use debt for the project, so the inflows are the cash flows required minus any debt that was raised for the project. The outflows are cash flows from the project minus any interest and debt repayments.

To be able to assess the financial viability of the project a benchmark to compare the equity IRR is needed.

The Tool for the Demonstration and Assessment of Additionality Version 7.0.0 and the Guidelines issued at EB 62 state that "...Discount rates and benchmarks shall be derived from: Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data"

The Guidelines issued at EB 62[13], provides the default values for the expected return on equity as an appendix, and Moody's index values of most of the CDM Countries. At the time of investment decision, (2011) Turkey's Moody's index was (Ba2)[14] . This index of Ba2 is comparable to country's with the same Moody's index, and same default benchmark value (please see the appendix of the guidelines issued at EB 62[12]) from this point of view a reasonable and appropriate benchmark to compare the Equity IRR can be taken as 12.50 %.

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

The following parameters are taken into account for the assessment of the investment (Table 5) and supplementary parameters are provided in the "KirazlıkFinancialAnalysis" workbook and submitted to the validating DOE. The parameters are calculated based on the investment decision date marked by the date of the Electromechanical Equipment Procurement and Installation agreement dated 19 January 2011.

Table 5: Major parameters taken into account for the financial analysis and determination of the Equity IRR of the Kirazlık HPP Project:

| Parameter | Value | Unit | References |
|---|---|---|---|
| Installed Capacity | 46.11 | MWe | Third Party feasibility study report |
| Expected Annual Electricity Generation | 150,610 | MWh | Third Party feasibility study report |
| Expected Annual Emission Reduction(ER) | 81,307 | $tCO_2e$ | Calculated (see Chapter 3 for details) |
| Expected VCS-SCS- VCU sales price | 7.00 | USD/t $CO_2e$ | State of the Voluntary Markets 2010[15] |
| Total Investment | 128,732,273 | USD | Based on construction,and EM contracts and estimations on Expropriation and security expenses. |
| Annual Operation Costs | 1,228,574.69 | USD | Based on Up to date FSR Table 9.4 and labour cost estimations. |
| Loan | Confidential | USD | Loan Agreement |
| Loan Period | 10 | years | Loan Agreement |
| Electricity Sales Price | 0.09 | USD/KWh | Based on the estimations in the DSI recognised FSR. Chapter 9.1. |
| VAT | 18 | % | V.A.T. Law No:3065 |
| Income Tax | 20 | % | Income Tax Law number 5281 |

Thirteen percent of the value of the investment has been depreciated on a reducing balance basis over 15 years, and 87 % of the long lasting assets are depreciated over 40 years and the residual book value of 48,890,025 USD is added back to the cash flow. The economic life time of a hydro power plant investment is assumed to be about 50 years, based on the experts' committee report[16] on energy under the 8th development plan published by the State planning

[13] Annex 5 Guidelines on The Assessment of Investment Analysis (Version 05)
[14] Please visit http://www.moodys.com ; and search for "Turkey". At the time the PDD was prepared the Moody's index of Turkey was Baa3, but at the time of invest ment decision the rating was Ba2, this is shown by the Junary 8, 2010 rating action paper and August 3, 2011 announcement published by Moody's.
[15] Hamilton, K., Sjardin, M., Peters-Stanley, M., and Marcello, T., 2010, Building Bridges: State of the Voluntary Carbon Markets 2010;A Report by Ecosystem Marketplace &Bloomberg New Energy Finance, June 14, 2010.
[16] http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.25 (Last visited on 3/3/2011)

organization. Even if the facility can last for 50 years the major equipment needs to be replaced in every 20 years[17]. As a result the project lifetime is estimated to be about 20 years and the investment analysis is therefore done for a time frame of 20 years and an additional 2 years (prior to project commissioning date) is also taken into account as the loan commission and interest charges.

For the assessment of the viability of the project activity the Equity IRR is compared to the benchmark. The equity IRR is worked out as 6.48 %, which is below the benchmark of 12.50%.

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

To be able to conclude if the investment decision is the financially the most attractive alternative, a sensitivity analysis is performed. Three parameters that affect the equity IRR are examined for the sensitivity analysis:

- Investment Cost
- Operating and Maintenance Cost
- Electricity Revenue

The sensitivity analysis is performed for a range of ±10% fluctuations in the above parameters. The figures in the following table (Table 6) are obtained. Following the "Guidelines on the assessment of investment analysis (Version 05)" of EB 62 Annex 5 when any of the key variables are increased or decreased by at least 10%, and the benchmark is not exceeded (also see Figure 5).

Table 6: Sensitivity analysis for the Equity IRR without carbon revenue for the project (Benchmark: 12.50%)

| Change | -10% | -5% | 5% | 10% | Exceed Benchmark? |
|---|---|---|---|---|---|
| Investment Cost | 8.76% | 7.50% | 5.62% | 4.89% | No |
| Operating Cost | 6.61% | 6.54% | 6.42% | 6.35% | No |
| Electricity Revenue | 5.15% | 5.82% | 7.14% | 7.79% | No |

17 http://ekutup.dpt.gov.tr/enerji/oik585.pdf page 4.26 (Last visited on 3/3/2011)

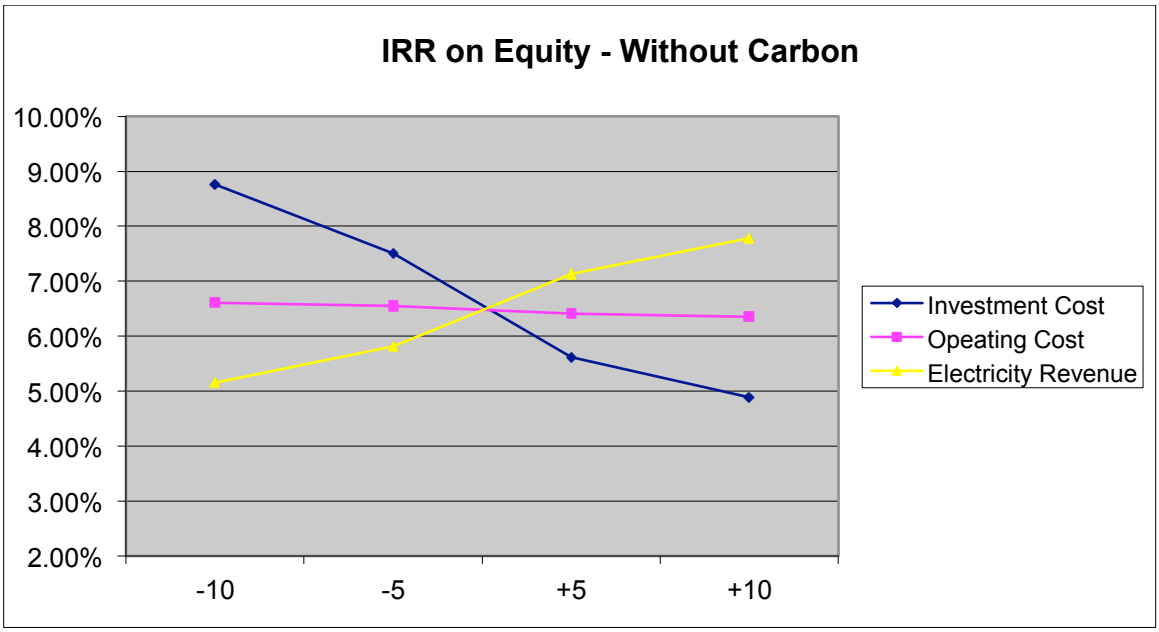



Figure 5: Sensitivity analysis: Fluctuation of the Equity IRR without the carbon revenue, by changing major parameters that effect the Equity IRR by ±10%

To exceed the benchmark, the electricity revenue must increase by about 47.80% over the life of the project, or the investment cost must be reduced by about 19.61%. As the Renewable energy law only guaranties a minimum price of USD 0.073 per kWh, the 0.09 USD per KWh price that we have used in our financial analysis is already very optimistic and conservative, and expecting a price increase of 47.80% is not reasonable. As the feasibility report and the design of the project is based on the maximum available capacity of the Botan river, and all our financial analysis is based on the maximum electricity output of the project, such an increase in amount of electricity generation is also very unlikely. In addition to that as the availability of the water decreases due to the globally accepted results of global climate change, electricity production is very unlikely to reach to an increased generation of 47.80%. In addition to this the climate change models indicate for the Mediterranean basin an increased drought and water scarcity that could even risk the project to reach the firm energy values.

The investment costs we have considered in our financial analysis are reasonable and reflect the average market conditions but are unlikely to go down. Therefore it is very unlikely for the investment cost to finalize below the amounts estimated and shown in the financial analysis.

**Outcome of Step 2:**

Without the VER revenue the Internal Rate of Return of the project cannot get close to the benchmark of 12.50 %, with an equity internal rate of return of 6.48%. A fluctuation of ± 10% in the key parameters also does not make the project exceed the benchmark.

**Step 3 - Barrier Analysis**

As the investment analysis concludes that the proposed project activity is unlikely to be the most financially attractive option, the sub step 3- Barrier analysis is optional to be applied and barrier analysis is not considered for the Kirazlık HPP.

**Step 4: Common Practice Analysis**

**Sub-step 4a. Analyse other activities similar to the proposed project activity**

As per "Tool for the Demonstration and Assessment of Additionality", projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory frame-work, investment climate, access to technology, access to financing, etc. According to the Guidelines on Common Practice (version 02), common practice analysis is presented through the following 5 steps.

Common Practice tool Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity:

As a hydropower project, the installed capacity is chosen as an appropriate proxy for "similar scale". The power generation capacity of 46.11 MW of the proposed project is selected as the design capacity. Therefore, the range from 23.05 MW to 69.16 MW is considered as applicable capacity.

Outcome of Common Practice tool Step 1: Applicable output range is 23.05 MW to 69.16 MW.

*Common Practice tool Step 2: identify similar projects (both CDM and non-CDM), which fulfil all of the following conditions:*

*(a) The projects are located in the applicable geographical area;*

*(b) The projects apply the same measure as the proposed project activity;*

*(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;*

*(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;*

*(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;*

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity[18].

[18] While identifying similar projects, project participants may also use publicly available information, for example from government departments, industry associations, international associations on the market penetration of different technologies, etc.

Checking all the power plants within the capacity range determined in Step 1, and looking projects that have started commercial operation before the start date of the project, it is revealed that there are 41 power plants operational in the Turkish grid with a capacity ranging between 23.05 MW to 69.16 (See Table:7). Please note that Turkey has a closed grid where the boundaries are shown in Figure 6 and the projects within the entire turkish grid is considered for the common practice analysis.

Table 7: Projects that are commissioned before the project activity, and with a capacity ranging from 23.05 MW to 69.16 MW.

| No: | Name Of HPP | Project Owner | Capacity (MW) | Average Production (Gwh) | Location | Catchment Number And Name | DSI district Name | Year Of Commissioning | VER STATUS |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Pamuk | Private | 23.7 | 81 | Çamliyayla | 17 D. Akdeniz | 06 Adana | 2004 | |
| 2 | Ceyhanhes(Oşka nhes-Enova) | Private | 23.9 | 98 | Ceyhan | 20 Ceyhan | 06 Adana | 2010 | VCS 810 |
| 3 | Tektuğ-Kargilik | Private | 23.9 | 83 | Andirin | 20 Ceyhan | 20 K.Maraş | | VCS 264 |
| 4 | Kargilik | BOT | 24 | 71 | Andirin | 20 Ceyhan | 20 K.Maraş | 2005 | |
| 5 | Ceyhanhes(Berk manhes-Enova) | Private | 25.2 | 103 | Ceyhan | 20 Ceyhan | 06 Adana | 2010 | VCS 810 |
| 6 | Tortum-I | Gov | 26.2 | 85 | Uzundere | 23 Çoruh | 08 Erzurum | 1960 | |
| 7 | Kepez-I | Gov | 26.4 | 169 | Merkez | 09 Antalya | 13 Antalya | 1961 | |
| 8 | Almus | Gov | 27 | 99 | Almus | 14 Yeşilirmak | 07 Samsun | 1966 | |
| 9 | Burçbendi(Akkure n.) | Private | 27.3 | 113 | Besni | 21 Firat | 20 K.Maraş | 2010 | VCS 419 |
| 10 | Selenel.(Kepezka yahes) | Private | 28 | 124 | - | 17 D. Akdeniz | 04 Konya | 2010 | Develoed As VCS |
| 11 | Cinderedenizli | Gov | 28.2 | 88 | Guney | 07 B. Menderes | 21 Aydin | 2009 | |
| 12 | Akçay | Private | 28.8 | 95 | Nazilli | 07 B. Menderes | 21 Aydin | 2009 | |
| 13 | Ceykarbağişli | Private | 29.6 | 99 | Merkez | 26 Dicle | 17 Van | 2009 | VCS 657 |
| 14 | Tümen.Pinar | Private | 30.1 | 138 | Tut | 21 Firat | 20 K.Maraş | 2010 | |
| 15 | Çamligöze | Gov | 32 | 102 | Suşehri | 14 Yeşilirmak | 19 Sivas | 2000 | |
| 16 | Karacaören-I | Gov | 32 | 142 | Bucak | 09 Antalya | 18 Isparta | 1990 | |
| 17 | Kepezi-Ii | Gov | 32.4 | 170 | Merkez | 09 Antalya | 13 Antalya | 1986 | |
| 18 | Yenice | Gov | 37.89 | 122 | Nallihan | 12 Sakarya | 03eskişehir | 2000 | |
| 19 | Dimhes (Dilerelek.) | Private | 38.3 | 123 | Manavgat | 09 Antalya | 13 Antalya | 2010 | |
| 20 | Değirmenüstü(Ka hramanmaraş) | Private | 38.6 | 106 | Andirin | 20 Ceyhan | 20 K.Maraş | 2008 | VCS 565 |
| 21 | Bereket (Mentaş) | Private | 39.9 | 163 | İmamoğlu | 18 Seyhan | 06 Adana | 2006 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **22** | Tektuğ-Andirin | Private | 40.5 | 106 | Andirin | 20 Ceyhan | 20 K.Maraş | 2010 | |
| **23** | Bereket(Koyulhisar) | Private | 42 | 329 | Koyulhisar | 14 Yeşilirmak | 19 Sivas | 2009 | VCS 730 |
| **24** | Eşen-Ii(Göltaş) | Private | 43.4 | 170 | Fethiye | 08 B. Akdeniz | 21 Aydin | 2003 | |
| **25** | Eşen-Ii-Göltaş | Otopr | 43.5 | 203 | Fethiye | 08 B.Akdeniz | 21 Aydin | 2002 | |
| **26** | Aş.Dalamanberekket | Otopr | 45 | 249 | Dalaman | 08 B.Akdeniz | 21 Aydin | 2001 | |
| **27** | Erenlerreg.(Bmebirleşiken.) | Private | 45 | 85 | Borçka | 23 Çoruh | 22 Trabzon | | |
| **28** | Karacaören-Ii | Gov | 47.2 | 206 | Serik | 09 Antalya | 13 Antalya | 1993 | |
| **29** | Kemer | Gov | 48 | 143 | Bozdoğan | 06k.Menderes | 21 Aydin | 1958 | |
| **30** | Manavgat | Gov | 48 | 220 | Manavgat | 09 Antalya | 13 Antalya | 1988 | |
| **31** | Birkapili | Otopr | 48.5 | 57 | Mut | 17 D.Akdeniz | 06 Adana | 2004 | |
| **32** | Enerji-Sabirkapili | Private | 48.5 | 171 | Mut | 17 D. Akdeniz | 06 Adana | 2004 | Started As Auto Producer |
| **33** | Darenhes(Seyrantepebaraji) | Private | 49.7 | 182 | Karakoçan | 21 Firat | 09 Elaziğ | 2008 | |
| **34** | Kovada-Ii | Gov | 51.2 | 222 | Eğirdir | 09 Antalya | 18 Isparta | 1971 | |
| **35** | Şanliurfa | Gov | 51.8 | 124 | Bozova | 21 Firat | 15 Urfa | 2005 | |
| **36** | Kapulukaya | Gov | 54 | 190 | Merkez | 15 Kizilirmak | 05 Ankara | 1989 | |
| **37** | Seyhan-1 | Gov | 54 | 350 | Merkez | 18 Seyhan | 06 Adana | 1956 | |
| **38** | Kadincik-Ii | Gov | 56 | 320 | Tarsus | 17 D.Akdeniz | 06 Adana | 1974 | |
| **39** | Derbent | Gov | 58.3 | 257 | Bafra | 15 Kizilirmak | 07 Samsun | 1991 | |
| **40** | Adigüzel-I | Gov | 62 | 280 | Güney | 07 B.Menderes | 21 Aydin | 1996 | |
| **41** | Demirköprü | Gov | 69 | 192 | Salihli | 05 Gediz | 02 İzmir | 1960 | |

*Outcome of Common Practice tool Step 2:*

There are 41 projects within the comparison range of the project activity.

*Common Practice tool Step 3:* within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number $N_{all}$.

Looking at the above table (Table 7), Ceyhan HPP (Oşkanhes-Enova), Tektuğ-Kargilik, Ceyhanhes (Berkmanhes-Enova), Burçbendi(Akkuren.) Selen Elektrik. .(Kepezkaya HPP). Ceykarbağişli. Değirmenüstü (Kahramanmaraş), Bereket (Koyulhisar HPP) are identified as projects benefitting from carbon finance. Therefore excluding them we get the following 33 projects listed in Table 8, as the projects that will be considered within $N_{all.}$

Table 8: Projects that are commissioned before the project activity that can be considered to be included in the count of $N_{all}$.

| No: | Name of HPP | Project Owner | Capacity (MW) | Average Production(Gwh) | Firm Production (Gwh) | City | Province | Basin Number And Name | SI district Name | Year Of Commissioning |
|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | Pamuk | Private | 23.7 | 81 | 23 | 33 Mersin | Çamliyayla | 17 D.Akdeniz | 06 Adana | 2004 |
| **2.** | Kargilik | BOT | 24 | 71 | 10 | 46 K.Maraş | Andirin | 20 Ceyhan | 20 K.Maraş | 2005 |
| **3.** | Tortum-I | Gov | 26.2 | 85 | 85 | 25 Erzurum | Uzundere | 23 Çoruh | 08 Erzurum | 1960 |
| **4.** | Kepez-I | Gov | 26.4 | 169 | 130 | 07 Antalya | Merkez | 09 Antalya | 13 Antalya | 1961 |
| **5.** | Almus | Gov | 27 | 99 | 39 | 60 Tokat | Almus | 14 Yeşilirmak | 07 Samsun | 1966 |
| **6.** | Cinderedenizli | Gov | 28.2 | 88 | 50 | 20 Denizli | Guney | 07 B. Menderes | 21 Aydin | 2009 |
| **7.** | Akçay | Private | 28.8 | 95 | 45 | 09 Aydin | Nazilli | 07 B. Menderes | 21 Aydin | 2009 |
| **8** | Tümen.Pinar | Private | 30.1 | 138 | 65 | 02 Adiyaman | Tut | 21 Firat | 20 K.Maraş | 2010 |
| **9** | Çamligöze | Gov | 32 | 102 | 77 | 58 Sivas | Suşehri | 14 Yeşilirmak | 19 Sivas | 2000 |
| **10.** | Karacaören-I | Gov | 32 | 142 | 84 | 15 Burdur | Bucak | 09 Antalya | 18 Isparta | 1990 |
| **11.** | Kepez-II | Gov | 32.4 | 170 | 55 | 07 Antalya | Merkez | 09 Antalya | 13 Antalya | 1986 |
| **12.** | Yenice | Gov | 37.89 | 122 | 92 | 06 Ankara | Nallihan | 12 Sakarya | 03 Eskişehir | 2000 |
| **13.** | Dimhes (Dilerelek.) | Private | 38.3 | 123 | 70 | 07 Antalya | Manavgat | 09 Antalya | 13 Antalya | 2010 |
| **14.** | Bereket (Mentaş) | Private | 39.9 | 163 | 140 | 01adana | İmamoğlu | 18 Seyhan | 06 Adana | 2006 |
| **15.** | Tektuğ-Andirin | Private | 40.5 | 106 | 60 | 46 K.Maraş | Andirin | 20 Ceyhan | 20 K.Maraş | 2010 |
| **16.** | Eşen-II(Göltaş) | Private | 43.4 | 170 | 80 | 48 Muğla | Fethiye | 08 B. Akdeniz | 21 Aydin | 2003 |
| **17.** | Eşen-II-Göltaş | Auto | 43.5 | 203 | 0 | 48 Muğla | Fethiye | 08b.Akdeniz | 21 Aydin | 2002 |
| **18.** | Aş.Dalaman Bereket | Auto | 45 | 249 | | 48 Muğla | Dalaman | 08b.Akdeniz | 21 Aydin | 2001 |
| **19.** | Erenlerreg.(Bmebirleşiken.) | Private | 45 | 85 | 48 | 08 Artvin | Borçka | 23 Çoruh | 22 Trabzon | |
| **20.** | Karacaören-Ii | Gov | 47.2 | 206 | 118 | 07 Antalya | Serik | 09 Antalya | 13 Antalya | 1993 |
| **21.** | Kemer | Gov | 48 | 143 | 62 | 09 Aydin | Bozdoğan | 06 K.Menderes | 21 Aydin | 1958 |
| **22.** | Manavgat | Gov | 48 | 220 | 40 | 07 Antalya | Manavgat | 09 Antalya | 13 Antalya | 1988 |
| **23.** | Birkapili | Auto. | 48.5 | 57 | 0 | 33 Mersin | Mut | 17 D.Akdeniz | 06 Adana | 2004 |
| **24.** | Darenhes (Seyrantepe) | Private | 49.7 | 182 | 161 | 23 Elaziğ | Karakoçan | 21 Firat | 09 Elaziğ | 2008 |
| **25.** | Kovada-II | Gov | 51.2 | 222 | 121 | 32 Isparta | Eğirdir | 09 Antalya | 18 Isparta | 1971 |
| **26.** | Şanliurfa | Gov | 51.8 | 124 | 85 | 63 Urfa | Bozova | 21 Firat | 15 Urfa | 2005 |
| **27.** | Kapulukaya | Gov | 54 | 190 | 150 | 71 Kirikkale | Merkez | 15 Kizilirmak | 05 Ankara | 1989 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **28.** | Seyhan-1 | Gov | 54 | 350 | 109 | 01 Adana | Merkez | 18 Seyhan | 06 Adana | 1956 |
| **29.** | Kadincik-II | Gov | 56 | 320 | 200 | 33 Mersin | Tarsus | 17 D.Akdeniz | 06 Adana | 1974 |
| **30.** | Derbent | Gov | 58.3 | 257 | 201 | 55 Samsun | Bafra | 15 Kizilirmak | 07 Samsun | 1991 |
| **31.** | Adigüzel-I | Gov | 62 | 280 | 15 | 20 Denizli | Güney | 07 B.Menderes | 21 Aydin | 1996 |
| **32.** | Demirköprü | Gov | 69 | 192 | 78 | 45 Manisa | Salihli | 05 Gediz | 02 İzmir | 1960 |
| **33. .** | Tektuğ-Andirin | Private | 40.5 | 106 | 60 | 46 K.Maraş | Andirin | 20 Ceyhan | 20 K.Maraş | 2010 |

*Outcome of Common Practice tool Step 3: There is 33 projects count as $N_{all}$, therefore:*

*$N_{all}$=33.*

Common Practice tool Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity, Note their number $N_{diff}$:

When we consider the project listed in Table 8, these projects are different from Kirazlık HPP in the following aspects:

- Different developer: In the list, projects numbered 2,3,4,5,6,9,10,11,12, 17, 18, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, and 32 were either developed under an auto producer license where the purpose of producing electricity is to satisfy the needs of a factory or another facility that is owned by the auto producer license owner or are developed by government, and therefore since they were developed considering public benefit or the specific needs of a factory conditions and economical motivations in developing them are very different than the project activity.
- The projects with numbers 1,7,8,13,14,15,16, 19 and 24 were developed by the private sector, however looking at the names of the catchments/river basins they were developed none of them are from the Tigris Catchment, and were therefore developed under different water budgets and with different income expectations. In addition to this those that were developed before 2008 (including that year) were unaware of the carbon finance opportunity. And when we have communicated with those that were commissioned between 2009 and 2010 they informed us that they were informed that their projects were not eligible as their capacities were higher than 20 MW. A misleading explanation that probably only considered another voluntary standard's eligibility criteria, that these projects missed the possibility of being screened for their additionality.
- In addition to that the above-sited private projects were developed at different DSI jurisdictional regions, the project activity is developed under the jurisdiction of DSI 10$^{th}$ District Diyarbakır. .

Outcome of Common Practice tool Step 4: The number of projects that are different than the project activity is 33. Therefore:

$N_{diff}$=33

*Common Practice tool Step 5: Calculate factor F=1-$N_{diff}$/$N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.*

F=1-$N_{diff}$/$N_{all}$

F=1-(33/33)

F=0

Outcome of Common Practice tool Step 5:

F=0

The proposed project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}$-$N_{diff}$ is greater than 3

Factor F is calculated to be 0 < 0.2

$N_{all}$-$N_{diff}$ =33-33=0 <3 in that case the Kirazlık HPP is not common practice.

**Conclusion of Step 4:** In conclusion the proposed project is deemed to be additional according to ACM0002 and the tool and guideline for the demonstration and assessment of additionality.

## 2.6 Methodology Deviations

The UNFCCC methodology of ACM0002/ Version 13.3.0 and its related tools have been applied without any deviations.

# 3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 3.1 Baseline Emissions

According to the latest version (version 13.0.0) of ACM0002 and the tool to calculate the emission factor for electricity system, since the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> *Electricity delivered to the grid by the project activity 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" (version 03.0.0 (*EB 70, Annex 22*)).*

The Project therefore applies the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (version 0*3.0.0,* EB 70, Annex 22).

**Step 1 -*Identify the relevant electric power system***

As the host country is not participating in the compliance markets hence does not have a DNA, a delineation of the project electricity system and connected electricity systems has not been published yet. For such cases, the tool suggests using the following criteria to determine the existence of significant transmission constraints:

1. *"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."* This criterion is not applicable as there is no spot electricity market in the host country.

2. *"The transmission line is operated at 90% or more of its rated capacity during 90% or more of the hours of the year"*: The transmission line operator (TEIAS) or any other official source has not published the capacity usage figures for the Turkish grid; hence this criterion cannot be proved.

According to the tool, where the application of these criteria does not result in a clear grid boundary, a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national) shall be used. A provincial grid definition may indeed in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity. In other countries, the national (or other largest) grid definition should be used by default.

Therefore, for the case of the subject project activity "the project electricity system" and "the connected system" are same, and the Turkish National Grid is used as the "project electricity system". It is also confirmed by TEIAS that the Turkish grid is interconnected. There isn't any independent or regional grid system in any region of Turkey. The map of the Turkish Electricity Grid is given in the below figure (Figure 6):

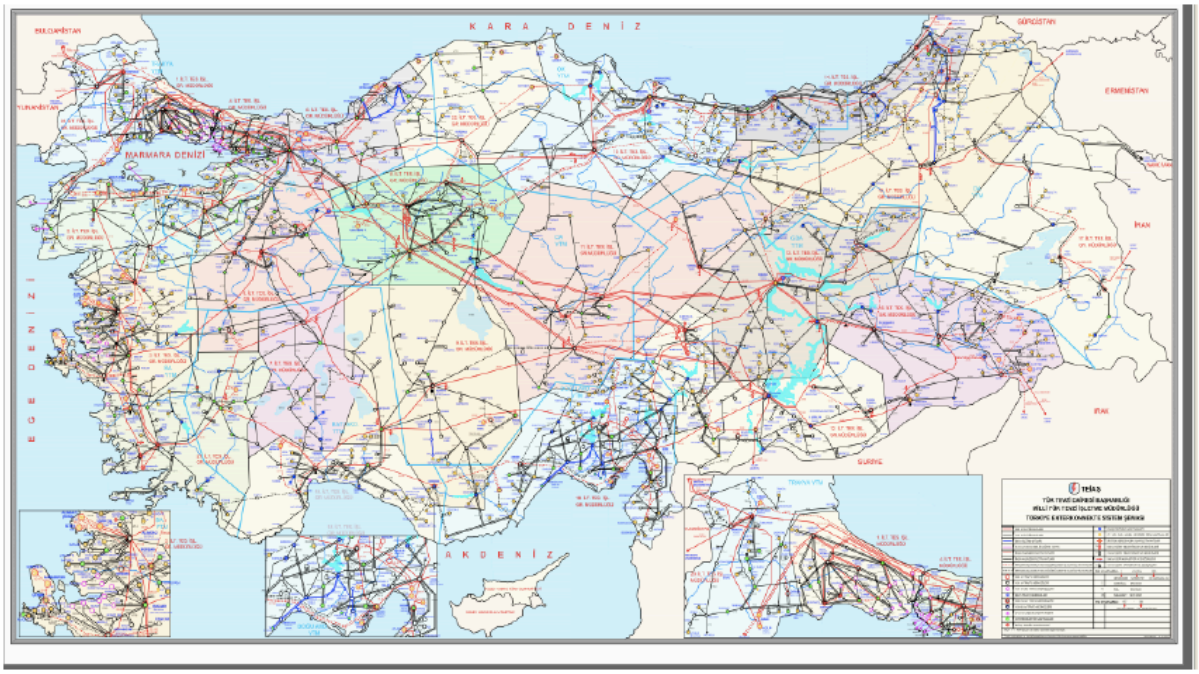



**Figure 6:** The Map showing the boundaries of Turkish Electricity Grid (Source Electricity Market Report 2010, by Electricity Market Regulatory Authority http://www.epdk.gov.tr/documents/10157/48dd12d4-74da-4dcf-9f48-86983146c0d8)

All the calculations details of which are given below are made for the entire Turkish Grid.

For the purpose of determining the operating margin emission factor, the tool directs us to use one of the following options to determine the CO2 emission factor(s) for net electricity imports from a connected electricity system:

0 tCO2/MWh; or (a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 (d) below; or (b) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 (a), if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or (c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4 (b) below.

For imports from connected electricity systems located in Annex I country(ies), the emission factor is 0 tons CO2 per MWh.

And the tool also notes that the …"Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors."

In our case the host country (imports electricity mainly from Annex -1 countries, so the emission factor related to imports is considered to be zero"0".

***Step 2 - Choose whether to include off-grid power plants in the project electricity system***

The tool requires Project participants to choose between the following two options to calculate the operating margin and build margin emission factor:

**Option I:** Only grid power plants are included in the calculation.

**Option II:** Both grid power plants and off-grid power plants are included in the calculation.

In our case, "Option I" has been selected for the calculation of grid emission factor, and only grid power plants are included in the calculation.

***Step 3 – Select an operating margin (OM) method***

According to the "Tool to calculate the emission factor for an electricity system", version 03.0.0 in calculating the Operating Margin grid emission factor for a given year y (EFgrid,OM, y), project developers have the option of selecting from four methods:

(a) Simple OM,

(b) Simple adjusted OM,

(c) Dispatch Data Analysis OM, or

(d) Average OM.

As the shares of "low cost/must run" resources are below 50% for the five most recent years (Table 9), therefore, in accordance with the Tool, (a) Simple OM method will be used in the calculations.

Table 9: **Share of primary sources in electricity generation, 2006 – 2010**[19]

| | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|
| *Thermal* | 74.78 % | 81.02 % | 82.72 % | 80.5 % | 73.78 % |
| *Hydro* | 25.10 % | 18.72 % | 16.77 % | 18.46 % | 24.52 % |
| *Wind & Geothermal* | 0.12 % | 0.26 % | 0.51 % | 0.99 % | 1.70 % |
| ***Total*** | 100 % | 100 % | 100 % | 100 % | 100 % |

Since the Simple OM calculation (option (A)) is selected, the emission factor is calculated by the generation-weighted average emissions per electricity unit (tCO2/GWh), and averaged over the past three years of all generating sources serving the system, not including low-cost / must run power plants. The tool gives two options for the calculation of $EF_{grid, OM, y}$;

- *Ex-ante* option

[19] Annual Development of Installed Capacity Generation in Turkey (1970-2010) (http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kgucunkullanım(13-21)/13.xls)

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 emission factor be updated annually during monitoring.

For the calculation of the Simple OM, the "**Ex-Ante**" option is selected, at the time of PDD submission to the DOE, the data vintages that were most recent at the start of validation, belongs to the years 2008, 2009 and 2010. All the data used in calculation of the Simple OM are taken from the TEIAS website, details of which are given below.

***Step 4 - Calculate 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 of net electricity generation ($tCO_2/MWh$) for all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

- Option A: Based on the net electricity generation and a $CO_2$ emission factor of each power unit; or

- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The following data are available from the Turkish Electricity Transmission Company (TEİAŞ) web site:

- Annual fuel consumption by fuel type[20],

- Annual heating values for fuels consumed for electricity generation[21],

- Annual electricity generation by fuel type, import and export[22]

Taking into consideration the available data Simple OM method Option B is the applicable method for the project activity. Option A requires data on net electricity generation of each power plant / unit and a $CO_2$ emission factor of each power unit, both of which are not publicly available, for the Turkish electricity grid.

[20] Fuel Consumed in thermal P.P.in Turkey by the Electric Utilities (2008-2010) (http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls)
[21] Heating Values Of Fuels Consumed In Thermal P.Ps In Turkey By The Electric Utilities (2008-2010), (http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls).
[22] Turkey's Gross Electricity Generation by Primary Energy Resources and The Electric Utilities (2008-2010) / (http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls)/ Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2009), (http://www.teias.gov.tr/istatistik2009/30(84-09).xls).

$EF_{grid,OMsimple,y}$, using option B 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 the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_{y,grid}} \quad (7)$$

Where:

$EF_{grid,OM\ simple,y}$ = Simple operating margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$)

$FC_{i,y}$ = 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)

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

$EG_y$ = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year *y*

y = The relevant year as per the data vintage chosen in Step 3

***Step 5 - Calculate the build margin (BM) emission factor:***

The tool indicates that, in terms of vintage of data, project participants can choose between one of the following two options:

**Option 1:** For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

And ,

**Option 2:** For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

We prefer the Option 1, calculating the Build Margin Emission factor, “ex ante”, for the first crediting period.

The sample group of power units m used to calculate the build margin are determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

b) Determine the annual electricity generation of the project electricity system; excluding power units registered as CDM project activities ($AEG_{total}$, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of $AEG_{total}$ (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation ($SET_{sample}$); identify the date when the power units in $SET_{sample}$ started to supply electricity to the grid. If none of the power units in $SET_{sample}$ started to supply electricity to the grid more than 10 years ago, then use $SET_{sample}$ to calculate the build margin.

According to the tool in terms of vintage of data, project participants can choose either the ex-ante option or the ex-post option. Between these two options, Option 1 is selected. For the first crediting period, the build margin emission factor is calculated ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used. This option does not require monitoring the emission factor during the crediting period.

The build margin emissions factor is the generation-weighted average emission factor ($tCO_2$/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EG_{EL.m.y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO2 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 electricity generation data is available

According to the tool, the $CO_2$ emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin. Taking into consideration the available data on the capacity additions, the formula given under Option A2 of the Simple OM option A is used to calculate $EF_{EL,m,y}$.

The $CO_2$ emissions from the most recent capacity additions are calculated by multiplying the $EF_{EL,m,y}$ values calculated for each fuel source by the annual generation of that fuel source. The emission factor has been taken as "zero" for the renewable and wastes and the generation efficiencies for the thermal power plants type of which are not known are taken as 60%, which is generation efficiency for the combined cycle natural gas power plants. The Build Margin Emission Factor for each year is calculated by dividing the total $CO_2$ Emissions of the subject year by the total generation from the capacity additions of the same year.

The Build Margin Emission Factor of the grid is then calculated as an average for the years 2009 and 2010, as explained in the part where the actual calculations are shown, the assessed capacities added in these two years constitutes our $SET_{sample}$.

**Step 6 - Calculation of the combined margin emissions factor**

Finally, the combined margin grid emission factor ($EF_{grid,CM,y}$) is expressed as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$):

$$\mathrm{EF}_{\mathrm{grid,CM,y}} = \mathrm{EF}_{\mathrm{grid,OM,y}} \times \mathrm{w}_{\mathrm{OM}} + \mathrm{EF}_{\mathrm{grid,BM,y}} \times \mathrm{w}_{\mathrm{BM}}$$

Where:

$EF_{grid,BM,y}$ Build margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$)

$EF_{grid,OM,y}$ Operating margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$)

$W_{OM}$ Weighting of operating margin emissions factor (%)

$W_{BM}$ Weighting of build margin emissions factor (%)

Where weights $w_{OM}$ and $w_{BM}$ are by default 0.50 and 0.50 according to the selected methodology. And $EF_{OM}$ and $EF_{BM}$ are calculated as described in the previous steps.

Then baseline emissions ($BE_y$) are obtained as:

$$\mathrm{BE}_{\mathrm{y}} = \mathrm{EG}_{\mathrm{PJ,y}} \times \mathrm{EF}_{\mathrm{grid,CM,y}}$$

Where:

| | | |
|---|---|---|
| $BE_y$ | = | Baseline emissions in year *y* ($tCO_2$/yr) |
| $EG_{PJ'y}$ | = | Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr) |
| $EF_{grid,CM,y}$ | = | Combined margin $CO_2$ emissions factor in year *y* ($tCO_2$/MWh) |

And

$$EG_{PJ,y} = EG_{facility,y}$$

| | | |
|---|---|---|
| $EG_{facility,y}$ | = | Quantity of net electricity generation supplied by the project plant to the grid in year *y* (MWh/yr) |

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

$$ER_y = BE_y - PE_y$$

Where:

| | | |
|---|---|---|
| $ER_y$ | = | Emission reductions in year *y* ($tCO_2$) |
| $BE_y$ | = | Baseline emissions in year *y* ($tCO_2$) |
| $PE_{,y}$ | = | Project Emissions in year *y* ($tCO_2$) |
| $L_y$ | = | Leakage emissions in year *y* ($tCO_2$) |

As methodology states the PEy and Ly in case of a hydro power project with a power density > 10 W/m$^2$ (, which is 46.11 W/m$^2$ for the Project Activity) to be zero hence ERy = BEy

## 3.2 Project Emissions

As the methodology states the PEy in case of a hydropower project will be calculated:

"Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

*For hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for $CH_4$ and $CO_2$ emissions from the reservoir, estimated as follows:"*

"...the power density of the project activity (PD) is greater than 4 W/m$^2$ and less than or equal to 10 W/m$^2$:"

The project has a power density of 46.11 W/m$^2$ therefore:

$$PE_{HP,y} = 0$$

Where:

| | |
|---|---|
| $PE_{H}$ P,y | Project emissions from water reservoirs ($tCO_2e$/yr) |

Although there will be auxiliary diesel generators installed within the project boundary, the emissions from these have been deemed negligible as per the ACM0002 (version 13.0.0) methodology.

## 3.3 Leakage

There are no leakage emissions related to project activity.

## 3.4 Summary of GHG Emission Reductions and Removals

Ex-ante calculation of emission reductions:

Simple Operating margin (OM)

As also explained above, for the computation of the Simple OM, the Ex-Ante option is selected, at the time of PD submission to the DOE, the data vintages that were most recent, belongs to the years 2008, 2009 and 2010. All the data used in calculation of the Simple OM are taken from the TEİAŞ website, details of which are given below. Taking into account the available data "Simple OM" method "Option B" is the appropriate method for the project activity. TEİAŞ publishes the annual heating values of the fuels consumed in the power plants, the heating values are directly related to fuel consumption and are used to calculate average Net Calorific Values (TJ/kt) (Table 10).

The heating values of fuels consumed in thermal power plants are announced by TEİAŞ, the unit of the heating values are Tcal. Tcal is converted to GJoule by using the conversion factor 1cal = 4.1868 Joule. Then the heating values in GJ are divided by Fuel Consumption ($FC_{i,y}$) to get the Net Calorific Values of the fuels consumed in TJ/kt as follows:

Table 10: Net Calorific Values for each fuel type for Turkey

| Fuel Type | NCV (TJ/kt) | | |
|---|---|---|---|
| | 2008 | 2009 | 2010 |
| Hard Coal+ Imported Coal | 22.24 | 22.21 | 22.32 |
| Lignite | 6.83 | 6.43 | 7.13 |
| Fuel Oil | 39.70 | 39.81 | 40.23 |
| Diesel Oil | 42.38 | 42.37 | 43.09 |
| LPG | 0.00[23] | 46.47 | 0.00[13] |
| Naphtha | 44.61 | 43.65 | 33.50 |
| Natural Gas | 36.63 | 37.17 | 37.38 |

The emission factors of fuels required are taken from IPCCC 2006 guidelines for GHG inventories[24]. All data used for the calculations can be found in Annex-2 (See Table 1 and Table 2 to in Annex -2). Table 11 shows total $CO_2$ emission by fuel types calculated using lower IPCCC emission factors and available data from the TEİAŞ website.

[23] It is shown as zero as in year 2008 and 2010 there was no LPG consumption in the grid.

[24] Table 2.2.Default Emission Factors for Stationary Combustion in the Energy Industries, Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf)

Table 11: Calculation of emission by electricity generation (2008-2010)

| | Default $CO_2$ Emissions ($tCO_2$) | | |
|---|---|---|---|
| | 2008 | 2009 | 2010 |
| Hard Coal+Imported Coal | 12,942,102.18 | 13,649,138.82 | 15,365,199.79 |
| Lignite | 41,189,044.65 | 37,164,240.90 | 36,745,389.26 |
| Fuel Oil | 6,513,942.76 | 4,792,096.57 | 2,708,730.18 |
| Diesel Oil | 403,661.11 | 556,318.57 | 63,674.50 |
| Lpg | 0.00 | 317.74 | 0.00 |
| Naphtha | 32,786.41 | 24,429.94 | 30,502.68 |
| Natural Gas | 42,980,830.92 | 42,346,272.06 | 44,215,362.69 |
| TOTAL | 104,062,368.04 | 98,532,496.86 | 99,128,859.11 |

Net electricity generated and supplied to the grid by thermal power plants has been calculated using data obtained from TEİAŞ web page. The ratio between total gross and total net generation (including low-cost/must run plants) has been calculated for each year. The same ratio is assumed to be valid for all thermal plants and total net generation by the plants has been calculated accordingly. Summing up total net generation with the imported electricity, total supply excluding low cost / must run sources for each year is determined and given in Table 12.

Table 12: Net Electricity Generation from thermal power plants (units in GWh)

| | **2008** | **2009** | **2010** |
|---|---|---|---|
| | | **Unit: GWh** | |
| ***Net Generation*** | 189,761.90 | 186,619.30 | 203,046.10 |
| ***Gross Generation*** | 198,418.00 | 194,812.90 | 211,207.70 |
| ***Net/Gross Ratio*** | 0.9563744 | 0.9579412 | 0.9613575 |
| ***Net Thermal Generation*** | 156,978.63 | 150,323.43 | 149,806.03 |
| ***Electricity Imports*** | 789.40 | 812.00 | 1,143.80 |
| ***$EG_y$* (GWh)** | 157,768.03 | 151,135.43 | 150,949.83 |
| ***$EG_y$* (MWh)** | 157,768,028.11 | 151,135,428.72 | 150,949,827.21 |

The OM Emission Factor for the years 2008, 2009 and 2010 are calculated by dividing the total $CO_2$ emissions for those years (Table11) to the Net Electricity Generation (Table 12) for the subject year. The annual OM emission factors are calculated as follows (Table 13):

Table 13: Annual OM Emission Factors

| Year | OM Emission Factor |
|---|---|
| 2008 | 0.65959 |
| 2009 | 0.65195 |
| 2010 | 0.65670 |

Finally, OM emission factor is calculated as a generation weighted average for the three most recent years. The resulting OM Emission Factor is;

$EF_{grid,OMsimple}$ = 0.65613

Build margin

As mentioned above we have preferred the Option 1, calculating the Build Margin Emission factor, “ex ante”, for the first crediting period.

The sample group of power units m used to calculate the build margin are determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

b) Determine the annual electricity generation of the project electricity system; excluding power units registered as CDM project activities ($AEG_{total}$, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of $AEG_{total}$ (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation ($SET_{sample}$); Identify the date when the power units in $SET_{sample}$ started to supply electricity to the grid. If none of the power units in $SET_{sample}$ started to supply electricity to the grid more than 10 years ago, then use $SET_{sample}$ to calculate the build margin.

Between the $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$, the sample group that comprises the larger annual generation is $SET_{\geq 20\%}$, hence the set of capacity additions in the electricity system that comprise 20% of the system generation is used.

The amount of electricity produced by the $SET_{5\text{-}units}$ is calculated to be 4,288.65 GWh. (= $AEG_{SET\text{-}5\text{-}units}$).

The gross electricity generation in year 2010 is taken as reference for determination of plants that comprise 20% of the system generation. Based on Turkey’s Annual Electricity statistics published on the TEIAŞ web site (www.teias.gov.tr) , the gross generation in year 2010 was 211,207.70 GWh (See Table 12), out of this amount 7,053.40 GWh was identified[25] to be produced by projects that claimed VERs, excluding this number from the gross generation we end up with 195,992.70 GWh of electricity which is our $AEG_{TOTAL}$ and 20% of that amount is calculated as 39,198.54 GWh.

Comparing the $AEG_{SET\text{-}5\text{-}units}$ and 20% of $AEG_{TOTAL}$, it is seen that 20% of $AEG_{TOTAL}$, is higher than $AEG_{SET\text{-}5\text{-}units}$.

[25] A list of units providing electricty to the year 2010 Turkish Electricity Grid is provided as an Annex 1 to the most recent Capacity Projection report published by TEIAS (http://212.175.131.171/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf). We have checked and identified the ones that have claimed VERs by comparing the list to the Gold Standard registry (https://gs2.apx.com/myModule/rpt/myrpt.asp?r=111) and VCS Project Database (http://www.vcsprojectdatabase.org). This list is provided to the validating DOE.

Therefore the 20% of $AEG_{TOTAL}$ with a value of 40,830.86 GWh is to be compared to the capacity additions in the recent years.

Summing up electricity the generations of all the plants added to the Turkish National Grid in 2010 and 2009, but excluding the projects that claimed VERs, their total generation is 47,745.76 GWh. The total generation by the power plants added in year 2010 is 26,256.04 GWh which is still less than the 20% of $AEG_{TOTAL}$ value of 40,830.86 GWh, however we are unable to identify the date of addition of the units that are added to the Grid in year 2009 to complete the amount of electricity added to the Grid by year 2010 power plants. Therefore, with a conservative approach we are considering all the units added in year 2009 and the $AEG_{SET\ Sample}$ value we are using in our BM calculation is 47,745.76 GWh and is greater than the 20% of the total generation, So only the power plants added in the last 2 years, excluding those claiming VER credits, are used in the calculations. As there is no power unit older than 10 years this number is being used for Build Margin Calculations.

The lists of most recent capacity additions to the grid by year and their average and firm generation capacities for the years 2010, and 2009 are available as Annex-2 to the capacity projection reports published in the TEIAS web page. Also the annual generation capacity data for each plant is not available on the statistics page of TEİAŞ. The data for the years 2009[26] and 2010[27] are taken from the TEİAŞ Capacity Projection Reports which are also available in another section of the TEİAŞ website. For the capacity additions, the firm generation capacities of the power plants are used. The units that are taken out of the grid are not taken into consideration. All the data used for calculations could be found in Annex-2 (see Table 8a and Table8b).

According to the tool in terms of vintage of data, a project participant can choose either the ex-ante option or the ex-post option. As explained above, out of these two options, as mentioned above, Option 1 is selected. For the first crediting period, the build margin emission factor is calculated ex-ante based on the most recent information available on units already built for sample group m at the time of VER-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used. This option does not require monitoring the emission factor during the crediting period.

*Electric efficiency rates*

There is no complete and up-to-date data regarding the electrical efficiency of thermal power plants that supply electricity to the Turkish National Grid system. Therefore the default values provided in Annex 1(Default efficiency factors for power plants) of the Methodological Tool to calculate the emission factor for an electricity system (Version *03.0.0* ) (EB 70 Report Annex 22) is utilised, in a very conservative manner, considering that we are unable to differentiate the units that were commissioned before year 2000, and we cannot differentiate their technologies, all the coal and lignite fired thermal power plants are considered to operate with 50% efficiency, all the

[26] TEİAŞ Capacity Projection Report 20010-2019 (http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf)
[27] http://www.teias.gov.tr/projeksiyon/KapasiteProjeksiyonu2011.doc

oil fired power plants are considered to operate with 46% efficiency, and all the Natural Gas fired power plants are considered to operate at 60 % efficiency. For the diesel powered thermal power plants the efficiency is considered to be 45%. Since the default values are not provided for Naphtha, it is considered to behave like oil and its efficiency is considered as 46%, and Bitumen is considered to behave like coal and its efficiency is considered to be 50%. The efficiency values considered in BM calculations can be summarized as follows (Table 14):

Table 14: Default Electric efficiency rates taken from Annex 1 of the Methodological Tool to calculate the emission factor for an electricity system (Version 03.0.0) (EB 70 Report Annex 22).

| Fuel Type | Average Electric efficiency rate |
|---|---|
| Coal | 50.0% |
| Lignite | 50.0% |
| Fuel Oil | 46.0% |
| Diesel | 46.0% |
| Naphtha | 46.0% |
| Natural Gas | 60.0% |
| Bitumen | 50.0% |

The parameters for the calculation of $EF_{EL,m,y}$, and its calculation is shown in Table 15 below:

Table 15: Calculation of $EF_{EL}$ generation efficiency based on the default values provided in Annex 1 of the Methodological Tool to calculate the emission factor for an electricity system (03.0.0) (EB 70 Report Annex 22)

| **Calculation of $EF_{EL}$ using default generation efficiencies** | | | | |
|---|---|---|---|---|
| | EF (tCO2/TJ) | (EF*3.6) | Generation Efficiency % | $EF_{EL,m,y}$ tCO2/MWh |
| **Coal** | 92.80 | 334.080 | 50.0% | 0.668 |
| **Lignite** | 90.90 | 327.240 | 50.0% | 0.654 |
| **Fuel Oil** | 75.50 | 271.800 | 46.0% | 0.591 |
| **Diesel** | 72.60 | 261.360 | 46.0% | 0.568 |
| **Naphtha** | 69.30 | 249.480 | 46.0% | 0.542 |
| **Natural Gas** | 54.30 | 195.480 | 60.0% | 0.326 |
| **Bitumen** | 73.00 | 262.800 | 50.0% | 0.526 |

The $CO_2$ emissions from the most recent capacity additions are calculated by multiplying the $EF_{EL,m,y}$ values calculated for each fuel source by the annual generation of that fuel source (Table 16). The emission factor has been taken as “zero” for the renewable and wastes and the generation efficiencies for the thermal power plants type (such as Bitumen) of which are not known are taken same as the most similar fuel’s efficiency factor of the known units, which is generation efficiency for the coal power plants. The Build Margin Emission Factor for each year is

calculated by dividing the total $CO_2$ Emissions of the subject year by the total generation from the capacity additions of the same year.

Table 16 Annual $CO_2$ Emissions for Capacity Additions and Annual BM Emission Factors

| Capacity Additions in 2009 (GWh) | | $CO_2$ Emissions | $EF_{grid,BM,2009}$ |
|---|---|---|---|
| Asphaltite | 945.00 | 496.69 | |
| Fuel Oil | 1,082.08 | 639.37 | |
| Coal | 1,923.33 | 1,285.09 | |
| Lignite | 7.00 | 4.58 | |
| Natural Gas | 16,512.65 | 5,379.82 | |
| Renewables and Wastes | 1,019.66 | 0.00 | |
| **TOTAL** | **21,489.72** | **7,805.56** | **0.36322** |
| Capacity Additions in 2010 (GWh) | $CO_2$ Emissions | $EF_{grid,BM,2008}$ | |
| Coal | 12017.6 | 8,029.71 | |
| Lignite | 180.0 | 117.81 | |
| Natural Gas | 13108.5 | 4,270.76 | |
| Renewables and Wastes | 949.9 | 0.00 | |
| **TOTAL** | **12017.6** | **8,029.71** | **0.47297** |

The Build Margin Emission Factor of the grid is then calculated as a generation weighted average for the years 2009 and 2010. The resulting BM Grid is:

$EF_{grid,BM}$ = 0.42357 $tCO_{2e}$/MWh

Combined margin emission factor

Where weights $W_{OM}$ and $W_{BM}$ are by default 0.50 and 0.50 according to the selected methodology. And $EF_{OM}$ and $EF_{BM}$ are calculated as described in the previous steps.

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

$EF_y$ = 0.50 * 0.65613 $tCO_{2e}$/MWh + 0.50 * 0.42357 $tCO_{2e}$/MWh = 0.53985 $tCO_{2e}$/MWh

Emission reductions

$ER_y = BEy = EG_{facility,y} * EFy$

= 150,610 MWh* 0.53985 $tCO_{2e}$/MWh = 81,307$tCO_{2e}$

A summary of the GHG removals by the project activity is given as follows (Table 17):

Table 17: summary of the GHG removals by the project activity

| Years | Estimated baseline emissions or removals ($tCO_{2e}$) | Estimated project emissions or removals ($tCO_{2e}$) | Estimated leakage emissions ($tCO_{2e}$) | Estimated net GHG emission reductions or removals ($tCO_{2e}$) |
|---|---|---|---|---|
| Year 0: 2013 (October, 22- December 31) | 15,815 | 0 | 0 | 15,815 |
| Year 1: 2014 | 81,307 | 0 | 0 | 81,307 |
| Year 2: 2015 | 81,307 | 0 | 0 | 81,307 |
| Year 3: 2016 | 81,307 | 0 | 0 | 81,307 |
| Year 4: 2017 | 81,307 | 0 | 0 | 81,307 |
| Year 5: 2018 | 81,307 | 0 | 0 | 81,307 |
| Year 6: 2019 | 81,307 | 0 | 0 | 81,307 |
| Year 7: 2020 | 81,307 | 0 | 0 | 81,307 |
| Year 8: 2021 | 81,307 | 0 | 0 | 81,307 |
| Year 9: 2022 | 81,307 | 0 | 0 | 81,307 |
| Year 10: 2023 (Jan. 1st to October,22nd) | 65,492 | 0 | 0 | 65,492 |
| **Total** | 813,070 | 0 | 0 | 813,070 |

# 4 MONITORING

## 4.1 Data and Parameters Available at Validation

The following are the data and parameters available at validation:

| | |
|---|---|
| Data / Parameter: | $FC_{i,y}$ |
| Data unit: | Volume Unit (cubic meter) |
| Description: | Amount of fuel i consumed by relevant power plants in Turkey in years, 2008, 2009, 2010. |
| Source of data: | Official publications at the Turkish Electricity Transmission Company (TEIAŞ) Web Site (http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/47.xls) |
| Measurement procedures (if any): | - |
| Monitoring frequency: | Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation |
| Value applied: | Please see Annex 2-Table-1 |
| QA/QC Procedures | - |
| Justification of choice of data or description of measurement methods and procedures | Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date |

| | |
|---|---|
| applied: | and reliable data available for the Turkish grid. |
| Any comment: | Data used for the calculation of $EF_{grid,OM,Simple,y}$ |

| | |
|---|---|
| Data / Parameter: | $NCV_{i,y}$ |
| Data unit: | GJ/Mass or Volume Unit |
| Description: | Net Calorific Values for fossil fuel type i in year, for the years 2008, 2009 and 2010 |
| Source of data: | Regional or national average default values that are reliable and documented in national energy statistics of the Turkish Electricity Transmission Company Web Site (http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/49.xls http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/47.xls ) |
| Measurement procedures (if any): | - |
| Monitoring frequency: | For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation<br>For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period |
| Value applied: | Please see Annex-2-Table-1b |
| QA/QC Procedures | - |
| Justification of choice of data or description of measurement methods and procedures applied: | Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to date and reliable data available for the Turkish grid. |
| Any comment: | Data used for the calculation of $EF_{grid,OM,Simple,y}$. As data on the NCV is not published directly on the TEİAŞ website, this data is calculated using the heating values of fuels and the volume or mass of fuels consumed for each year. |

| | |
|---|---|
| Data / Parameter: | $EF_{CO2,i,y}$ |
| Data unit: | $tCO_2/GJ$ |
| Description: | $CO_2$ emission factor of fossil fuel type i in year y |
| Source of data: | IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories, (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf). |
| Measurement procedures (if any): | - |
| Monitoring frequency: | For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation<br>For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period |
| QA/QC Procedures | - |
| Value applied: | Please see Annex 2-Table-2. |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied: | According to the "Tool to calculate the emission factor for an electricity system" version 03.0.0 , if values provided by the fuel supplier of the power plants in invoices or regional or national average defaults values are not available the IPCC default values at the lower limit of uncertainty must be used. |
| Any comment: | Data used both for the calculation of $EF_{grid,OM,Simple,y}$ and $EF_{EL,m,y}$ |

| | |
|---|---|
| Data / Parameter: | $EG_y$ |
| Data unit: | MWh |
| Description: | Net electricity generated in the project electricity system in other words, 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 |
| Source of data: | Turkish Electricity Transmission Company Web Site http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls www.teias.gov.tr/istatistik2009/30(84-09).xls |
| Measurement procedures (if any): | - |
| Monitoring frequency: | For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation<br>For BM: For the first crediting period, once for the ex ante and for the second and third crediting period, only once ex ante at the start of the second crediting period (For BM VER projects are excluded). |
| QA/QC Procedures | - |
| Value applied: | Please see Annex 2-Table 3 and Table 4. |
| Justification of choice of data or description of measurement methods and procedures applied: | Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid. |
| Any comment: | Data used for the calculation of $EF_{grid,OM,Simple,y}$ |

| | |
|---|---|
| Data / Parameter: | $EG_{m,y}$ |
| Data unit: | MWh |
| Description: | Net electricity generated and delivered to the grid by power unit m in year y |
| Source of data: | Turkish Electricity Transmission Company Web Site (www.teias.gov.tr). Data is extracted from the relevant annexes of the capacity projection reports for the years 2009[28] and 2010[29], and the projects that are listed in Gold Standard Registry, VCS project Database, and Blue Registry (VER+ Standard) are deducted. |
| Measurement procedures (if any): | - |
| Monitoring frequency: | For Simple OM : Once for each crediting period using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation<br>For BM: For the first crediting period, once for the ex-ante and for the second and third crediting period, only once ex ante at |

[28] http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf
[29] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf

| | |
|---|---|
| | the start of the second crediting period |
| QA/QC Procedures | - |
| Value applied: | Please see Annex 2-Table 8a and Table 8b. |
| Justification of choice of data or description of measurement methods and procedures applied: | Data used is taken from the TEİAŞ website, which is the website of the Turkish Electricity Distribution Company. The data published on the TEİAŞ website is the most up-to-date and reliable data available for the Turkish grid. |
| Any comment: | Data used for the calculation of $EF_{grid,BM,y}$ |

| | |
|---|---|
| Data / Parameter: | $\eta_{m,y}$ |
| Data unit: | % |
| Description: | Specific electrical efficiency for all relevant energy sources (natural gas, lignite, coal/anthracite, fuel/motor oil). |
| Source of data: | Default values provided at Appendix 1 of the Methodological tool: Tool to calculate the emission factor for an electricity system Version 03.0.0. In case where the default value is not provided, the efficiency value of the most similar primary fuel source is taken (for bitumen and lignite the efficiency factor of coal is considered). |
| Measurement procedures (if any): | - |
| Monitoring frequency: | Once for the crediting period |
| QA/QC Procedures | N/A as the default values provided in Annex 1 is used. |
| Value applied: | See Table 14 |
| Justification of choice of data or description of measurement methods and procedures applied: | As no plant specific efficiency data is available, average numbers were calculated with the help of statistical data from TEIAS. |
| Any comment: | Data used for the calculation of EFgrid,BM,y |

## 4.2 Data and Parameters Monitored

The following are the data and parameters monitored subsequent to validation:

| | |
|---|---|
| Data / Parameter: | $EG_{PP\text{-self consumption, y}}$ |
| Data unit: | MWh |
| Description: | Quantity of electricity imported by the power plant from the Grid for self-consumption, in year y |
| Measured /Calculated /Default: | Measured |
| Source of data: | The primary source of data will be the Main TEIAS meters located at the Kirazlık Powerhouse. The data read through these meters are to be recorded at the monthly reading protocols, the column related to electricity obtained from the Grid.<br>There will be three main meters, each recording the generation of electricity from each line that transmit the electricity generated by the generators, and there will be three back-up meters, for each one of these main meters.<br>The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading UECM[30]. |
| Description of measurement methods and procedures to be applied: | Measurements are to be made by electricity meters that belong to the grid operator TEIAŞ. The meters will be in compliance with the collected data. Data will be used to calculate the net electricity supplied obtained from the grid, |
| Frequency of monitoring/recording: | Recorded continuously, reported monthly on TEIAS Meter |

[30] UEÇM: Uzlaştırmaya Esas Çekim Miktarı-Amount of Electricity taken from the grid based on Reconciliation.

| | |
|---|---|
| | Reading Protocols, Reported annually on the VCS Monitoring Report. (Monthly Protocol readings can be onsite, as well as remote by TEIAS). |
| Value applied: | Will be determined at the monitoring stage |
| Monitoring equipment: | All Meters will be in compliance with the communiqué for Metering Devices to be used in the Electricity Market[31]. They have an accuracy class of Class002 indicating an accuracy range of 0,2%. |
| QA/QC procedures to be applied: | Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class02, that is to say should be within the ±0.2% (±0.002) range. The monthly reported meter readings by the main meters will be crosschecked with the readings of the back up meters. If the reading difference is less than ±0,002 (±0,2%) than the meter readings will be considered to be OK, if not than the meters will be checked. The monthly reported readings will also be crosschecked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data. |
| Calculation method: | Direct continuous measurement |
| Any comment: | Data will be used to calculate net electricity obtained from the grid. |

| | |
|---|---|
| Data / Parameter: | $EG_{PP\text{-}gross,\ y}$ |
| Data unit: | MWh |
| Description: | Quantity of electricity produced by the power plant , in y |
| Measured /Calculated /Default: | Measured |
| Source of data: | The primary source of data will be the Main TEIAS meters located at the Kirazlık Powerhouse. There will be three meters. The data will be read remotely by TEIAS, through these meters are recorded at the monthly reading protocols, the column related to electricity supplied to the Grid.<br>There are three main meters, each record the generation of electricity from the line that transmit the electricity generated by each unit of generators, and there will be one back-up meters, for each one of the three main meters.<br>The secondary source of data will be the PMUM/MFRC web site screen shots, the column with the heading ISVM[32]. |
| Description of measurement methods and procedures to be applied: | Measurements are to be made by electricity meters. That belongs to the grid operator TEIAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid, |
| Frequency of monitoring/recording: | Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report. (Monthly Protocol readings can be onsite, as well as remote by TEIAS). |
| Value applied: | Will be determined at the monitoring stage |
| Monitoring equipment: | All Meters will be in compliance with the communiqué for Metering Devices to be used in the Electricity Market[33]. They |

[31] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44
[32] ISVM: İletim Sistemine Veriş Miktarı-Amount Supplied to the Grid
[33] The latest version of the communiqué (in Turkish) can be found in the following link: http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44

| | |
|---|---|
| | have an accuracy class of Class002 indicating an accuracy range of 0,2%. |
| QA/QC procedures to be applied: | Measurements will be carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class02, that is to say should be within the ±0.2% (±0.002) range. The main meter readings will be will be crosschecked against the back up meters. If the reading difference is less than ±0,002 (±0,2%) than the meter readings are considered to be OK, if not than the meters will be checked. The monthly reported readings will also be crosschecked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data. |
| Calculation method: | Direct continuous measurement |
| Any comment: | Data will be used to calculate net electricity supplied to the grid. |

| Data / Parameter: | $\mathbf{Cap_{PJ}}$ |
|---|---|
| Data unit: | W |
| Description: | Installed capacity of the hydropower plants after the implementation of the Project Activity. |
| Measured /Calculated /Default: | Measured |
| Source of data: | Project site |
| Description of measurement methods and procedures to be applied: | Observed via the SCADA system of the Project Activity |
| Frequency of monitoring/recording: | Once for each monitoring period |
| Value applied: | 46,110,000 |
| Monitoring equipment: | SCADA system of the Project Activity |
| QA/QC procedures to be applied: | Can be confirmed also by the parameter readings on the design plates of each turbine and by summing the two units. |
| Calculation method: | N/A |
| Any comment: | - |

| Data / Parameter: | $\mathbf{A_{PJ}}$ |
|---|---|
| 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. |
| Measured /Calculated /Default: | Indirectly measured based on depth readings from the Scada system |
| Source of data: | Scada System of the project |
| Description of measurement methods and procedures to be applied: | The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4. |

| | |
|---|---|
| Frequency of monitoring/recording: | Once during each monitoring period |
| Value applied: | 1,000,000 |
| Monitoring equipment: | Scada system water level readings |
| QA/QC procedures to be applied: | Can be checked and compared to satellite imagery available by Google Earth. |
| Calculation method: | - |
| Any comment: | - |

## 4.3 Description of the Monitoring Plan

*Objectives of the monitoring program*

The Monitoring plan is developed to ensure that the Project Activity is well organized from the start in terms of the collection and archival of complete and reliable data that is needed to ensure reliable and accurate measurements of actual emission reductions.

*Data to be monitored*

Given that the emission factor is calculated on an ex-ante basis, the first data to be monitored is the electricity net supplied to the grid.

The second data to be monitored is the installed capacity of the Project Activity. Using the SCADA system installed capacity will be measured automatically.

The third data to be monitored is the reservoir area of the Project Activity. The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.

*Monitoring procedures*

The Verified Emission Reduction (VER) Monitoring Team will conduct the monitoring. The VER Team Members, and their position and duties for the monitoring is outlined in the following table (Table 18):

Table 18: Positions and responsibilities of the VER monitoring team members.

| Position | Responsibility |
|---|---|
| Kirazlık HPP Manager (Also Monitoring Team Manager) | Day to day operation of the Kirazlık HPP,<br>Compliance of the project activity with the host country rules and regulations<br>Coordination of the data collection and recording for the VCS monitoring report. |
| Chief Electrical Engineer | Day to day follow up of electrical equipment<br>Recording and monitoring of the electricity generation data |

| | |
|---|---|
| Accounts Manager | Data keeping for power sales<br>Keeping the track record of PMUM/MFRC data |
| Chief Mechanical Engineer | Day to day operation of the power plant<br>Keeping records of malfunctions and repairs |
| Carbon Consultant | Emission reduction calculations<br>Scripting of the periodic monitoring report<br>Follow up of the verification process |

The power generation meter readings will be performed by using the main metering devices and the back-up metering devices will be used for accuracy checks only. Data from metering devices will be recorded by TEİAŞ on monthly-agreed protocols and will form the basis for invoicing. In addition to the readings of the three metering devices, generation data of the Kirazlık HPP can be cross checked, via the TEİAŞ – PMUM web site (http://pmum.teias.gov.tr ), which is accessible by a password available to the electricity generation companies. The monthly screen shot print outs of the PMUM data will be available to the verifying DOE during the verification process for cross checking. Electricity generation data at the Market Financial Reconciliation Centre (MFRC/PMUM) web page will exhibit the net electricity generated less transmission loss, to be able to produce comparable numbers, the figures taken from PMUM web site needs to be multiplied by the transmission loss factor of the grid.

*Staff training*

The VER Manager will be responsible for ensuring that procedures are followed on site and continuously for improving the procedures to ensure the reliability of the monitoring system.

All staff involved in the VER project will receive training from the monitoring team manager. The Project Owner will keep records of staff training.

*Monitoring equipment*

*Electricity meters*

The main and back-up electricity meters will be bi-directional for quantifying the electricity delivered by the Project Activity to the grid.

The meters will be in compliance with the standards of the Turkish Standards Institute and will have obtained a “Type and System Approval” certificate from the Ministry of Trade and Industry. In case there are modifications to the standards, the modified standard shall be valid; and in case a valid standard is cancelled or abolished, the new standard shall be valid. The standards that will be used are TS-620 EN 60044-1 and TS718 IEC60044.2 for main and back-up meters, respectively. The sensitivity of the main and secondary meters are CI = 0.2 for active and reactive energy. The meters shall be factory calibrated by the manufacturer before installation. Records of the meter (type, made, model and calibration documentation) will be retained in the quality control system.

*Data collecting and recording*

*I. The net electricity generation by the project activity.* Based on the baseline scenario presented above, this amount of electricity would have been produced by the Turkish National Grid.

The electricity produced will be sold to TEİAŞ. Therefore, TEİAŞ measures the electricity produced by four main meters and four Back-up meters.

These meters are placed at the Kirazlık powerhouse where the power plant gets connected to the Turkish national grid. Those meters will provide official data, which will be read and recorded monthly by TEİAŞ officers for invoicing. TEİAŞ also conducts the calibration and maintenance of these meters and thus, ensures the accuracy and quality of the measurements. The quality standards that the meters need to comply is "The ICE/TSE 62053-22: Electricity metering equipment (a.c) – Particular requirements - Part 22: Static meters for active energy (Classes 0,2 S and 0,5 S)" The calibration of the meters is done and the meters will be checked continuously if there is a difference of 0.2 % in the readings of the main and the auxiliary meters, the calibration is repeated.

At the end of each month, the monthly generation will be read remotely and e-mailed to the project owner. In case of failure of the main meters, back-up meters are used to determine the invoiced generation amount. These readings can be on site as well as remotely by the systems that will be put in place by the grid operator TEIAS.

The net electricity produced ($EG_{PP\text{-}net,\ y}$) in year y is calculated by subtracting the total electricity consumed by the hydroelectric power plant ($EG_{PP\text{-}self\ consumption,\ y}$) , from the gross electricity generation ($EG_{PP\text{-}gross,\ y}$) . After obtaining the net electricity production value, the emission reductions will be calculated by multiplying the net electricity with the Ex-ante Combined Margin Emission Factor calculated above.

*Measuring Installed Capacity*

By means of the SCADA system established in the plant all kinds of technical parameters related with turbines and generators including installed capacity will be measured and stored in the system on real time basis. The installed capacity of the plant will be measured from SCADA once a year while the plant is operated with full load and the related data will be stored as per the monitoring program.

*Measuring Reservoir Area*

The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4.

*Data management*

At the end of each month, electricity supplied to the grid will be entered into an electronic spread sheet. The data to be measured for installed capacity and reservoir area will be entered into an

electronic spread sheet at the end of each year. The electronic files will be backed up on both hard drives and on a Compact Disc (CD).

*Quality Control and Assurance (QC/QA)*

All of the main and back-up meters are owned and installed by the grid operator, TEIAS. The Project Owner will sign an agreement with the grid operator to specify the QA procedure for measurement and calibration to ensure the measurement accuracy of the main and back-up meters are in compliance with national regulations. The Calibrations of the electricity meters are valid for the next 10 years after calibration,

The grid operator's Metering Officer should be notified of any failure of one of the meters. TEIAS is the only one entity, authorized to deal with fixing, calibrating, or changing the meters, which will be done either by the grid operator or by a company authorized by the grid operator. The Project Owner will keep electricity sale and purchase records, to which the recorded data will be compared.

All written documentation such as maps, drawings, the EIA and the Feasibility study, will be stored and will be made available to the verifier so that the reliability of the information may be checked.

All data records will be kept for at least 2 years from the last project-crediting year.

The continuity and security of the emission reductions related data depends on safe and sound operation of the project activity. To achieve this, the project owner and the project management team will be doing their best to maintain the project activity. In case of an emergency the emergency plan detailed between pages 196 and 198 of the EIA and the Emergency action flow charts outline in Addendum 14 of the EIA will be implemented.

Further detailed information on the monitoring procedures is presented in the following Table (Table19).

**Table 19: Table outlining the details of the monitoring Procedures**

| Parameter | Monitoring location | Superintendent | Procedure (monitoring and calibration) | Data collection and archiving |
|---|---|---|---|---|
| $EG_y$ | Four electricity meters three main for each line and three back up for each line of measurement) would be installed for reading all the electricity delivered from the hydroelectric power plant to the local grid and the electricity consumed by the power plant. The main and secondary back-up meters will be installed at the end of the transmission line. | TEIAS inspector & Project Owner's Representative/Or remote Access by the TEIAS operator. | Continuous measuring monthly recording: On every month's last day, the production index will be taken from the main as well as the back-up meter: Meter readings shall be carried out at 00:00 on the last day of every month by authorized representatives of TEIAS or the distribution licensee in the region where the generation facility and consumers are located, in the presence of Project Owner's representative. Every month the meters will be read and recorded in the meter reading minutes. A protocol, which shows the measured data will be signed by the Project Owner's representative and a responsible person from the State Authorities (TEIAS – Turkish Electricity Transmission Company).The three meters will be calibrated directly at the installation point by the grid company (TEIAS) supplier representative. The grid operator could hold a periodic or random examination of the calibration to all four of the meters, from time to time. Otherwise the calibration of the meters is valid for the next 10 years after calibration. The monthly meter reading can as well be remotely arranged by the grid operator and be approved by the project owner's authorized personnel via e-mail correspondence. | The reading protocol will be sent to PMUM which is "Financial Settlement Centre" a branch of system operator and is responsible for preparing of invoices reacted with market participants generation volume and the amount of electricity delivered to the system or energy purchased from the system. On the 18th of every next month, PMUM announces the settlement amount and sends invoices to the energy purchasers and takes the invoices from the sellers. In reference to the checked data from the protocol and the PMUM data, Project Owner will prepare the invoice for the generated electricity. Project Owner and TEIAS will store the monthly meter reading documents on electronic spread sheets with back-up files. |
| $Cap_{PJ}$ | Installed capacity of the hydropower plant after the implementation of the Project Activity. | Project Owner's Assigned Technician | Using the SCADA system installed capacity will be measured automatically. | By means of the SCADA system established in the plants all kinds of technical parameters related with turbines and generators including installed capacity will be measured and stored in the system on real time basis. The installed capacity of the plants will be measured from SCADA once a year while the plants are operated with full load and the related data will be stored as per the monitoring program. |
| $AP_J$ | Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity when the reservoir is full | Project Owner's Assigned Technician | The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps. And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic. In order to make verification of the reservoir area, the monthly maximum water depth recordings will be taken and the corresponding reservoir area will be determined using the same graphic, Presented in Annex 4. | The Google Earth image of the reservoir at maximum operational level will be made available to the verifying DOE as a means of secondary comparison. |

# 5 ENVIRONMENTAL IMPACT

In accordance with “Environmental Law” No. 2872 (Issued in 1983), Annex 2 of Environmental Impact Assessment (EIA) Regulation (issued in 1993 and revised in 2001), run-off river type Hydroelectric Power Plants with an installed capacity of 50 MW or more are subject to a full EIA process or report preparation. The project has gone through a full EIA process and The Ministry of Forestry and Urban Planning granted an EIA Affirmative certification for the project presented in Annex-3;

It is summarized in the detailed EIA report (2009) that, for the construction of the project activity will be taking materials from 2 clay and 1 sand and gravel quarry. Therefore the EIA report also covers a detailed mitigation plan for the recovery and remediation of these quarries.

As the planned hydro power plant is an “impoundment type of power plant” , the distance between the weir and the powerhouse is very short. Therefore the water that will be taken via the weir will be directly left to the riverbed.

The Environmental impacts and the mitigation measures are discussed in detail in the Environmental Impact Assessment report including more details at the relevant addendums that deal in more detail for issues such as noise and dust modelling. It is also mentioned in this third party government approved report that the impacts that will form during the construction phase of the project will be temporary and will not be affecting the area as soon as the construction will be completed.

During the operation phase on the other hand the most important issue will be the continuity of the aquatic life in Botan River. The EIA report studies all the peculiarities of the river and states that it will be enough for the project to release a lifeline water of 8m3/s during the relatively vet season, between October, November, December, January, February, March, July, August and September, and states that that this amount would be 40m3/s during the spring months starting from April till end of June.

Based on the information obtained from the lawyers of the project owner, the right bank of the project site belongs to the forest authority and the reservoir lake area, access roads, damping sites and the site where the power house is to be constructed is located at this part. For that part of the project that covers and aerial extent of 519,374 m2, the permits are taken from the forest authority.

The land on the left banks of the project site coincides with a land designated with a meadow status. For this land the governor’s office has given approval for a change of status from Meadowland to treasury land, with a decision dated 14.03.2011 and numbered B.12.4.İLM.0.56.00.01.07-2/792-2443. The land use purpose change document is released and the 453,940.57-m2 piece of land is already registered with the parcel number 759, and registration number of M48-A-07-A, to the name of Treasury. The process of expropriation related to this piece of land, that is the transfer of land use rights was still in progress when this document was prepared.

Some of the potential impacts that may occur during the construction phase and their mitigation actions can be summarized as follows:

*Dust:*

During the construction phase it is expected that dust can be form during the excavation and transportation of construction materials. The following measures will be taken in order to minimize the amount of dust flow during all activities and to minimize the exposure of the construction workers:

1. The material loaded on trucks will be covered with canvas during transportation.
2. Loading and unloading will be made without winnowing.
3. Speed limits will be set for the vehicles.
4. The construction sites and service roads will be sprayed with water.

The provisions of “Regulations for Control of Air Pollution Caused by Industrial Facilities", announced in the Official Gazette No. 26236, dated 22/07/2006, shall be observed during this activity.

Excavated waste material;

Excavation waste is expected to occur not only during the material excavation from the quarries but also as a result of construction process, for such waste a waste damping site will be designated.

*Top Soil:*

Top vegetative part of the soil will be scraped and will be reserved separately at its designated site until the end of the construction period. Later on this topsoil will be used to cover the reclaimed areas and to improve the landscape.

Wastewater:

The project is going to be utilizing the well-structured Alkumru Dam Work site that also belongs to the subcontracted construction company. Therefore the household liquid waste will be treated at the biological packed waste water treatment facility that will be set up at the Alkumru project site, as the workers will be logged in that work site campus.

For the toiletry needs of the workers that will be working about 5 km away from the Alkumru work site, mobile toilets will be utilized, and their filled basins will be discharged to the sewage system of the Alkumru Dam work site, that drains to the biological packed waste water treatment system. The treated water is than discharged to the Botan River. The water quality of the discharged water is in line with the host country regulations.

*Solid Wastes:*

The household solid waste that will result from the presence of workers and other activities will be handled together with that of the wastes that occur as a result of activities in the construction of the Alkumru Dam. All these solid waste will be collected at the designated temporary solid waste storage site and will be transferred to the Aydınlar Municipality landfill or waste handling facility.

Other wastes such as cooking oils or heavy oils will be collected separately and transferred to the licenced handling facilities. The project will therefore will be complying with the host country regulations related to handling of solid waste, hazardous waste and waste oils.

Accordingly, The residue oils and fuels from the construction equipment will be disposed of according to the Regulations for Control of Hazardous Wastes, announced in the Official Gazette No. 25755, on 14 of March 2005, and Regulations for Control of Waste Oils announced in the Official Gazette No. 25353, on 21 January 2004.

The explosive to be used in construction of the conveyance tunnel is ANFO. The explosives will be transported and used in accordance with the “Regulations of Measures to be Taken At Workplaces Operated Using Explosive, Combustive, Dangerous and Hazardous Substances" and the “Regulations Related to Procedures and Principles of Production, Import, Transportation, Preserving, Storing, Sales, Use, Disposal, Inspection of Explosive Substances, Hunting Materials and Similar Substances, Excluding Tekel”, announced in the Official Gazette No. 19589 on 29 September 1987.

Hazardous waste such as rubber, batteries, cables, paints, barrels, contaminated ground by oil, oil binding filters, etc. shall be collected and sent to a licensed hazardous waste recycling or disposal plant, and treated according to the provisions given in the "Regulations for Control of Hazardous Wastes" announced in the Official Gazette No. 25755, dated 14 March 2005.

*Flora and Fauna;*

The project area is not designated as an area for preservation. According to the available literature, there are no rare, endemic, endangered or protected species by national and/or international laws. Fauna and flora species, which are included in the Bern Convention or Red Data Book categories, were not found in the project area. A fish passage for fish species will be built, and once in operation, the project will not produce any air or water pollution to the surrounding environment. It is therefore concluded that the implementation of the project is expected to have only a minor impact on the surrounding environment and regional ecology.

The reservoir lake and its surrounding will be creating new habitat for waterfowl and other birds.

*Possible impacts and Mitigation measures during the operation phase;*

Due to the peculiarities of the project the distance between weir and the powerhouse is as short as 20-30 m. The project will make sure that the lifeline water that will support the sustenance of the aquatic life will be released at all times. As mentioned above the amount of water to be released will be 8m3/s during the relatively vet season, between October, November, December, January, February, March, July, August and September, and states that that this amount would be 40m3/s during the spring months starting from April till end of June.

As the project is an impoundment type of dam, the amount of water that will be left continuously during the operation phase will be sufficient to support the aquatic life in the Botan River.

*Fish Passage:*

The project will be have a fish ladder that will facilitate the upward and downward movements of the fish living in the Botan river.

Household Waste Water:

It is expected that there will be 15 people working during the operation phase. For this personnel there will be a housing constructed at the downstream axis of the Alkumru Dam site and the staff will be living with their families in this site. The wastewater from this site will be collected in a septic tanks that will be periodically sucked up and transferred to the wastewater treatment facility of the upstream Alkumru Dam Site.

# 6 STAKEHOLDER COMMENTS

For the project activity a local stakeholders consultation meeting was held in Aydınlar town of Siirt Province, on April 2nd, 2009, at 11:00 am, in the Public Educational Centre Meeting Hall of Aydınlar Town, Siirt.

The LSC meeting targeted government officials, village heads (Muhtar's) of the nearby villages, and any interested local inhabitants as stakeholders of the project. The meeting was organized under the coordination of the local branch of MoEF, held within the context of the EIA process, to comply with the environmental regulations of the host country.

The meeting was announced at the bulletin boards of the governor house, and municipality, and by loudspeakers, several times before the day of the meeting. Also the meeting was announced via local newspaper (Siirt Postasi) via a National News Paper (Bugün Gazetesi) on March 19th, 2009.

On the day of the meeting, Limak Hidroelektrik Santral Yatırımları A.Ş. has sent mini-busses to the villages and helped the stakeholders reach to the meeting hall.

The consultant company that prepared the EIA report, moderated the meeting and provided information about the project and its environmental impacts to the local stakeholders and answered their questions.

In general most of the questions were related to the expropriation process and the amount of compensation money. None of the attendants mentioned any doubts about the negative impacts of the project to the surrounding environment. Both the project owner company representatives and the environmental consultants answered these questions emphasising that the expropriation process would be conducted in line with the host country rules and regulations.

The following are pictures from the actual meeting:

Figure 7: Pictures from the local stakeholder consultation meeting held in Aydınlar town, on April 2nd, 2009.

## ANNEX-1: THE LEGAL FRAMEWORK OF THE HOST COUNTRY THAT BINDS THE PROJECT

Turkish Environmental Legislation

The Environmental Law (No. 2872), which was published in Turkish Official Gazette No. 18132 dated August 11, 1983 and revised in Turkish Official Gazette No. 26167 dated May 13, 2006 (Law No. 5491) provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre-operation phases. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations. Those that pertain to development and operation of renewable energy projects are the following:

- Environmental Impact Assessment Regulation, Official Gazette No. 26939 dated July 17, 2008.
- Water Pollution Control Regulation, Official Gazette No. 25687 dated December 31, 2004 and revised in Official Gazette No. 26786 dated February 13, 2008;
- Regulation on Construction of Cesspits where there is no Wastewater Collection System, Official Gazette No. 13783 dated March 13, 1971;
- Hazardous Chemicals Regulation, Official Gazette No.21634 dated July 11, 1993 and revised in Official Gazette No. 27092 dated December 26, 2008;
- Regulation on General Principles of Waste Management, Official Gazette No. 26927 dated July 5, 2008;
- Hazardous Wastes Control Regulation, Official Gazette No. 25755 dated March 14, 2005;
- Waste Oil Control Regulation, Official Gazette No. 26952 dated July 30, 2008 and revised Official Gazette No. 27304 dated July 31, 2009;
- Vegetative Waste Oil Control Regulation, Official Gazette No. 25791 dated April 19, 2005; and revised Official Gazette No. 27305 dated July 31, 2009
- Solid Waste Control Regulation, Official Gazette No. 20814 dated March 14, 1991 and revised in Official Gazette No. 25777 dated April 5, 2005;
- Medical Waste Control Regulation, Official Gazette No. 25883 dated July 22, 2005;
- Environmental Audit Regulation, Official Gazette No. 27061 dated November 21, 2008;
- Packaging Waste Control Regulation, Official Gazette No. 26562 dated June 24, 2007 and revised in Official Gazette No. 27046 dated November 6, 2008; and
- Waste Batteries and Accumulators Control Regulation, Official Gazette No. 25569 dated August 31, 2004 and revised in Official Gazette No. 25744 dated March 03, 2005;
- The Excavation, Construction and Demolition Waste Control Regulation, Official Gazette No. 25406 dated March 18, 2004;
- Soil Pollution Control Regulation, Official Gazette No. 25831 dated May 31, 2005;

- Regulation Related to Workplace Opening and Operation Permits, Official Gazette No. 25902 dated August 10, 2005 and revised in Official Gazette No. 26492 dated April 13, 2007;
- Industrial Air Pollution Control Regulation, Official Gazette No.27277 dated July 3, 2009
- Air Quality Assessment and Management Regulation, Official Gazette No. 26898 dated June 6, 2008 and revised in Official Gazette No. 27219 and dated May 5, 2009;
- Air Pollution Control Regulation For Heating Sources, Official Gazette No. 25699 dated January 13, 2005 and revised in Official Gazette No. 27134 dated February 07, 2009;
- Exhaust Gases Emission Control Regulation, Official Gazette No. 27190 dated April 04, 2009; and
- Regulation on Protection of Wetlands, Official Gazette No. 25818 dated May 17, 2005.
- In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the proposed project. The project will comply with the 4857 numbered Labour Law and its regulations stated below:
- Occupational Health and Safety Statute, Official Gazette No. 14765 dated April 11, 1974;
- Health and Safety Regulation for Construction Works, Official Gazette No. 25325 dated December 23, 2003;
- Regulation on Health and Safety Regarding Temporary Works, Official Gazette No. 25463 dated May 15, 2004.

Other regulations that the project will comply with can be listed as follows:

- 5346 numbered Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy;
- Regulation on Protection and Usage of Agricultural Lands, Official Gazette No. 25766 dated March 25, 2005;
- 2863 numbered Law on Protection of Cultural and Natural Heritage (revised by 5226 numbered Law);
- 4342 numbered Pasture Law;
- 6831 numbered Forestry Law (amended by 5192 numbered Revision in Forestry Law);

Regulation on Buildings located on the Disaster Areas, Official Gazette No. 26582 dated July 14, 2007;

# Annex-2: Baseline Information

Table 1

| TÜRKİYE TERMİK SANTRALLARINDA KULLANILAN YAKIT MİKTARLARININ ÜRETİCİ KURULUŞLARA DAĞILIMI<br>(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)<br>*FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES*<br>*(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)* | | | | | |
|---|---|---|---|---|---|
| | | | | | Birim(Unit):Ton/Gaz(gas) $10^3$ $m^3$ |
| | | | **2007** | **2008** | **2009** |
| | **Taşkömürü** | *Hard Coal* | 1,707,037 | 1,636,566 | 1,664,859 |
| | **Linyit** | *Lignite* | 55,232,102 | 60,284,929 | 57,850,129 |
| **EÜAŞ VE BAĞLI** | **TOPLAM** | *TOTAL* | **56,939,139** | **61,921,495** | **59,514,988** |
| **ORTAKLIKLARI** | | **Asıl Yakıt** *Main Fuel* | 551,217 | 832,635 | 239,410 |
| | **Fuel-Oil** *Fuel Oil* | **Yrd. Yakıt** *Auxiliary Fuel* | 166,815 | 154,307 | 134,007 |
| *EÜAŞ AND* | | **TOPLAM** *TOTAL* | **718,032** | **986,942** | **373,417** |
| *AFFILIATED* | | **Asıl Yakıt** *Main Fuel* | 3,617 | 0 | 45,364 |
| *PARTNERSHIPS OF EÜAŞ* | **Motorin** *Diesel Oil* | **Yrd. Yakıt** *Auxiliary Fuel* | 46,354 | 83,041 | 72,956 |
| | | **TOPLAM** *TOTAL* | **49,971** | **83,041** | **118,320** |
| | **TOPLAM** | *TOTAL* | **768,003** | **1,069,983** | **491,737** |
| | **Doğal Gaz** | *Natural Gas* | 4,932,282 | 5,789,269 | 5,091,011 |
| **MOBİL SANTRALLAR** | **Fuel-Oil** | *Fuel Oil* | 170,285 | 67,762 | 0 |
| *MOBILE POWER PLANTS* | **Motorin** | *Diesel Oil* | 0 | 0 | 0 |
| | **TOPLAM** | *TOTAL* | **170,285** | **67,762** | **0** |
| | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 4,322,106 | 4,633,442 | 4,956,318 |
| **OTOPRODÜKTÖRLER** | **Linyit** | *Lignite* | 5,991,719 | 6,089,191 | 5,770,389 |
| **ÜRETİM ŞİRKETLERİ** | **TOPLAM** | *TOTAL* | **10,313,825** | **10,722,633** | **10,726,707** |
| **İŞLETME HAKKI DEVİR** | **Fuel-Oil** | *Fuel Oil* | 1,362,369 | 1,118,667 | 1,220,904 |
| **ADÜAŞ*** | **Motorin** | *Diesel Oil* | 262 | 48,165 | 62,537 |
| *AUTOPRODUCERS* | **LPG** | *LPG* | 0 | 0 | 111 |
| *PRODUCTION COMP.* | **Nafta** | *Naphta* | 11,441 | 10,606 | 8,077 |
| *TOOR* | **TOPLAM** | *TOTAL* | **1,374,072** | **1,177,438** | **1,291,629** |
| *ADÜAŞ* | **Doğal Gaz** | *Natural Gas* | 15,525,511 | 15,818,366 | 15,887,029 |
| | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 6,029,143 | 6,270,008 | 6,621,177 |
| | **Linyit** | *Lignite* | 61,223,821 | 66,374,120 | 63,620,518 |
| | **TOPLAM** | *TOTAL* | **67,252,964** | **72,644,128** | **70,241,695** |
| | **Fuel-Oil** | *Fuel Oil* | 2,250,686 | 2,173,371 | 1,594,321 |
| **TÜRKİYE** | **Motorin** | *Diesel Oil* | 50,233 | 131,206 | 180,857 |
| *TURKEY* | **LPG** | *LPG* | 0 | 0 | 111 |
| | **Nafta** | *Naphta* | 11,441 | 10,606 | 8,077 |
| | **TOPLAM** | *TOTAL* | **2,312,360** | **2,315,183** | **1,783,366** |
| | **Doğal Gaz** | *Natural Gas* | **20,457,793** | **21,607,635** | **20,978,040** |
| Not:Ayrıca Otoprodüktör santrallarda kullanılan Ağaç Kabuğu, Talaş ,Sıvı Kükürt, Siyah Likör, Katran, Kükürt keki , Kok Gazı, YF Gazı Rafineri gazı,Biogaz ve Endüstriyel atık ile ilgili miktarlar tabloda yer almamaktadır. | | | | | |
| *Note: Quantities of Wood Wastes, Liquid Sulphur, Black Liquor, Bitumen Pyrite,Sulphur Cake etc. and Natural Gas,Coke Oven Gas , Blast Furnace Gas and Refinery Gas values used by autoproducers are not included in the table.* | | | | | |

http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls

Table-2: IPCC Default $CO_2$ Emission Factors (2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy, Table 1.2)

| Fuel Type: | EF (tCO2/TJ) |
|---|---|
| Coal | 92.80 |
| Lignite | 90.90 |
| Fuel Oil | 75.50 |
| Diesel | 72.60 |
| LPG | 61.60 |
| Naphtha | 69.30 |
| Natural Gas | 54.30 |
| Bitumen | 73.00 |

Table-3

http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls

**TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ**
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
*HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES*
*(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)*

**Birim(Unit): Tcal**

| | | | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **EÜAŞ VE BAĞLI ORTAKLIKLARI** *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ* | **Taşkömürü** | *Hard Coal* | 5,514 | 5,452 | 4,990 |
| | **Linyit** | *Lignite* | 94,045 | 83,356 | 80,967 |
| | **TOPLAM** | *Total* | **99,559** | **88,809** | **85,957** |
| | **Fuel-Oil** *Fuel Oil* | **Asıl Yakıt** *Main Fuel* | 7,993 | 2,301 | 162 |
| | | **Yrd. Yakıt** *Auxiliary Fuel* | 1,481 | 1,286 | 1,009 |
| | | **TOPLAM** *TOTAL* | **9,474** | **3,587** | **1,171** |
| | **Motorin** *Diesel Oil* | **Asıl Yakıt** *Main Fuel* | 0 | 467 | 0 |
| | | **Yrd. Yakıt** *Auxiliary Fuel* | 855 | 751 | 195 |
| | | **TOPLAM** *TOTAL* | **855** | **1,219** | **195** |
| | **TOPLAM** | *TOTAL* | **10,329** | **4,806** | **1,366** |
| | **Doğal Gaz** | *Natural Gas* | **47,744** | **42,335** | **37,354** |
| | **TOPLAM** | *TOTAL* | **157,632** | **135,949** | **124,676** |
| **MOBİL SANTRALLAR** *MOBIL POWER PLANTS* | **Fuel-Oil** | ***Fuel Oil*** | 649 | 0 | 0 |
| | **Motorin** | ***Diesel Oil*** | | | |
| | **TOPLAM** | ***TOTAL*** | **649** | **0** | **0** |
| **OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ** *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ* | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 27,796 | 29,677 | 34,556 |
| | **Linyit** | *Lignite* | 14,182 | 14,295 | 15,584 |
| | **TOPLAM** | *Total* | **41,978** | **43,973** | **50,141** |
| | **Fuel-Oil** | *Fuel Oil* | 10,484 | 11,573 | 7,398 |
| | **Motorin** | *Diesel Oil* | 473 | 612 | 15 |
| | **Lpg** | *Lpg* | 0 | 1 | 0 |
| | **Nafta** | *Naphta* | 113 | 84 | 105 |
| | **TOPLAM** | *TOTAL* | **11,070** | **12,270** | **7,518** |
| | **Doğal Gaz** | *Natural Gas* | **141,313** | **143,931** | **157,134** |
| | **TOPLAM** | *TOTAL* | **183,291** | **187,904** | **207,275** |
| **TÜRKİYE** *TURKEY* | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 33,310 | 35,130 | 39,546 |
| | **Linyit** | *Lignite* | 108,227 | 97,652 | 96,551 |
| | **TOPLAM** | *Total* | **141,537** | **132,781** | **136,097** |
| | **Fuel-Oil** | *Fuel Oil* | 20,607 | 15,160 | 8,569 |
| | **Motorin** | *Diesel Oil* | 1,328 | 1,830 | 209 |
| | **Lpg** | *Lpg* | 0 | 1 | 0 |
| | **Nafta** | *Naphta* | 113 | 84 | 105 |
| | **TOPLAM** | *TOTAL* | **22,048** | **17,076** | **8,884** |
| | **Doğal Gaz** | *Natural Gas* | **189,057** | **186,266** | **194,487** |
| | **TOPLAM** | *TOTAL* | **352,642** | **336,123** | **339,468** |

**Not 1 :Ayrıca Ağaç kabuğu,talaş,sıvı kükürt,siyah likör,katran,kok gazı,YF gazı,rafineri gazı v.b otoprodüktör santrallarda kullanılan yakıtların ısı değerleri tabloda yer almamaktadır.**
*Note 1: Heating values of wood wastes,liquid sulphur,black liquor,bitumen,coke oven gas,blast furnace gas,refinery gas used by autoproducers are not included in the table.*

Source: http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls

Table 4:

**TÜRKİYE TERMİK SANTRALLARINDA TÜKETİLEN YAKITLARIN KURULUŞLARA GÖRE ISI DEĞERLERİ**
(BİRLEŞİK ISI-ELEKTRİK SANTRALLARINDA ISI ÜRETİMİ İÇİN KULLANILAN YAKITLAR DAHİL)
*HEATING VALUES OF FUELS CONSUMED IN THERMAL POWER PLANTS IN TURKEY BY THE ELECTRIC UTILITIES*
*(FUELS USED FOR HEAT PRODUCTION IN CHP PLANTS INCLUDED)*
1cal = 4,1868 Joule

**Birim(Unit): Gjoule**

| | | | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| **EÜAŞ VE BAĞLI ORTAKLIKLARI** *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ* | **Taşkömürü** | *Hard Coal* | 23,086,015 | 22,828,163 | 20,892,383 |
| | **Linyit** | *Lignite* | 393,747,606 | 348,995,433 | 338,990,622 |
| | **TOPLAM** | *Total* | **416,833,621** | **371,823,595** | **359,883,005** |
| | **Fuel-Oil** *Fuel Oil* | **Asıl Yakıt** *Main Fuel* | 33,465,092 | 9,632,696 | 679,656 |
| | | **Yrd. Yakıt** *Auxiliary Fuel* | 6,200,651 | 5,386,180 | 4,223,229 |
| | | **TOPLAM** *TOTAL* | **39,665,743** | **15,018,876** | **4,902,885** |
| | **Motorin** *Diesel Oil* | **Asıl Yakıt** *Main Fuel* | 0 | 1,956,278 | 159 |
| | | **Yrd. Yakıt** *Auxiliary Fuel* | 3,579,714 | 3,146,162 | 815,082 |
| | | **TOPLAM** *TOTAL* | **3,579,714** | **5,102,441** | **815,241** |
| | **TOPLAM** | *TOTAL* | **43,245,457** | **20,121,317** | **5,718,126** |
| | **Doğal Gaz** | *Natural Gas* | **199,894,579** | **177,247,713** | **156,392,061** |
| | **TOPLAM** | *TOTAL* | **659,973,658** | **569,192,626** | **521,993,192** |
| **MOBİL SANTRALLAR** *MOBIL POWER PLANTS* | **Fuel-Oil** | ***Fuel Oil*** | 2,717,233 | 0 | 0 |
| | **Motorin** | ***Diesel Oil*** | 0 | 0 | 0 |
| | **TOPLAM** | ***TOTAL*** | **2,717,233** | **0** | **0** |
| **OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ** *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ* | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 116,376,293 | 124,253,075 | 144,680,890 |
| | **Linyit** | *Lignite* | 59,377,198 | 59,852,102 | 65,249,084 |
| | **TOPLAM** | *Total* | **175,753,490** | **184,105,177** | **209,929,975** |
| | **Fuel-Oil** | *Fuel Oil* | 43,894,411 | 48,452,601 | 30,974,336 |
| | **Motorin** | *Diesel Oil* | 1,980,356 | 2,560,350 | 61,818 |
| | **Lpg** | *Lpg* | 0 | 5,158 | 0 |
| | **Nafta** | *Naphta* | 473,108 | 352,524 | 440,154 |
| | **TOPLAM** | *TOTAL* | **46,347,876** | **51,370,633** | **31,476,308** |
| | **Doğal Gaz** | *Natural Gas* | **591,649,268** | **602,609,967** | **657,887,178** |
| | **TOPLAM** | *TOTAL* | **767,402,759** | **786,715,144** | **867,817,153** |
| **TÜRKİYE** *TURKEY* | **Taşkömür+İthal kömür** | *Hard Coal+Imported Coal* | 139,462,308 | 147,081,237 | 165,573,274 |
| | **Linyit** | *Lignite* | 453,124,804 | 408,847,535 | 404,239,706 |
| | **TOPLAM** | *Total* | **592,587,112** | **555,928,772** | **569,812,980** |
| | **Fuel-Oil** | *Fuel Oil* | 86,277,388 | 63,471,478 | 35,877,221 |
| | **Motorin** | *Diesel Oil* | 5,560,070 | 7,662,790 | 877,059 |
| | **Lpg** | *Lpg* | 0 | 5,158 | 0 |
| | **Nafta** | *Naphta* | 473,108 | 352,524 | 440,154 |
| | **TOPLAM** | *TOTAL* | **92,310,566** | **71,491,950** | **37,194,434** |
| | **Doğal Gaz** | *Natural Gas* | **791,543,848** | **779,857,681** | **814,279,239** |
| | **TOPLAM** | *TOTAL* | **1,476,441,526** | **1,407,278,403** | **1,421,286,653** |

Source: Computed based on the data in p. 44.

Table-5

**NET CALORIFIC VALUES OF FUELS CONSUMED IN THE THERMAL POWER PLANTS**

Unit: TJ/KT

| | | | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| EÜAŞ VE BAĞLI ORTAKLIKLARI *EÜAŞ AND AFFILIATED PARTNERSHIPS OF EÜAŞ* | Taşkömürü | *Hard Coal* | 14.11 | 13.71 | 13.36 |
| | Linyit | *Lignite* | 6.53 | 6.03 | 6.76 |
| | TOPLAM | *TOTAL* | **6.73** | **6.25** | **6.96** |
| | Fuel-Oil *Fuel Oil* | Asıl Yakıt *Main Fuel* | 40.19 | 40.24 | 40.30 |
| | | Yrd. Yakıt *Auxiliary Fuel* | 40.18 | 40.19 | 40.19 |
| | | TOPLAM *TOTAL* | **40.19** | **40.22** | **40.21** |
| | Motorin *Diesel Oil* | Asıl Yakıt *Main Fuel* | 0.00 | 0.00 | 1.00 |
| | | Yrd. Yakıt *Auxiliary Fuel* | 43.11 | 43.12 | 43.12 |
| | | TOPLAM *TOTAL* | **43.11** | **43.12** | **43.12** |
| | TOPLAM | *TOTAL* | **40.42** | **40.92** | **40.60** |
| | Doğal Gaz | *Natural Gas* | 34.53 | 34.82 | 34.81 |
| MOBİL SANTRALLAR *MOBILE POWER PLANTS* | Fuel-Oil | *Fuel Oil* | 40.10 | 0.00 | 0.00 |
| | Motorin | *Diesel Oil* | | | |
| | TOPLAM | *TOTAL* | **40.10** | **0.00** | **0.00** |
| OTOPRODÜKTÖRLER ÜRETİM ŞİRKETLERİ İŞLETME HAKKI DEVİR ADÜAŞ* *AUTOPRODUCERS PRODUCTION COMP. TOOR ADÜAŞ* | Taşkömür+İthal kömür | *Hard Coal+Imported Coal* | 25.12 | 25.07 | 24.71 |
| | Linyit | *Lignite* | 9.75 | 10.37 | 9.94 |
| | TOPLAM | *TOTAL* | **16.39** | **17.16** | **16.90** |
| | Fuel-Oil | *Fuel Oil* | 39.24 | 39.69 | 40.23 |
| | Motorin | *Diesel Oil* | 41.12 | 40.94 | 42.66 |
| | LPG | *LPG* | 0.00 | 0.00 | 1.00 |
| | Nafta | *Naphta* | 44.61 | 43.65 | 33.50 |
| | TOPLAM | *TOTAL* | **39.36** | **39.77** | **40.13** |
| | Doğal Gaz | *Natural Gas* | 37.40 | 37.93 | 38.05 |
| TÜRKİYE *TURKEY* | Taşkömür+İthal kömür | *Hard Coal+Imported Coal* | 22.24 | 22.21 | 22.32 |
| | Linyit | *Lignite* | 6.83 | 6.43 | 7.13 |
| | TOPLAM | *TOTAL* | **8.16** | **7.91** | **8.89** |
| | Fuel-Oil | *Fuel Oil* | 39.70 | 39.81 | 40.23 |
| | Motorin | *Diesel Oil* | 42.38 | 42.37 | 43.09 |
| | LPG | *LPG* | 0.00 | 0.00 | 1.00 |
| | Nafta | *Naphta* | 44.61 | 43.65 | 33.50 |
| | TOPLAM | *TOTAL* | **39.87** | **40.09** | **40.20** |
| | Doğal Gaz | *Natural Gas* | 36.63 | 37.17 | 37.38 |

Computed based on the data in page 45

Table-6:

Data Source: http://www.teias.gov.tr/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls

**TÜRKİYE BRÜT ELEKTRİK ENERJİSİ ÜRETİMİNİN ÜRETİCİ KURULUŞLAR VE BİRİNCİL ENERJİ KAYNAKLARINA DAĞILIMI**
*TURKEY'S GROSS ELECTRICITY GENERATION BY PRIMARY ENERGY RESOURCES AND THE ELECTRIC UTILITIES*

Birim(Unit) : GWh

| ÜRETİM KARAKTERİSTİĞİ *Generation Characteristics* | | | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| E | TAŞKÖMÜRÜ | *Hard Coal* | 1,882.4 | 1,851.1 | 1,882.7 |
| | LİNYİT | *Lignite* | 22,433.3 | 22,395.3 | 20,646.7 |
| | KÖMÜR TOPLAMI | *Coal Total* | **24,315.7** | **24,246.4** | **22,529.4** |
| Ü | FUEL-OİL | *Fuel Oil* | 3,365.1 | 974.4 | 62.2 |
| | MOTORİN | *Diesel oil* | 0.4 | 0.2 | 0.0 |
| A | SIVI TOPLAMI | *Liquid Total* | **3,365.5** | **974.6** | **62.2** |
| | DOĞAL GAZ | *Natural Gas* | **18,818.5** | **17,225.5** | **15,289.4** |
| Ş | TERMİK TOPLAM | *Thermal Total* | **46,499.7** | **42,446.5** | **37,881.0** |
| | HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM | *Hydro+Jeothermal+Wind Total* | **28,419.4** | **28,338.2** | **41,377.4** |
| | TOPLAM | *Total* | **74,919.1** | **70,784.8** | **79,258.3** |
| BAĞLI ORTAKLIKLAR | LİNYİT | *Lignite* | 14,802.7 | 11,974.5 | 10,524.2 |
| *Affiliated partnerships Of EÜAŞ* | DOĞAL GAZ | *Natural Gas* | 7,995.1 | 6,694.4 | 5,749.9 |
| | TERMİK TOPLAM | *Thermal Total* | **22,797.8** | **18,668.9** | **16,274.1** |
| MOBİL SANTRALLAR | FUEL-OİL | *Fuel Oil* | **330.5** | **0.0** | **0.0** |
| *MOBILE P.P.* | MOTORİN | *Diesel oil* | | | **0.0** |
| | TERMİK TOPLAM | *Thermal Total* | **330.5** | **0.0** | **0.0** |
| | TAŞKÖMÜRÜ+İTHAL KÖMÜR | *Hard Coal+Imported Coal* | 13,975.1 | 14,744.5 | 17,221.6 |
| | LİNYİT | *Lignite* | 4,622.1 | 4,719.6 | 4,771.2 |
| | KÖMÜR TOPLAMI | *Coal Total* | **18,597.2** | **19,464.1** | **21,992.8** |
| | FUEL-OİL | *Fuel Oil* | 3,513.0 | 3,465.4 | 2,081.6 |
| OTOPRODÜKTÖRLER | MOTORİN | *Diesel oil* | 265.9 | 345.6 | 4.3 |
| ÜRETİM ŞRK. | LPG | *LPG* | 0.0 | 0.4 | 0.0 |
| İŞLETME HAKKI DEV. | NAFTA | *Naphtha* | 43.6 | 17.6 | 31.9 |
| | SIVI TOPLAMI | *Liquid Total* | **3,822.5** | **3,829.0** | **2,117.8** |
| *Autoproducers* | DOĞAL GAZ | *Natural Gas* | **71,871.7** | **72,174.8** | **77,104.5** |
| *Production Comp.* | YENİLENEBİLİR+ATIK | *Renewables and wastes* | **219.9** | **340.1** | **457.0** |
| *TOOR* | TERMİK TOPLAM | *Thermal Total* | **94,511.3** | **95,808.0** | **101,672.5** |
| | HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM | *Hydro+Jeothermal+Wind Total* | **5,859.3** | **9,551.2** | **14,002.8** |
| | TOPLAM | *Total* | **100,370.6** | **105,359.2** | **115,675.3** |
| | TAŞKÖMÜRÜ+İTHAL KÖMÜR | *Hard Coal+Imported Coal* | 15,857.5 | 16,595.6 | 19,104.3 |
| | LİNYİT | *Lignite* | 41,858.1 | 39,089.5 | 35,942.1 |
| | KÖMÜR TOPLAMI | *Coal Total* | **57,715.6** | **55,685.1** | **55,046.4** |
| | FUEL-OİL | *Fuel Oil* | 7,208.6 | 4,439.8 | 2,143.8 |
| | MOTORİN | *Diesel oil* | 266.3 | 345.8 | 4.3 |
| T Ü R K İ Y E | LPG | *LPG* | 0.0 | 0.4 | 0.0 |
| | NAFTA | *Naphtha* | 43.6 | 17.6 | 31.9 |
| *TURKEY* | SIVI TOPLAMI | *Liquid Total* | **7,518.5** | **4,803.5** | **2,180.0** |
| | DOĞAL GAZ | *Natural Gas* | **98,685.3** | **96,094.7** | **98,143.7** |
| | YENİLENEBİLİR+ATIK | *Renewables and wastes* | **219.9** | **340.1** | **457.5** |
| | TERMİK TOPLAM | *Thermal Total* | **164,139.3** | **156,923.4** | **155,827.6** |
| | HİDROLİK +JEOTERMAL+RÜZGAR TOPLAM | *Hydro+Jeothermal+Wind Total* | **34,278.7** | **37,889.5** | **55,380.1** |
| | TÜRKİYE TOPLAMI | *TURKEY'S TOTAL* | **198,418.0** | **194,812.9** | **211,207.7** |

Table 7
http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls

**TÜRKİYE ELEKTRİK ENERJİSİ ÜRETİM - TÜKETİM VE KAYIPLARININ YILLAR İTİBARİYLE GELİŞİMİ**
***ANNUAL DEVELOPMENT OF ELECTRICITY GENERATION- CONSUMPTION AND LOSSES IN TURKEY***
(1984-2009)

http://www.teias.gov.tr/TürkiyeElektrikİstatistikleri/istatistik2010/front%20page%202010-çiçek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls

| YILLAR YEARS | BRÜT ÜRETİM GROSS GEN. | ARTIŞ % INCREASE | İÇ İHTİYAÇ INTERNAL CONSUMPTION | % | NET ÜRETİM NET GEN. | İTHALAT IMPORTS | ŞEBEKEYE VERİLEN[1] SUPPLIED TO THE NETWORK[1] | ŞEBEKE KAYBI — NETWORK LOSSES: İLETİM TRANSMISSION | % | DAĞITIM DISTRIBUTION | % | TOPLAM TOTAL | % | İHRACAT[2] EXPORTS[2] | NET TÜKETİM NET CONS. | | ARTIŞ % INCREASE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1984 | 30613.5 | 11.9 | 1890.7 | 6.2 | 28722.8 | 2853.0 | 31575.8 | 1577.4 | 5.0 | 2183.2 | 6.9 | 3760.6 | 11.9 | | 27835.2 | | 13.0 | |
| 1985 | 34218.9 | 11.8 | 2306.8 | 6.7 | 31912.1 | 2142.4 | 34054.5 | 1611.4 | 4.7 | 2734.5 | 8.0 | 4345.9 | 12.8 | | 29708.6 | | 7.5 | |
| 1986 | 39694.8 | 16.0 | 2815.0 | 7.1 | 36879.8 | 776.6 | 37656.4 | 1344.3 | 3.6 | 4102.4 | 10.9 | 5446.7 | 14.5 | | 32209.7 | | 8.4 | |
| 1987 | 44352.9 | 11.7 | 2807.7 | 5.9 | 41745.2 | 572.1 | 42317.3 | 1627.4 | 3.8 | 3982.6 | 9.4 | 5620.0 | 13.3 | | 36697.3 | | 13.9 | |
| 1988 | 48046.8 | 8.3 | 2400.0 | 5.0 | 45646.8 | 381.2 | 46030.0 | 2016.6 | 4.4 | 4291.9 | 9.3 | 6308.5 | 13.7 | | 39721.5 | | 8.2 | |
| 1989 | 52043.2 | 8.3 | 3234.5 | 6.2 | 48808.7 | 558.5 | 49367.2 | 1544.0 | 3.1 | 4703.2 | 9.5 | 6247.2 | 12.7 | | 43120.0 | | 8.6 | |
| 1990 | 57543.0 | 10.6 | 3311.4 | 5.8 | 54231.6 | 175.5 | 54407.1 | 1787.2 | 3.3 | 4893.1 | 9.0 | 6680.3 | 12.3 | 908.8 | 46820.0 | | 8.6 | |
| 1991 | 60246.3 | 4.7 | 3655.2 | 6.1 | 56591.1 | 759.4 | 57350.5 | 1437.8 | 2.5 | 6123.4 | 10.7 | 7561.2 | 13.2 | 506.4 | 49282.9 | | 5.3 | |
| 1992 | 67342.2 | 11.8 | 4237.3 | 6.3 | 63104.9 | 188.8 | 63293.7 | 1342.9 | 2.1 | 7651.9 | 12.1 | 8994.8 | 14.2 | 314.2 | 53984.7 | | 9.5 | |
| 1993 | 73807.5 | 9.6 | 3943.1 | 5.3 | 69864.4 | 212.9 | 70077.3 | 1634.9 | 2.3 | 8616.7 | 12.3 | 10251.6 | 14.6 | 588.7 | 59237.0 | | 9.7 | |
| 1994 | 78321.7 | 6.1 | 4539.1 | 5.8 | 73782.6 | 31.4 | 73814.0 | 1800.3 | 2.4 | 10042.7 | * 13.6 | 11843.0 | 16.0 | 570.1 | 61400.9 | * | 3.7 | |
| 1995 | 86247.4 | 10.1 | 4588.8 | 5.1 | 81658.6 | 0 | 81658.6 | 2034.9 | 2.5 | 11733.9 | * 14.3 | 13768.8 | 16.8 | 695.9 | 67393.9 | * | 9.8 | |
| 1996 | 94861.7 | 10.0 | 4777.3 | 5.0 | 90084.4 | 270.1 | 90354.5 | 2461.7 | 2.7 | 13393.1 | * 14.8 | 15854.8 | 17.5 | 343.1 | 74156.6 | * | 10.0 | |
| 1997 | 103295.8 | 8.9 | 5050.2 | 4.9 | 98245.6 | 2492.3 | 100737.9 | 2935.5 | 2.9 | 15646.4 | * 15.5 | 18581.9 | 18.4 | 271.0 | 81885.0 | * | 10.4 | |
| 1998 | 111022.4 | 7.5 | 5523.2 | 5.0 | 105499.2 | 3298.5 | 108797.7 | 3337.1 | 3.1 | 17457.8 | * 16.0 | 20794.9 | 19.1 | 288.2 | 87704.6 | * | 7.1 | |
| 1999 | 116439.9 | 4.9 | 5738.0 | 4.9 | 110701.9 | 2330.3 | 113032.2 | 2965.1 | 2.6 | 18559.9 | * 16.4 | 21545.0 | 19.1 | 285.3 | 91201.9 | * | 4.0 | |
| 2000 | 124921.6 | 7.3 | 6224.0 | 5.0 | 118697.6 | 3791.3 | 122488.9 | 3161.8 | 2.6 | 20574.1 | * 16.8 | 23755.9 | 19.4 | 437.3 | 98295.7 | * | 7.8 | |
| 2001 | 122724.7 | -1.8 | 6472.6 | 5.3 | 116252.1 | 4579.4 | 120831.5 | 3374.4 | 2.8 | 19954.3 | * 16.5 | 23328.7* | 19.3 | 432.8 | 97070.0 | * | -1.2 | |
| 2002 | 129399.5 | 5.4 | 5672.7 | 4.4 | 123726.8 | 3588.2 | 127315.0 | 3440.7 | 2.7 | 20491.2 | * 16.1 | 23931.9 | 18.8 | 435.1 | 102946.0 | * | 6.1 | |
| 2003 | 140580.5 | 8.6 | 5332.2 | 3.8 | 135248.3 | 1156.0 | 136406.3 | 3330.7 | 2.4 | 20722.0 | * 15.2 | 24052.7 | 17.6 | 587.6 | 111766.0 | * | 8.6 | |
| 2004 | 150886.3 | 7.2 | 5632.6 | 3.7 | 145065.7 | 463.5 | 145529.2 | 3422.8 | 2.4 | 19820.2 | * 13.6 | 23243.0 | 16.0 | 1144.3 | 121141.9 | * | 8.4 | |
| 2005 | 161856.2 | 7.5 | 6487.1 | 4.0 | 155469.1 | 635.9 | 156105.0 | 3695.3 | 2.4 | 20348.7 | * 13.0 | 24044.0 | 15.4 | 1788.1 | 130262.9 | * | 7.5 | |
| 2006 | 176289.8 | 8.9 | 6756.7 | 3.8 | 169543.1 | 573.2 | 170116.3 | 4543.8 | 2.7 | 19245.4 | * 11.3 | 23789.2 | 14.0 | 2235.7 | 144091.4 | * | 10.6 | |
| 2007 | 191558.1 | 8.7 | 8218.4 | 4.3 | 183339.7 | 864.3 | 184204.0 | 4523.0 | 2.5 | 22123.6 | * 12.0 | 26646.6 | 14.5 | 2422.2 | 155135.2 | * | 7.7 | |
| 2008 | 198418.0 | 3.6 | 8656.1 | 4.4 | 189761.9 | 789.4 | 190551.3 | 4388.4 | 2.3 | 23093.1 | * 12.1 | 27481.5 | 14.4 | 1122.2 | 161947.6 | * | 4.4 | |
| 2009 | 194812.9 | -1.8 | 8193.6 | 4.2 | 186619.3 | 812.0 | 187431.3 | 3973.4 | 2.1 | 25018.0 | * 13.3 | 28991.4 | 15.5 | 1545.8 | 156894.1 | * | -3.1 | |
| 2010 | 211207.7 | 8.4 | 8161.6 | 3.9 | 203046.1 | 1143.8 | 204189.9 | 5690.5 | 2.8 | 24531.2 | * 12.0 | 30221.7 | 14.8 | 1917.6 | 172050.6 | * | 9.7 | |

1)Şebekeye Verilen = Net Üretim+İthalat

2) İhracat,ülkeye teslim esasına göre yapıldığından,ihracat ile ilgili şebeke kaybı,iletim kaybının içinde yer almaktadır.

* Kaynak : Türkiye Elektrik Dağıtım ve Tüketim İstatistikleri , 1984-2010

1)Supplied to the Network = Net Generation+Import

2)As the export is made on delivery at border basis,its losses are included in the section for transmission network losses.

* Source : *Electricity Distribution and Consumption Statistics of Turkey , 1984-2010*

Source:http://www.teias.gov.tr/istatistik2009/30(84-09).xls

Table-8a:
Source: http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (Mw) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| Silopi Elektrik Uretim A.Ş. | Prod.Comp. | Bitumen | 135 | 945.00 | |
| Habaş (Bilecik)(Paşalar) | Prod.Comp. | Fuel Oil | 18 | 144.00 | |
| Habaş (Izmir)(Habaş) | Prod.Comp. | Fuel Oil | 36 | 288.00 | |
| Hayat Kağit | Prod.Comp. | Fuel Oil | 7.5 | 56.30 | |
| Silopi Elektrik Uretim A.Ş.(Esenboğa) | Prod.Comp. | Fuel Oil | 44.8 | 315.00 | |
| Tire- Kutsan (Tire) | AutoProducer | Fuel Oil | 8 | 37.00 | |
| TUPRAŞ O.A.RAFİNERİ(Kırıkkale)(Düzeltme) | AutoProducer | Fuel Oil | 10 | 70.00 | |
| Tüpraş Rafineri(Aliağa/Izmir) | AutoProducer | Fuel Oil | 24.7 | 171.78 | |
| Içdaş Çelik (Ilave) | Prod.Comp. | Imported Coal | 270 | 1,923.33 | |
| Alkim Alkali Kimya (Cihanbeyli/Konya) | Autoproducer | Lignite | 0.4 | 3.00 | |
| Konya Şeker San. Tic. A.Ş. | Autoproducer | Lignite | 1.6 | 4.00 | |
| Ak Gida San. Ve Tic. A.Ş. (Pamukova) | Autoproducer | Natural Gas | 7.5 | 61.00 | |
| Aksa Akrilik Kimya Sn. A.Ş. (Yalova) | Prod.Comp. | Natural Gas | 70 | 539.00 | |
| Aksa Enerji (Antalya) (Güç Değişikliği) | Prod.Comp. | Natural Gas | 16.2 | 127.72 | |
| Aksa Enerji (Antalya) (Ilave) | Prod.Comp. | Natural Gas | 300 | 2310.00 | |
| Aksa Enerji (Antalya) (Ilave) | Prod.Comp. | Natural Gas | 300 | 2310.00 | |
| Aksa Enerji (Manisa) (Ilave) | Prod.Comp. | Natural Gas | 52.4 | 414.93 | |
| Aksa Enerji (Manisa) (Ilave) | Prod.Comp. | Natural Gas | 10.5 | 83.14 | |
| Anadolu Elektrik (Çakirlar Hes) | Prod.Comp. | Natural Gas | 16.2 | 28.00 | |
| Antalya Enerji (Ilave) | Prod.Comp. | Natural Gas | 41.8 | 302.10 | |
| Arenko Elektrik Uretim A.Ş. (Denizli) | Prod.Comp. | Natural Gas | 12 | 84.00 | |
| Bil Enerji (Dg+M) (Balgat) | Prod.Comp. | Natural Gas | 36.6 | 255.00 | |
| Cam Iş Elektrik (Mersin) (Ilave) | Prod.Comp. | Natural Gas | 126.1 | 1008.00 | |
| Çelikler Taah. Inş. (Rixox Grand) | Autoproducer | Natural Gas | 2 | 16.00 | |
| Dalsan Alçi San. Ve Tic. A.Ş. | Autoproducer | Natural Gas | 1.2 | 9.00 | |
| Delta Enerji Uretim Ve Tic.A.Ş. | Prod.Comp. | Natural Gas | 47 | 365.82 | |
| DELTA ENERJI URETIM VE TİC.A.Ş. (ılave) | Prod.Comp. | Natural Gas | 13 | 101.18 | |
| DESA ENERJI ELEKTRIK ÜRETİM A.Ğ. | Prod.Comp. | Natural Gas | 9.8 | 70.00 | |
| E.Şehir End. Enerji (Dg+M)(Eskişehir-2) | Prod.Comp. | Natural Gas | 59 | 451.80 | |
| Ege Birleşik Enerji (Lpg+Dg+M)(Aliağa) | Prod.Comp. | Natural Gas | 12.8 | 107.00 | |
| Entek Köseköy(Iztek) (Düzeltme) | Prod.Comp. | Natural Gas | 36.3 | 288.87 | |
| Entek Köseköy(Iztek) (Düzeltme) | Prod.Comp. | Natural Gas | 0.8 | 6.37 | |
| Erdemir(Ereğli-Zonguldak) | Prod.Comp. | Natural Gas | 39.2 | 237.88 | |
| Falez Elektrik Uretimi A. Ş. | Prod.Comp. | Natural Gas | 11.7 | 88.00 | |
| Global Enerji (Pelitlik) | Prod.Comp. | Natural Gas | 8.6 | 155.00 | |
| Gül Enerji Elkt. Uret. Sn. Ve Tic. A.G. | Prod.Comp. | Natural Gas | 24.3 | 170.00 | |
| Habaş Aliağa | Prod.Comp. | Natural Gas | 224.5 | 1796.00 | |
| Kasar Dual Tekstil San. A.Ş. (Çorlu) | Autoproducer | Natural Gas | 5.7 | 38.00 | |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (Mw) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| Ken Kipaş Elektrik Uretim (Karen) | Prod.Comp. | Natural Gas | 41.8 | 180.00 | |
| Ken Kipaş Elektrik Uretim (Karen) (Kahramanmaraş) | Prod.Comp. | Natural Gas | 17.5 | 75.36 | |
| Maksi Enerji Elektrik Uretim A.Ş. | Prod.Comp. | Natural Gas | 7.7 | 55.00 | |
| Marmara Pamuklu Mens. Sn.Tic.A.Ş. | Prod.Comp. | Natural Gas | 34.9 | 275.15 | |
| Mauri Maya San. A.Ş. | Autoproducer | Natural Gas | 2.3 | 20.00 | |
| Modern Enerji (B.Karıştıran) | Prod.Comp. | Natural Gas | 96.8 | 680.00 | |
| Mosb Enerji Elektrik Uretim Ltd. Şti. | Prod.Comp. | Natural Gas | 84.8 | 434.00 | |
| Nuh Çimento San. Tic. A.G.(Nuh Çim.) (İlave) | Prod.Comp. | Natural Gas | 47 | 329.00 | |
| Petkim Aliağa (Aliağa) | Autoproducer | Natural Gas | 222 | 1188.00 | |
| Petkim Aliağa (Aliağa)(Düzeltme-İlave) | Autoproducer | Natural Gas | 52 | 278.27 | |
| Rasa Enerji (Van) | Prod.Comp. | Natural Gas | 78.6 | 500.00 | |
| Şahinler Enerji (Çorlu/Tekirdağ) | Prod.Comp. | Natural Gas | 26 | 185.00 | |
| Selkaşan Kağit Paketleme Malz. İm. | Autoproducer | Natural Gas | 9.9 | 73.00 | |
| Sönmez Elektrik(Uşak) (Ilave) | Prod.Comp. | Natural Gas | 8.7 | 67.06 | |
| Süperfilm (Gaziantep) | AutoProducer | Natural Gas | 25.3 | 203.00 | |
| Tav Istanbul Terminal Işletme. A.Ş. | Autoproducer | Natural Gas | 3.3 | 27.61 | |
| Tav Istanbul Terminal Işletme. A.Ş. | Autoproducer | Natural Gas | 6.5 | 54.39 | |
| Tesko Kipa Kitle Paz. Tic. Ve Gida A.G. | Autoproducer | Natural Gas | 2.3 | 18.00 | |
| Yurtbay Elektrik Uretim A.Ş. (D.G.+M) | Prod.Comp. | Natural Gas | 6.9 | 50.00 | |
| Zorlu Enerji (B.Karıştıran) (İlave) | Prod.Comp. | Natural Gas | 49.5 | 396.00 | |
| Cargill Tarim Ve Gida San. Tic. A.Ş. | AutoProducer | R-Biogas | 0.1 | 0.70 | |
| Gürmat Elekt. (Gürmat Jeotermal) | Prod.Comp. | R-Geotherm al | 47.4 | 313.00 | |
| Akçay Hes Elektrik Ur. (Akçay Hes) | Prod.Comp. | R-HPP | 28.8 | 45.00 | |
| Akua Enerji (Kayalik Reg. Ve Hes) | Prod.Comp. | R-HPP | 5.8 | 20.00 | |
| Bağişli Reg. Ve Hes (Ceykar Elekt.) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 657 |
| Bağişli Reg. Ve Hes (Ceykar Elekt.) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 658 |
| Bereket Enerji (Koyulhisar Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 713 |
| Beyobasi En. Ur. A.Ş. (Sirma Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 603 |
| Cindere Hes (Denizli) | Prod.Comp. | R-HPP | 19.1 | 30.00 | |
| Değirmenüstü En. (Kahramanmaraş) | Prod.Comp. | R-HPP | 12.9 | 17.38 | |
| Denizli Elektrik (Ege I Hes) | Prod.Comp. | R-HPP | 0.9 | 2.00 | |
| Elestaş Elektrik (Yaylabel Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 582 |
| Elestaş Elektrik (Yazi Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 583 |
| Erva Enerji (Kabaca Reg. Ve Hes) | Prod.Comp. | R-HPP | 4.2 | 7.50 | |
| Erva Enerji (Kabaca Reg. Ve Hes) | Prod.Comp. | R-HPP | 4.2 | 7.50 | |
| Filyos Enerji (Yalnizca Reg. Ve Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | GS 618 |
| Kalen Enerji (Kalen I - Ii Hes) | Prod.Comp. | R-HPP | 15.7 | 23.58 | |
| Karel Enerji (Pamukova) | Prod.Comp. | R-HPP | 0 | 0.00 | GS 1073 |
| Kayen Alfa Enerji (Kaletepe Hes) | Prod.Comp. | R-HPP | 10.2 | 17.00 | |
| Kisik | EUAŞ | R-HPP | 9.6 | 20.00 | |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (Mw) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| Lamas Iii - Iv Hes (Tgt Enerji Üretim) | Prod.Comp. | R-HPP | 35.7 | 71.00 | |
| Obruk Hes | EUAŞ | R-HPP | 212.4 | 337.00 | |
| Ozgür Elektrik (Azmak Ii Reg.Ve Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS554 |
| OZTAY ENERJI (Günayğe REG.VE HES) | Prod.Comp. | R-HPP | 0 | 0.00 | GS636 |
| Ozyakut Elek. Ur.A.Ş. (Güneşli Hes) | Prod.Comp. | R-HPP | 1.8 | 4.00 | |
| Reşadiye 3 Hes (Turkon Mng Elekt.) | Prod.Comp. | R-HPP | 0 | 0.00 | GS645 |
| Saritepe Hes (Genel Dinamik Sis.El.) | Prod.Comp. | R-HPP | 0 | 0.00 | ? |
| Saritepe Hes (Genel Dinamik Sis.El.) | Prod.Comp. | R-HPP | 0 | 0.00 | ? |
| Şirikçioğlu El.(Kozak Bendi Ve Hes) | Prod.Comp. | R-HPP | 4.4 | 7.00 | |
| Taşova Yenidereköy Hes (Hameka A.Ş.) | Prod.Comp. | R-HPP | 2 | 6.00 | |
| Tektuğ (Erkenek) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 693 |
| Tektuğ (Erkenek) (Ilave) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 694 |
| Tocak I Hes (Yurt Enerji Uretim Sn.) | Prod.Comp. | R-HPP | 4.8 | 6.00 | |
| Tüm Enerji (Pinar Reg. Ve Hes) | Prod.Comp. | R-HPP | 30.1 | 65.00 | |
| Uzunçayir Hes (Tunceli) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 762 |
| Yapisan (Karica Reg. Ve Darica I Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 506 |
| Yapisan (Karica Reg. Ve Darica I Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 506 |
| Yeşilbaş Enerji (Yeşilbaş Hes) | Prod.Comp. | R-HPP | 0 | 0.00 | VCS 806 |
| Ypm Gölova Hes (Suşehri/Sivas) | Prod.Comp. | R-HPP | 1.1 | 2.00 | |
| Ypm Sevindik Hes (Suşehri/Sivas) | Prod.Comp. | R-HPP | 5.7 | 18.00 | |
| Itc-Ka Enerji (Sincan) | Prod.Comp. | R-Waste | 0 | 0.00 | GS 765 |
| Itc-Ka Enerji Mamak Kati Atik Top.Merk. | Prod.Comp. | R-Waste | 0 | 0 | GS 440 |
| Ortadoğu Enerji (Kömürcüoda) | Prod.Comp. | R-Waste | 0 | 0.00 | GS 707 |
| Ortadoğu Enerji (Oda Yeri) (İlave) | Prod.Comp. | R-Waste | 0 | 0 | GS 707 |
| Ortadoğu Enerji (Oda Yeri) (İlave) | Prod.Comp. | R-Waste | 0 | 0 | GS 707 |
| Ak Enerji (Ayyildiz Res) | Prod.Comp. | R-WPP | 0 | 0 | GS 634 |
| Alize Enerji (Çamseki Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 399 |
| Alize Enerji (Keltepe Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 437 |
| Alize Enerji (Sarikaya Res) (Şarköy) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 577 |
| Ayen Enerji A.Ş. Akbük Rüzgar | Prod.Comp. | R-WPP | 0 | 0.00 | GS 436 |
| AYEN ENERJI A.Ş. AKBUK RÜZGAR (Ilave) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 437 |
| Baki Elektrik Şamli Rüzgar | Prod.Comp. | R-WPP | 0 | 0.00 | GS? http://www.aksaenerji.com.tr/tr/samliWEPP.aspx |
| Baki Elektrik Şamli Rüzgar | Prod.Comp. | R-WPP | 0 | 0.00 | GS? http://www.aksaenerji.com.tr/tr/samliWEPP.aspx |
| Belen Elektrik Belen Rüzgar-Hatay | Prod.Comp. | R-WPP | 0 | 0.00 | GS 390 |
| Belen Elektrik Belen Rüzgar-Hatay | Prod.Comp. | R-WPP | 0 | 0.00 | GS 390 |
| Borasko Enerji (Bandirma Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 744? |
| Borasko Enerji (Bandirma Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 744? |
| Datça Res (Datça) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 428 |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (Mw) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| Datça Res (Datça) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 428 |
| Datça Res (Datça) (Ilave) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 428 |
| Koreş Kocadağ Res (Urla/İzmir) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 601 |
| Mazi-3 Res Elekt.Ur. A.G. (Mazi-3 Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 388 |
| Mazi-3 Res Elekt.Ur. A.G. (Mazi-3 Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 388 |
| Rotor Elektrik (Osmaniye Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 474 |
| Rotor Elektrik (Osmaniye Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 474 |
| Rotor Elektrik (Osmaniye Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 474 |
| Sayalar Rüzgar (Doğal Enerji) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 1090 |
| Soma Enerji Uretim (Soma Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 398 |
| Soma Enerji Uretim (Soma Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 398 |
| Soma Enerji Uretim (Soma Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 398 |
| Utopya Elektrik (Düzova Res) | Prod.Comp. | R-WPP | 0 | 0.00 | GS 672 |
| Total 2009 | | | 2,765.90 | 21,489.72 | |

Table- 8b
Source: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (MW) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| **Silopi Elektrik Ür. A.Ş. (Esenboğa)** | Prod. Comp. | Fuel Oil | (44.78) | 0.00 | |
| **AK TEKSTİL-1 (G.Antep)** | Autoproducer | Fuel-Oil | -13 | 0 | |
| **Eren Enerji Elektrik Ür. A.Ş. (İlave)** | Prod. Comp. | Imported Coal | 600.00 | 4005.88 | |
| **Eren Enerji Elektrik Ür. A.Ş. (İlave)** | Prod. Comp. | Imported Coal | 600.00 | 4005.88 | |
| **Eren Enerji Elektrik Üretim A.Ş.** | Prod. Comp. | Imported Coal | 160.00 | 1068.24 | |
| **Eti Soda Üre.Paz.Nak.Ve Elk.Üre.San.** | Autoproducer | Lignite | 24.00 | 144 | |
| **Konya Şeker San. Ve Tic. A.Ş.** | Autoproducer | Lignite | 6 | 15.00 | |
| **AK-ENERJİ (UŞAK OSB)(Uşak-Ak.En.)** | Prod. Comp. | Lng+N.Gas | (15.24) | 0.00 | |
| **Ak-Enerji(Dg+N) (Deba-Denizli)** | Prod. Comp. | Lng+N.Gas | (15.60) | 0.00 | |
| **Ataer Enerji Elektrik Üretim A.Ş.** | Prod. Comp. | Lng+N.Gas | 49.00 | 277.89 | |
| **Akbaşlar (İlave)** | Autoproducer | N.Gas | 1.54 | 80 | |
| **Altinmarka** | Autoproducer | N.Gas | 4.6 | 66 | |
| **Can Tekstil (Çorlu/Tekirdağ)** | Autoproducer | N.Gas | 7.832 | 100 | |
| **Flokser Tekstil (Çerkezköy/Tekirdağ)** | Autoproducer | N.Gas | 5.172 | 42 | |
| **International Hospital İstanbul Aş.** | Autoproducer | N.Gas | 0.77 | 6 | |
| **Keskinoğlu Tavukçuluk Ve Dam. İşl.** | Autoproducer | N.Gas | 3.495 | 65 | |
| **KIRKA BORAKS(Kırka) (Eti Maden İşl.) (İlave)** | Autoproducer | N.Gas | 10 | 120.00 | |
| **Kurtoğlu Bakir Kurşun San. A.Ş.** | Autoproducer | N.Gas | 1.585 | 65 | |
| **Marmara Pamuklu Mensucat (İlave)** | Autoproducer | N.Gas | 26 | 543 | |
| **Polyplex Europa Polyester Film** | Autoproducer | N.Gas | 8 | 61 | |
| **Rb Karesi İthalat İhracat Tekstil** | Autoproducer | N.Gas | 8.6 | 65 | |
| **Tüpraş Rafineri (İzmit) (Düzeltme)** | Autoproducer | N.Gas | -39 | 0 | |
| **Tüpraş Rafineri (İzmit) (İlave)** | Autoproducer | N.Gas | 40 | 255 | |
| **Yalova Elyaf** | Autoproducer | N.Gas | -12 | 0 | |
| **Yildiz Entegre Ağaç (Kocaeli)** | Autoproducer | N.Gas | 12.368 | 120 | |
| **Soktaş (N+Lpg) (Aydın)** | Autoproducer | Nafta | -4.5 | 0 | |
| **Aksa Enerji (Antalya)** | Prod. Comp. | Natural Gas | 25.00 | 192.50 | |
| **Aksa Enerji (Antalya)** | Prod. Comp. | Natural Gas | 25.00 | 192.50 | |
| **Aliağa Çakmaktepe Enerji (İlave)** | Prod. Comp. | Natural Gas | 69.84 | 557.92 | |
| **Altek Alarko Elektrik Santrallari** | Prod. Comp. | Natural Gas | 60.10 | 415.57 | |
| **Altek Alarko Elektrik Santrallari** | Prod. Comp. | Natural Gas | 21.89 | 151.36 | |
| **Binatom Elektrik Üretim A.Ş.** | Prod. Comp. | Natural Gas | 2.00 | 13.00 | |
| **Can Enerji Elektrik Ür. A.Ş.(Tekirdağ)** | Prod. Comp. | Natural Gas | 29.10 | 203.00 | |
| **Cengiz Enerji San. Ve Tic. A.Ş. (Tekkeköy)** | Prod. Comp. | Natural Gas | 101.95 | 802.00 | |
| **Cengiz Enerji San. Ve Tic. A.Ş. (Tekkeköy)** | Prod. Comp. | Natural Gas | 101.95 | 802.00 | |
| **Enerji-Sa (Bandirma)** | Prod. Comp. | Natural Gas | 1000.00 | 7540.00 | |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (MW) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| **Enerji-Sa (Bandirma) (Düzeltme)** | Prod. Comp. | Natural Gas | (69.20) | 0.00 | |
| **Global Enerji (Pelitlik)** | Prod. Comp. | Natural Gas | 3.54 | 27.06 | |
| **Rasa Enerji (Van)** | Prod. Comp. | Natural Gas | 26.19 | 166.62 | |
| **Rasa Enerji (Van) (İlave)** | Prod. Comp. | Natural Gas | 10.12 | 64.41 | |
| **Sönmez Enerji Üretim (Uşak)** | Prod. Comp. | Natural Gas | 33.24 | 256.30 | |
| **Sönmez Enerji Üretim (Uşak) (İlave)** | Prod. Comp. | Natural Gas | 2.56 | 19.77 | |
| **Uğur Enerji Ür. Tic.Ve San. A.Ş. (İlave)** | Prod. Comp. | Natural Gas | 12.00 | 100.86 | |
| **Uğur Enerji Üretim Tic. Ve San. A.Ş.** | Prod. Comp. | Natural Gas | 48.20 | 405.14 | |
| **Flokser Tekstil (Çatalça-İstanbul) (Suetser Tesisi)** | Autoproducer | Natural Gas | -2,128 | 0 | |
| **Simko Kartal Doğalgaz** | Autoproducer | Natural Gas | -2.054 | 0 | |
| **CEV ENERJİ ÜRETİM (GAZİANTEP ÇÖP Biogasi)** | Prod. Comp. | R-Biogas | 0.00 | 0 | GS745 |
| **Fritolay Gida San.Ve Tic A.Ş. (İlave)** | Autoproducer | R-Biogas | 0.33 | 2 | |
| **Fritolay Gida San.Ve Tic A.Ş.** | Autoproducer | R-Biogas | 0.65 | 4 | |
| **Menderes Geotermal Dora-2** | Prod. Comp. | R-Geothermal | 0.00 | 0 | GS445 |
| **Tuzla Jeotermal** | Prod. Comp. | R-Geothermal | 0.00 | 0 | GS353 |
| **Akim Enerji (Cevizlik Reg. Ve Hes)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS753 |
| **Alakir Hes (Yurt Enerji Üretim)** | Prod. Comp. | R-Hepp | 2.06 | 4.00 | |
| **ASA ENERJİ (KALE REG.Ve HES)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS637 |
| **Azmak-li Reg. Ve Hes (Düzeltme)** | Prod. Comp. | R-Hepp | (18.07) | 0.00 | |
| **Bayburt Hes (Bayburt Enerji Üret.)** | Prod. Comp. | R-Hepp | 14.63 | 24.00 | |
| **Beytek El. Ür. A.Ş. (Çataloluk Hes)** | Prod. Comp. | R-Hepp | 9.54 | 17.00 | |
| **Birim Hidr. Üretim Aş. (Erfelek Hes)** | Prod. Comp. | R-Hepp | 3.23 | 5.50 | |
| **Birim Hidr. Üretim Aş. (Erfelek Hes)** | Prod. Comp. | R-Hepp | 3.23 | 5.50 | |
| **Bulam Reg. Ve Hes (Mem Enerji Elk.)** | Prod. Comp. | R-Hepp | 7.03 | 19.00 | |
| **Burç Bendi Ve Hes (Akkur Enerji)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS419 |
| **Çakit Hes (Çakit Enerji A.Ş.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS685 |
| **Çamlikaya Reg. Ve Hes** | Prod. Comp. | R-Hepp | 5.65 | 11.00 | |
| **Ceyhan Hes (Berkman Hes)(Enova En.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS810 |
| **Ceyhan Hes (Berkman Hes)(Enova En.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS810 |
| **Ceyhan Hes (Oşkan Hes) (Enova En.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS810 |
| **Cindere Hes (İlave)** | Prod. Comp. | R-Hepp | 9.07 | 16.07 | |
| **Damlapinar Hes (Cenay Elektrik Ür.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCSunderdev |
| **Dim Hes (Diler Elektrik Üretim)** | Prod. Comp. | R-Hepp | 38.25 | 70.00 | |
| **Dinar Hes (Elda Elektrik Üretim)** | Prod. Comp. | R-Hepp | 4.44 | 9.00 | |
| **Doğubay Elektrik (Sarimehmet Hes)** | Prod. Comp. | R-Hepp | 3.10 | 6.00 | |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (MW) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| **Egemen 1 Hes (Enersis Elektrik)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS755 |
| **Egemen 1b Hes (Enersis Elektrik)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS755 |
| **Erenköy Reg. Ve Hes (Türkerler)** | Prod. Comp. | R-Hepp | 21.46 | 49.00 | |
| **Erenler Reg. Ve Hes (Bme Bir.Müt.En.)** | Prod. Comp. | R-Hepp | 45.00 | 48.00 | |
| **Erikli-Akocak Reg. Ve Akocak Hes** | Prod. Comp. | R-Hepp | 41.25 | 0 | VCS 535 |
| **Erikli-Akocak Reg. Ve Akocak Hes** | Prod. Comp. | R-Hepp | 0.00 | 0 | VCS 535 |
| **Feke 2 Baraji Ve Hes (Akkur Enerji)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 534 |
| **Firtina Elektrik Ür. A.Ş. (Sümer Hes)** | Prod. Comp. | R-Hepp | 21.60 | 39.00 | |
| **Gök Reg. Ve Hes (Gök Enerji El. San.)** | Prod. Comp. | R-Hepp | 10.01 | 24.00 | |
| **Güdül I Reg. Ve Hes (Yaşam Enerji)** | Prod. Comp. | R-Hepp | 2.36 | 8.00 | |
| **Güzelçay-I Hes (İlk Elektrik Enerji)** | Prod. Comp. | R-Hepp | 3.14 | 9.30 | |
| **Güzelçay-Ii Hes (İlk Elektrik Enerji)** | Prod. Comp. | R-Hepp | 4.96 | 14.70 | |
| **Hetaş Hacisalihoğlu (Yildizli Hes)** | Prod. Comp. | R-Hepp | 1.20 | 3.00 | |
| **Kahraman Reg. Ve Hes (Katircioğlu)** | Prod. Comp. | R-Hepp | 1.42 | 3.00 | |
| **Kahta I Hes (Erdemyildiz Elek. Ürt.)** | Prod. Comp. | R-Hepp | 7.12 | 20.00 | |
| **Kale Reg. Ve Hes (Kale Enerji Ür.)** | Prod. Comp. | R-Hepp | 34.14 | 66.00 | |
| **Kalkandere Reg. Ve Yokuşlu Hes** | Prod. Comp. | R-Hepp | 14.54 | 36.00 | |
| **Kar-En Karadeniz El.A.Ş. Aralik Hes** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS663 |
| **Karadeniz El. (Uzundere-1 Hes)(İlave)** | Prod. Comp. | R-Hepp | 31.08 | 46.50 | |
| **Karadeniz El.Üret. (Uzundere-1 Hes)** | Prod. Comp. | R-Hepp | 31.08 | 46.50 | |
| **Karşiyaka Hes (Akua Enerji Üret.)** | Prod. Comp. | R-Hepp | 1.59 | 5.00 | |
| **Kayabükü Reg. Ve Hes (Elite Elekt.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS726 |
| **Kirpilik Reg. Ve Hes (Özgür Elektrik)** | Prod. Comp. | R-Hepp | 6.24 | 13.00 | |
| **Kozan Hes (Ser-Er Enerji)** | Prod. Comp. | R-Hepp | 4.00 | 5.00 | |
| **Kulp Iv Hes (Yildizlar En.Elk.Ür.Aş.)** | Prod. Comp. | R-Hepp | 12.30 | 23.00 | |
| **Murgul Bakir (Ç.Kaya) (İlave)** | Prod. Comp. | R-Hepp | 19.60 | 31.59 | |
| **Narinkale Reg. Ve Hes (Ebd Enerji)** | Prod. Comp. | R-Hepp | 3.10 | 6.00 | |
| **Nisan E.Mekanik En. (Başak Reg. Hes)** | Prod. Comp. | R-Hepp | 6.85 | 12.00 | |
| **Nuryol Enerji (Defne Reg. Ve Hes)** | Prod. Comp. | R-Hepp | 7.23 | 13.00 | |
| **Özgür Elektrik (Azmak I Reg.Ve Hes)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 554 |
| **Özgür Elektrik (Azmak I Reg.Ve Hes)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 554 |
| **Paşa Reg. Ve Hes (Özgür Elektrik)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS 681 |
| **Peta Mühendislik En. (Mursal Ii Hes)** | Prod. Comp. | R-Hepp | 4.50 | 11.00 | |
| **Reşadiye 1 Hes (Turkon Mng Elekt.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS 643 |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (MW) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| **Reşadiye 2 Hes (Turkon Mng Elekt.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS 644 |
| **Sabunsuyu Ii Hes (Ang Enerji Elk.)** | Prod. Comp. | R-Hepp | 7.35 | 12.00 | |
| **Selen Elektrik (Kirazlık Hes)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCSunderdev |
| **Selimoğlu Reg. Ve Hes** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS 635 |
| **Tektuğ Elektrik (Andirin Hes)** | Prod. Comp. | R-Hepp | 40.50 | 60.00 | |
| **Uluabat Kuvvet Tüneli Ve Hes** | Prod. Comp. | R-Hepp | 0.00 | 0 | VCS 536 |
| **Uluabat Kuvvet Tüneli Ve Hes (İlave)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 536 |
| **Umut Iii Reg. Ve Hes (Nisan Elektr.)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 536 |
| **Uzunçayir Hes (Tunceli) (İlave)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | VCS 762 |
| **Uzunçayir Hes (Tunceli) (İlave)** | Prod. Comp. | R-Hepp | 0.00 | 0 | VCS 762 |
| **Yavuz Reg. Ve Hes (Masat Enerji)** | Prod. Comp. | R-Hepp | 0.00 | 0.00 | GS 651 |
| **Yedigöze Hes (Yedigöze Elektrik)** | Prod. Comp. | R-Hepp | 155.33 | 268.00 | |
| **Aksa Enerji (Demirtaş/Bursa)** | Prod. Comp. | R-Waste | 0.00 | 0.00 | GS1068 |
| **Itc Adana Biokütle Sant.** | Prod. Comp. | R-Waste | 0.00 | 0.00 | GS715 |
| **Itc Adana Biokütle Sant. (Düzeltme)** | Prod. Comp. | R-Waste | 0.00 | 0.00 | GS715 |
| **Itc-Ka Enerji (Sincan)** | Prod. Comp. | R-Waste | 0.00 | 0.00 | GS765 |
| **Ortadoğu Enerji (Oda Yeri) (Eyüp/İst.)** | Prod. Comp. | R-Waste | 0.00 | 0.00 | GS707 |
| **Aksa Enerji (Demirtaş/Bursa)** | Prod.Comp. | R-Waste | -1.4 | 0 | |
| **Akdeniz Elektrik (Mersin Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS753 |
| **Alize Enerji (Keltepe Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS437 |
| **Asmakinsan (Bandirma 3 Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS683 |
| **Asmakinsan (Bandirma 3 Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS683 |
| **Bakras En. Elkt.Ür. A.Ş. Şenbük Res** | Prod. Comp. | R-Wpp | 0.00 | 0 | GS733 |
| **Belen Elektrik (Belen Res) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS390 |
| **Bergama Res En. Ür. A.Ş. Aliağa Res** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS735 |
| **Bergama Res En. Ür. A.Ş. Aliağa Res** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS735 |
| **Borasko Enerji (Bandirma Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS744 |
| **Boreas Enerji (Boreas I Enez Res)** | Prod. Comp. | R-Wpp | 0.00 | 0 | GS704? |
| **Deniz Elektrik (Sebenoba Res)** | Prod. Comp. | R-Wpp | 0.00 | 0 | VCS 553 |
| **Kuyucak Res (Alize Enerji Ür.) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS576 |
| **Kuyucak Res (Alize Enerji Üret.)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS576 |
| **Mazi-3 Res Elektrik (Mazi-3 Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS388 |
| **Rotor Elektrik (Gökçedağ Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS? |
| **Rotor Elektrik (Gökçedağ Res) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS? |

| Plant Name | Electricity Utilities | Fuel Type | Installed Capacity (MW) | Firm Generation Capacity (GWh) | VER Status |
|---|---|---|---|---|---|
| **Rotor Elektrik (Osmaniye Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS474 |
| **Rotor Elektrik (Osmaniye Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS474 |
| **Rotor Elektrik (Osmaniye Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS474 |
| **Sares Res (Garet Enerji Üretim)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS963 |
| **Soma Enerji Üretim (Soma Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS398 |
| **Soma Enerji Üretim (Soma Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS398 |
| **Soma Enerji Üretim (Soma Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS398 |
| **Soma Enerji Üretim (Soma Res)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS398 |
| **Soma Enerji Üretim (Soma Res) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS398 |
| **Soma Res (Bilgin Wpp San. En.Ür.)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS655 |
| **Soma Res (Bilgin Wpp San.)(İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS655 |
| **Soma Res (Bilgin Wpp San) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS655 |
| **Turguttepe Res (Sabaş Elektrik Ür.)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS610 |
| **Ütopya Elektrik (Düzova Res) (İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0 | GS672 |
| **Ziyaret Res (Ziyaret Res Elek.)(İlave)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS617 |
| **Ziyaret Res (Ziyaret Res Elektrik)** | Prod. Comp. | R-Wpp | 0.00 | 0.00 | GS617 |
| **Total 2010** | | | **1,418.45** | **24,080.56** | |

# Annex-3: EIA Affirmative Certification of the Project Activity[34]

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

Karar Tarihi: 19/08/2009
Karar No : 1747

## ÇED OLUMLU BELGESİ

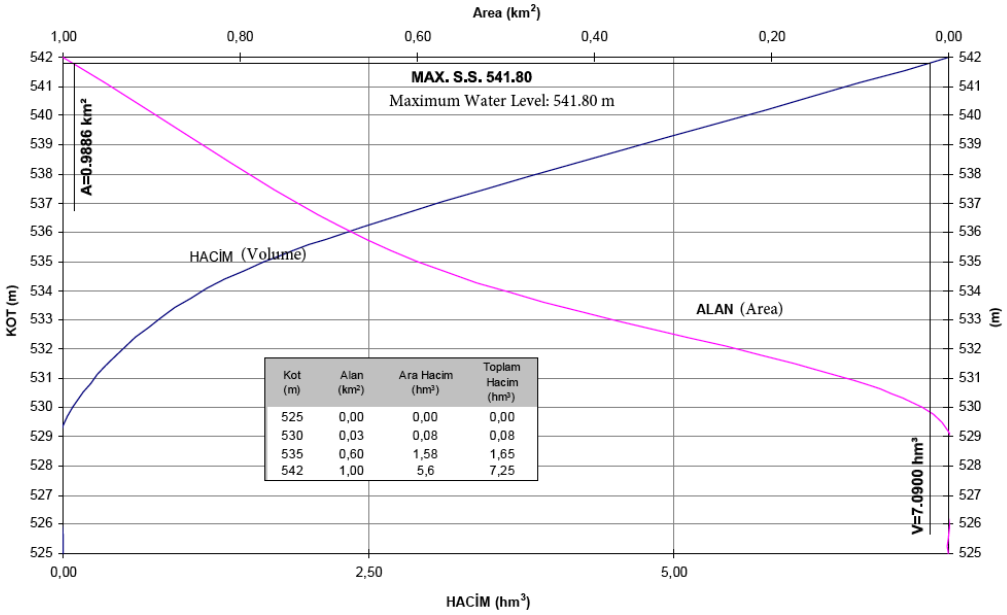
17.07.2008 tarih ve 26939 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 14. maddesi gereğince; *"Kirazlık Regülatörü, Hidroelektrik Santralı ve Malzeme Ocakları"* projesi hakkında *"Çevresel Etki Değerlendirmesi Olumlu Kararı"* verilmiştir.

Fevzi IŞBİLİR
Bakan a.
Genel Müdür

Proje Sahibi :Baren Enerji Üretim Sanayi ve Ticaret Ltd. Şti.
Projenin Yeri :Siirt ili, Aydınlar İlçesi, Botan Çayı Üzeri.

[34] The project owner Baren Enerji Üretim San. Ve Ticaret A. Ş. was initially a Limited Liability Company, with the title: Baren Enerji Üretim Sanayi ve Ticared Limited Şirketi. The company status has changed to a Corporation on 26 April 2013, with an announcement at the Trade Registry Gazette dated 26 April, 1013 and numbered: 8308, Published by Ankara Chamber of Commerce.

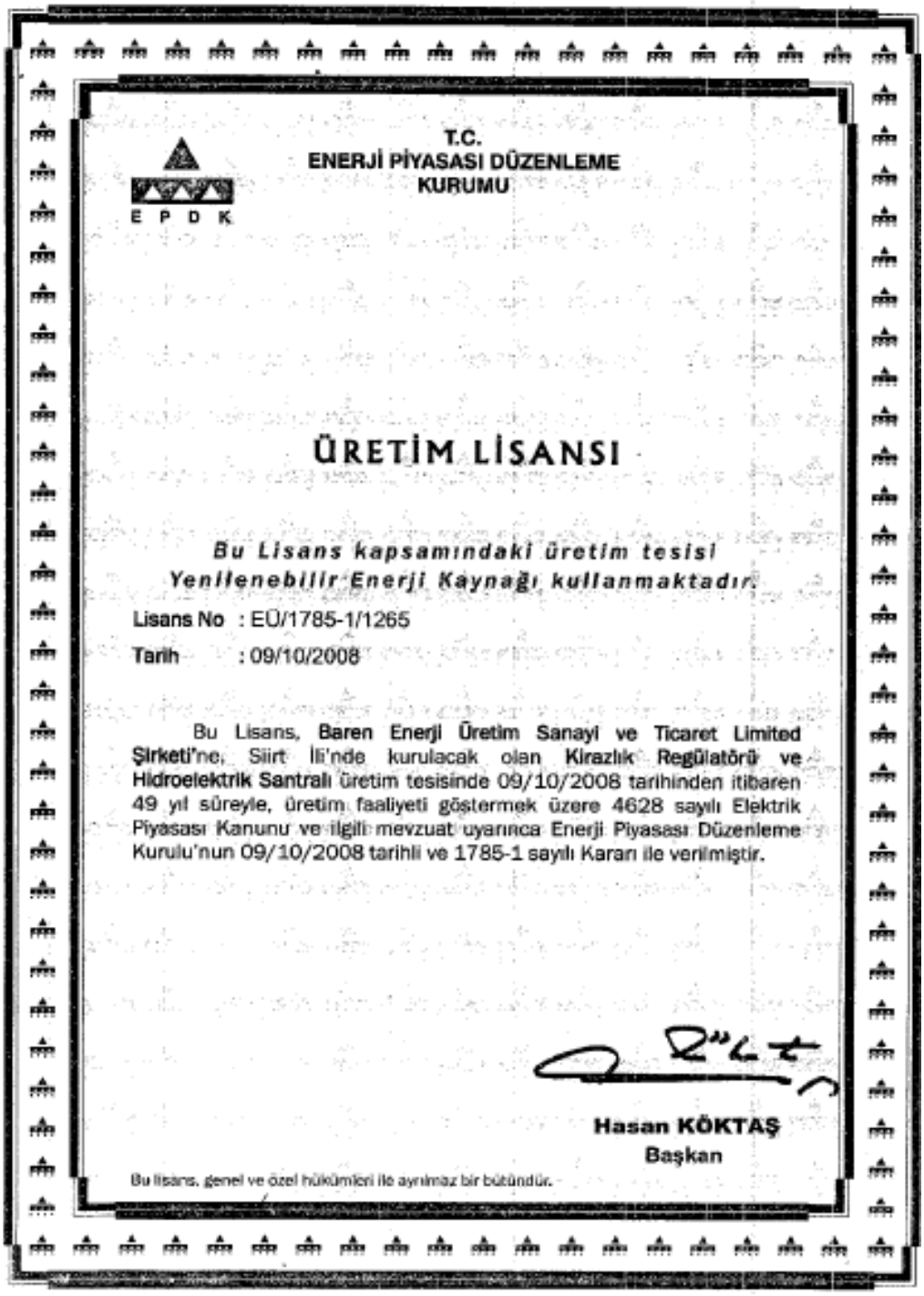
# Annex-4: Volume vs. Area Curve




| Kot (m) | Alan (km²) | Ara Hacim (hm³) | Toplam Hacim (hm³) |
|---|---|---|---|
| 525 | 0,00 | 0,00 | 0,00 |
| 530 | 0,03 | 0,08 | 0,08 |
| 535 | 0,60 | 1,58 | 1,65 |
| 542 | 1,00 | 5,6 | 7,25 |

This graphic is taken from the implementation project file submitted to the Ministry of Energy

# Annex-5: Electricity Generation License of the project[35]



T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

E P D K

## ÜRETİM LİSANSI

***Bu Lisans kapsamındaki üretim tesisi Yenilenebilir Enerji Kaynağı kullanmaktadır.***

**Lisans No** : EÜ/1785-1/1265

**Tarih** : 09/10/2008

Bu Lisans, **Baren Enerji Üretim Sanayi ve Ticaret Limited Şirketi**'ne, Siirt İli'nde kurulacak olan **Kirazlık Regülatörü ve Hidroelektrik Santralı** üretim tesisinde 09/10/2008 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 09/10/2008 tarihli ve 1785-1 sayılı Kararı ile verilmiştir.

**Hasan KÖKTAŞ**
**Başkan**

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

[35] The project owner Baren Enerji Üretim San. ve Ticaret A. Ş. was initially a Limited Liability Company, with the title: Baren Enerji Üretim Sanayi ve Ticared Limited Şirketi. The company status has changed to a Corporation on 26 April 2013, with an announcement at the Trade Registry Gazette dated 26 April, 1013 and numbered: 8308, Published by Ankara Chamber of Commerce. By the time the version 2.02 of the PDD was issued, the tittle on some of the official documents were under the process of change (such as the above seen licence) but the procedures were not completed.