Project design document form for

CDM project activities

(Version 07.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	ALAŞEHİR GEOTHERMAL POWER PLANT PROJECT 24 MW
Version number of the PDD	03
Completion date of the PDD	30/11/2016
Project participant(s)	Türkerler Jeothermal Enerji Arama Üretim A.Ş.
Host Party	TURKEY
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	RENEWABLE ENERGIES ACM0002 "Grid-connected electric generation from renewable sources, version 17", EB 89.
Sectoral scope(s) linked to the applied methodology(ies)	RENEWABLE ENERGIES ACM0002 "Grid-connected electric generation from renewable sources, version 17", EB 89.
Estimated amount of annual average GHG emission reductions	91597,72 t CO2/y

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

TÜRKERLER JEOTERMAL ENERJİ ARAMA VE ÜRETIM A.Ş. (TÜRKERLER Geo-Thermal Energy Exploration and Generation Joint Stock Co.) plans to install a Geo – Thermal Power Plant near the Sub-District of Piyadeler, District of Alaşehir, and Province of Manisa to generate electricity and transmit it to the national grid under the generation license acquired from the EPDK (Energy Market Regulatory Authority. It will generate electricity of approximately 177 GWh annually thanks to the project having a total installed output of 24 MW. According to the Contract with TEIAS about grid connection, 154 kW connected to the Demirköprü – Alaşehir Energy Transmission Line (Temporary connection) and 154 kW connected to the Alaşehir GEPP Havza Transformer Situation (final connection). The project would ensure carbon reduction of approximately 91597,72 tons annually when compared to Turkey's present energy generation forecasts. Upon transmission of energy to be generated by Türkerler Alaşehir Geo-Thermal Power Plant to the national grid, a portion of the country's steadily increasing energy requirements would be met as the region would be positively affected by the increases in income, population movement, training, health and other social and technical amenities and utilities. It is considered that the Project would provide major outputs economically because renewable and clean energy resources, which generate minimal effects in terms of environmental effects, would be used by the Power Plant.

Before the planned project, the project area consists of vineyards. Approximately in all of the area which is related with the 227 number business license of the project, viniculture was worked away actively. Upon putting the power plant into operation, contributions would be made to the regional economy as employment opportunities would be provided locally thanks to recruitment of labour from nearby Residential Areas at the stages of construction and operation. At the meeting to be held at Piyadeler Sub-District, the plan to invest in a new geo-thermal power plant will be publicly announced by the Project Owner for the first time. The purpose of the meeting is to provide information to the public on the Project and jointly assess the social and environmental effects of the project.

Upon transmission of energy to be generated by Türkerler Alaşehir Geo-Thermal Power Plant to the national grid, a portion of the country's steadily increasing energy requirements would be met as the region would be positively affected by the increases in income, population movement, training,

health and other social and technical amenities and utilities. It is considered that the Project would provide major outputs economically because renewable and clean energy resources, which generate minimal effects in terms of environmental effects, would be used by the Power Plant.

Due to the project is Geo-Thermal Power Plant Project which is renewable energy source, the project helps to keep environment clean and CO_2 emission reduction calculations are showed in the following parts of the PDD. Expected total emission reduction for the chosen crediting period is calculated as 641184,044 tCO2. Crediting period is 7 years.

A.2. Location of project activity

A.2.1. Host Party

Turkey

A.2.2. Region/State/Province etc.

Aegean Region / Manisa Province

A.2.3. City/Town/Community etc.

Near the Sub-District of Piyadeler, Alaşehir District, Piyadeler Town.

A.2.4. Physical/Geographical location

The area of the project is located on the Topographic Map with 1/25.000 scale. In the near the Sub-District of Piyadeler, Alaşehir District, Piyadeler Town, 23.595 m^2 of the total area is used for power plant area which includes Power house.

The figure shows the location of project site below;

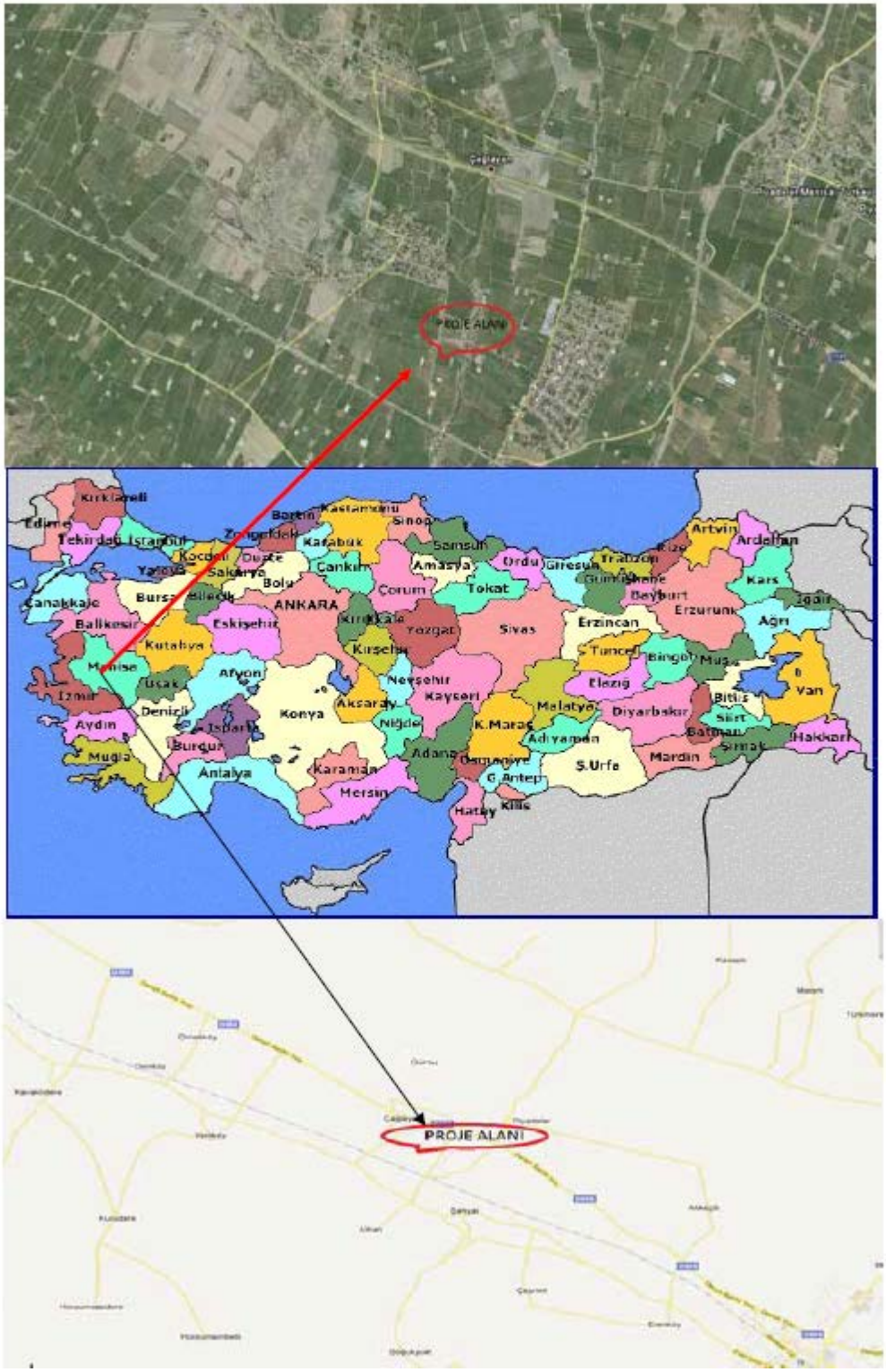

Figure 1 Map and Satellite View of Project Area

The Geo – Thermal Power Plant Project that is planned to install by the TÜRKERLER Geo-Thermal Energy Exploration and Generation Joint Stock Co. will be located on the 3290. Parcel in the 18. Screw plate, Province of Manisa, District of Alaşehir, Piyadeler Town. The Title Deed of the 18.035 m^2 of the planned power plant installation area belongs to the TÜRKERLER Geo-

Thermal Energy Exploration and Generation Joint Stock Co. Rest areas will be included to the power plant area by purchase by consent or compulsory purchase.

Table 1 Coordinates of the Power Plant Site[1]

Project Site	Coordinate order : To right , up Datum: ED-50 Type: UTM D.O.M.: 27 Zone: 35 Scaling Factor.: 6 degree		Coordinate order : latitude, longitude Datum: WGS-84 Type: Geographic D.O.M.: - Zone: - Scaling Factor: -	
Türkerler Geo-Thermal Power Plant	624828	4251912	38.406093	28.429596
	624976	4251875	38.405739	28.431284
	624938	4251707	38.404231	28.430819
	624800	4251774	38.404854	28.429251
	624828	4251912	38.406093	28.429596

Table 2 Coordinates of the Wells[2]

Project Site	Coordinate order : To right , up Datum: ED-50 Type: UTM D.O.M.: 27 Zone: 35 Scaling Factor.: 6 degree		Coordinate order : latitude, longitude Datum: WGS-84 Type: Geographic D.O.M.: - Zone: - Scaling Factor: -	
Batı Piyadeler-1 (1 well)	625201	4251716	38.404275	28.433832
Doğu Piyadeler-1 (1 well)	625718	4251528	38.402509	28.439717
Bayramyeri-1 (1 well)	623841	6251588	38.403312	28.418239

A.3. Technologies and/or measures

Technologies and/or measures

Applied approved baseline and monitoring methodology:

- ACM0002 “Grid-connected electric generation from renewable sources, version 17”, EB 89.

Used tools:

[1] Retrieved from the Alaşehir GPP EIA.

[2] Retrieved from the Alaşehir GPP EIA.

- Tool for the demonstration and assessment of additionally, version 07.0.0 EB 70.
- Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion, version 02, EB 41.
- Tool to calculate the emission factor for an electricity system, version 05.0" EB 87.

In the Alaşehir Geo-Thermal Power Plant ORC (Binary) system will be used. Thanks to the ORC (binary) system, in the Geothermal Power Plants which have up to 31.5˚C geothermal fluid, air-cooled condenser may be used. In this cycle fluid of work is heated in the vaporiser with the pipe type heat changers. The geo-thermal fluid existed from this cycle makes preheats the fluid of work from condenser and sent it to the reinjection line. The plant schema is shown in the following figure.

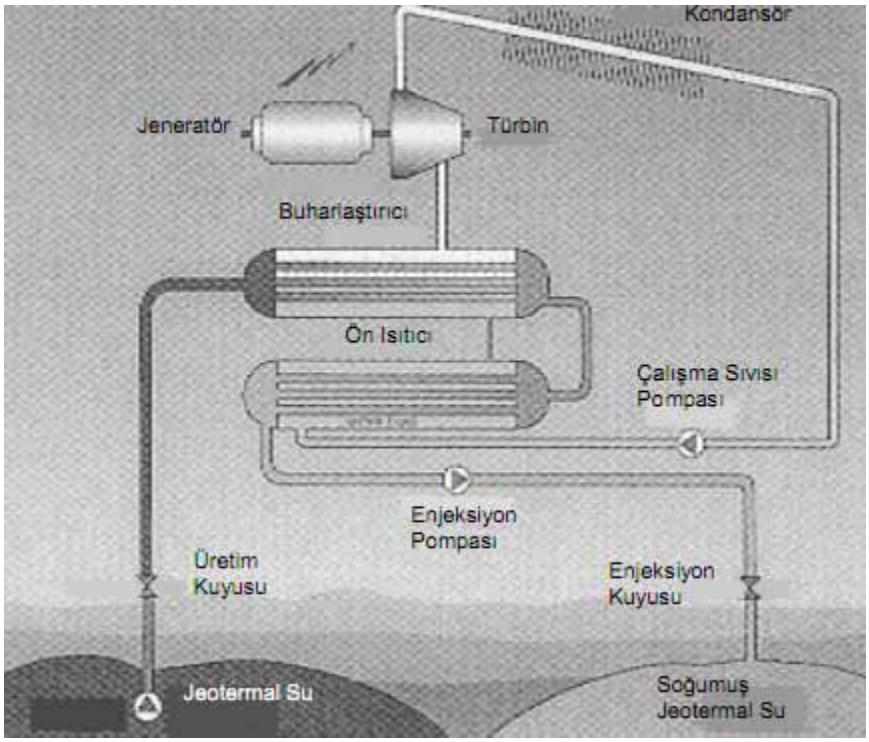

Figure 2 Process flowchart of the ORC system

Turbines

The turbine contains wheels driven by high pressure MF vapour to turn the generator and create electricity. Turbines are considered an integral part of the power skid.

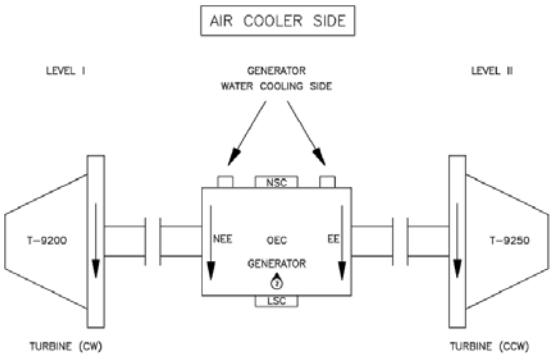

Figure 3 The rotational direction of the turbines[3]

The turbine contains wheels that are driven by high pressure MF vapour. Disc couplings connect the two turbine shafts to the synchronous generator. These discs (turbines) are named as L1 (Level 1) and L2 (Level2). The shaft capacity of the L1 is 13,4 MW and shaft capacity of the L2 is 11 MW. The gross capacity of both is 23,6 MW[4].

Lifetime of the equipment are indicated as 25 years[5].

The turbines turn the generator creating electricity. The location of the turbines within the power-skid is shown below.

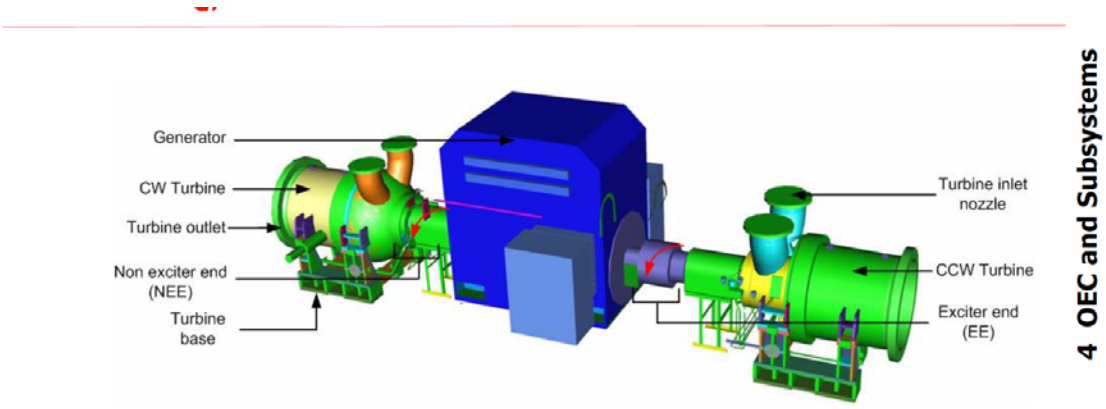

Figure 4 Basic power skid view with turbines [6]

[3] The information retrieved from the Türkerler O&M Documentation

[4] The information retrieved via email from owner company. The reference of the mail can be found in the Annex 6.

[5] The information retrieved via email from owner company. The reference of the mail can be found in the Annex 6.

[6] The information retrieved from the Türkerler O&M Documentation

Basic operational data for the turbines are listed in the unit's specification sheet and attached nameplates.

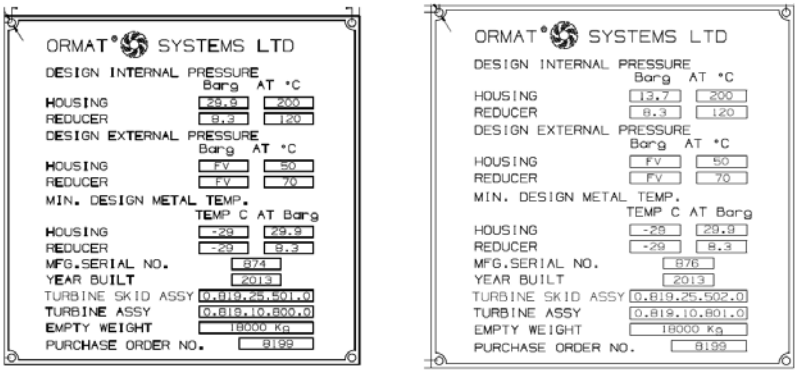

Figure 5 L1 and L2 Turbines' nameplates[7]

Table 3 Technical specifications of the turbines[8]

Dimensions	**L1 and L2 Turbines**
Length (inlet to outlet flange)	+,- 85/2159
Turbine base width	+.- 85/2159
Weight (lb/kg)	
Complete Turbine	+,- 39000/17690
Turbine outlet	+,- 7000/3175
Turbine housing	+,- 7000/3175
Shaft assembly	+,- 310/141
Rotors	+,- 2204/1000

[7] Türkerler O&M Documentation

[8] Türkerler O&M Documentation

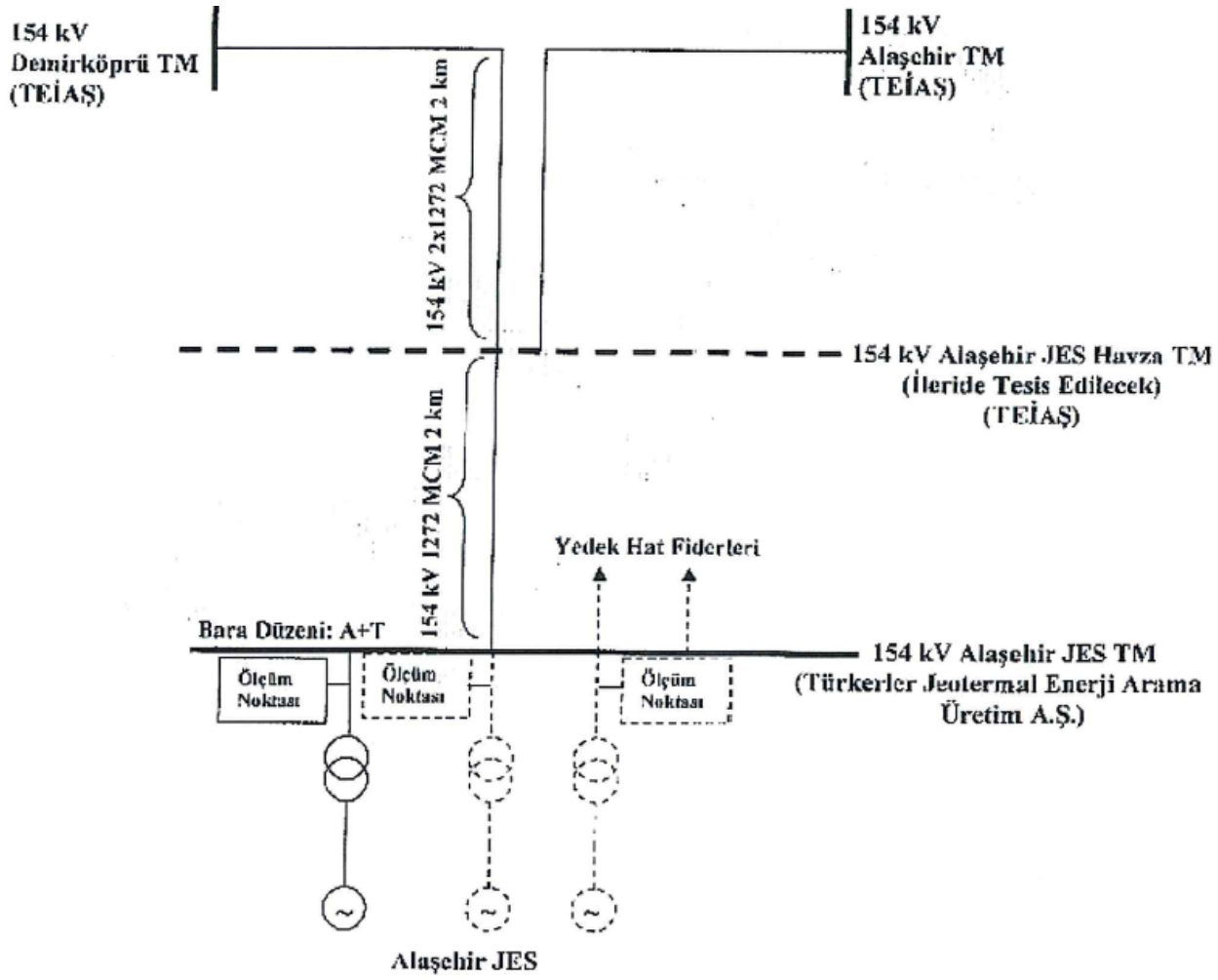

Figure 6 Transmission line diagram

A.4. Parties and project participants

Table 4 Table of parties and participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey	TÜRKERLER JEOTERMAL ENERJİ ARAMA VE ÜRETIM A.Ş	No

TÜRKERLER JEOTERMAL ENERJİ ARAMA ÜRETİM A.Ş. is the project participant of the project activity.

EN-ÇEV Energy Environmental Investment Consultancy INC. is the carbon advisor in the project activity.

A.5. Public funding of project activity

The project does not obtain public funding. Please see Appendix 2 for relevant document. The Project will be financed partly by Private investing company's own equity and the rest is planned to be realised by bank loan.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

Applied approved baseline and monitoring methodology:

- ACM0002 "Grid-connected electric generation from renewable sources, version 17", EB 89.

Used tools:

- Tool for the demonstration and assessment of additionally, version 07.0.0 EB 70.
- Tool to calculate Project or leakage CO2 emissions from fossil fuel combustion, version 02, EB 41.
- Tool to calculate the emission factor for an electricity system, version 05.0" EB 87.

B.2. Applicability of methodology and standardized baseline

Applicability of methodology

Methodology "ACM0002 "Grid-connected electricity generation from renewable sources, version 17, EB 89, Annex 1" is applicable to the proposed project activity because it fulfils the required criteria:

Applicability Criteria	Justification
This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (a) Involve a capacity addition to (an) existing plant(s); (b) Involve a retrofit of (an) existing operating plants/units; (c) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (d) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity involves installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity. The proposed project activity is a greenfield project activity[9].
The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects the existing plant/unit started commercial operation prior to the start of a minimum historical reference	The proposed project is the geothermal power plant project. Therefore option (a) is OK. There is not any case of the capacity addition, retrofit, rehabilitations or replacements. Therefore this criterion is not applicable to the proposed project activity.

[9] Electricity generation license of the Project

period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	
In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m2 ; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m2 ; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m2 , all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m2 ; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	Since the proposed project is the installation of a geothermal power plant, this criterion is not applicable to the proposed project activity.
In the case of integrated hydro power projects, project proponent shall: 7. Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or 8. Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of 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	Since the proposed project is the installation of a geothermal power plant, this criterion is not applicable to the proposed project activity.

power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	
The methodology is not applicable to: (a) 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; (b) Biomass fired power plants/units	The project does not involve switching from fossil fuels to renewable energy sources. And it is not biomass fired power plant.
In the case of retrofits, rehabilitations, replacements, or capacity additions, this 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, that is 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".	There is not any case of the capacity addition, retrofit, rehabilitations or replacements. Therefore this criterion is not applicable to the proposed project activity.

The project activity will not have a capacity extension at any year of the crediting period. The project activity may include renewable energy power plant of geothermal power plant.

B.3. Project boundary

The planned power plant generates electric by renewable and clean energy source which is geothermal energy. As a result of the analysis CO2, N2, O2, CH4, H2S gases have a possibility to out from the power plant. But any plant which uses fossil fuel causes SO2 and NOx emission which are more dangerous for environment. For the planned project, the only equipment that uses the fossil fuel is diesel generators. These generators will be putted in use only in emergency cases. Therefore the emissions from these generators are negligible.

Table 5 Information about project boundary

Source		Gas	Included	Justification/explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For dry or flash steam geothermal power plants, emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	Yes	Minor emission source
	For binary geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	Yes	Minor emission source
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hydrocarbon/ refrigerant	Yes	Main emission source
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	No	Main emission source
		N_2O	No	Minor emission source

B.4. Establishment and description of baseline scenario

In respect of large-scale consolidated methodology ACM0002 “Grid Connected Electricity Generation from Renewable Sources, version 17”, the baseline scenario is that the 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”.

Since the proposed project activity is " the installation of a new grid-connected renewable power plant/unit ", the baseline scenario is defined as the consolidation of electricity delivered to the grid by the project activity and electricity generated by the operation of grid-connected power plants in Turkey and electricity produced by the new generation sources as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system, ver 05.0”.

Installed electricity generation capacity in Turkey has reached 69519,8 megawatts (MW) as of 2014. Fossil fuels account for % 60.13 of the total installed capacity and hydro, geothermal, and wind account for the remaining % 39.87[10].

Table 6 Breakdown of installed capacity of Turkish grid, 2014[11]

Primary Energy Source	MW	% of installed capacity, 2013
Thermal	41801,8	60,13
Hydro	23643,2	34,0
Geothermal	404,9	0,58
Wind	3629,7	5,2
Solar	40,2	0,058
TOTAL	**69519,8**	**100**

[10] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2013/kguc(1-13)/1.xls

[11] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/kguc(1-13)/4.xls

Based on the above can be concluded that geothermal power constitutes the lowest share of the total electricity generation capacity of Turkey.

Electricity demand of Turkey has been growing continuously since the last decade due to the rapid growth in economy. In 2014, the electricity demand was 257,220 GWh which corresponds to an increase of 3.6 % compared to the previous year. The increase or decrease rates for electricity are presented in table below.

Table 7 The energy demand and increase rates between years 2004-2014[12]

Year	Energy Demand (GWh)	% increase
2004	150018	6,3
2005	160794	7,2
2006	174637	8,6
2007	190000	8,8
2008	198085	4,3
2009	194079	-2,0
2010	210434	8,4
2011	230306	9,4
2012	242370	5,2
2013	248324	2,5
2014	257220	3,6

Even if the energy demand has decreased from 2008 to 2009, it must be noted that it is because of the fact that a significant economic crisis has occurred in 2008 and the energy consumptions decreased accordingly.

Turkey, who intends to sustain its development, has tent to manage its energy supply-demand balance by the way of developing and constructing high capacity coal and natural gas power plants. The large natural resource availability, especially the abundance of economically accessible lignite and the governmental agreements on purchasing natural gas and accordingly developing

[12] http://www.teias.gov.tr/YayinRapor/APK/projeksiyon/index.htm, page 8.

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

According to the methodology ACM0002 "Large scale consolidated methodology : grid connected electricity generation from renewable sources, version 17.0" the baseline is only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.

$$BE_y = EG_{PY,y} \times EF_{grid,CM,y} \quad \text{(Equation 1)}$$

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 CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO2/MWh)

Quantity of net electricity generation ($EG_{PJ,y}$) is equal to quantity of net electricity generation ($EG_{facility,y}$)supplied by the project plant/unit to the grid in year y (MWh/yr) for greenfield plants.

B.5. Demonstration of additionality

Demonstration of additionality

The project additionally is demonstrated through use of the "Tool for the demonstration and assessment of additionally, version 07.0.0".

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Realistic and credible alternatives to the project activity that can be a part of the baseline scenario are defined through the following steps:

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

The alternatives to the proposed project activity are listed in table below.

Table 8 Alternatives to the project activity

Alternative A	Proposed project developed without the VER revenues
Alternative B	The continuation of the current situation (no project activity & no other alternative undertaken)
Alternative C	Construction of a thermal power plant with the same installed capacity or the same annual power output.

Alternative A is the implementation of the project without carbon revenue. Alternative B is the continuation of current situation, no project activity. Alternative B does not seem as a realistic option due to expected energy demand increase in Turkey. The next figure shows the energy demand projection (conservative scenario) between 2014 and 2023 prepared by TEİAS. Based on this fact, the electric generation in Turkey should be increased anyway in accordance with the expected energy demand. Therefore, no action alternative is not a plausible option and GEPPs should be constructed in order to generate clean energy where applicable.

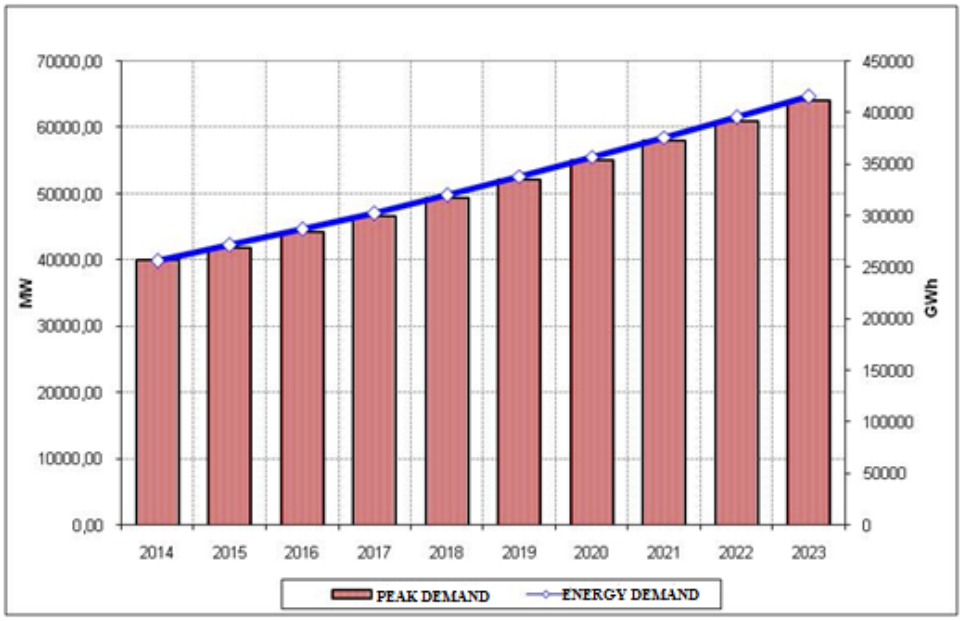

Figure 7 The energy demand projection between 2014 and 2023 (low demand)[13]

[13] http://www.teias.gov.tr/YayinRapor/APK/projeksiyon/index.htm, page 14.

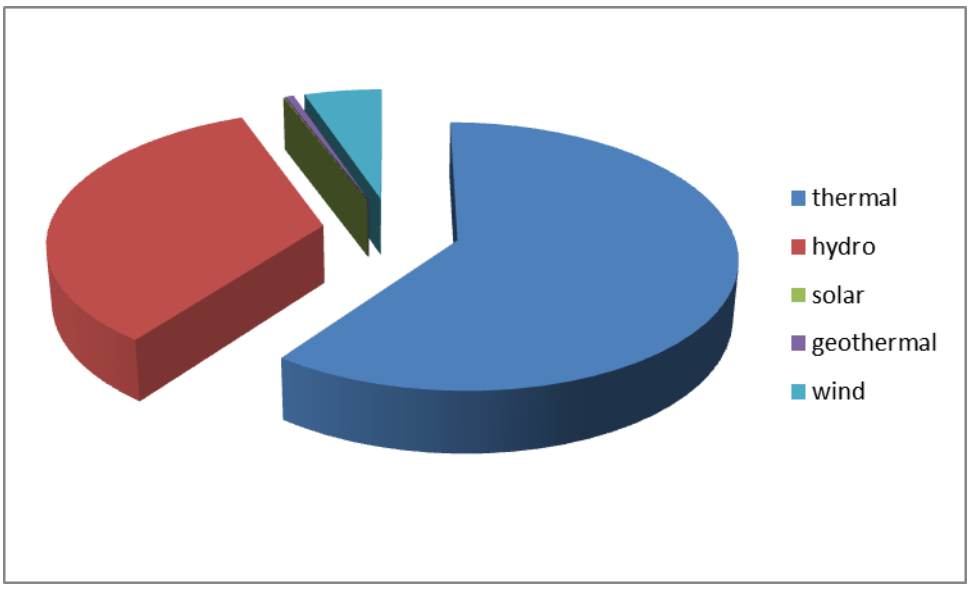

Figure 8 The distribution of installed capacity of Turkey by primary energy sources in 2014[14]

Outcome of Step 1a

Three alternatives are considered for the proposed project. However due to the increasing electricity demand in Turkey, Alternative B, which is the continuation of the current situation is an unrealistic option. Therefore, Alternatives A and C are the two alternatives to be evaluated.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law [Law Number: 6446 Enactment Date: 30.03.2013][15]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy [Law Number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005][16]
3. Environment Law [Law Number: 2872 Ratification Date: 09.08.1983 Enactment Date: 11.08.1983][17]
4. Energy Efficiency Law [Law Number 5627, Enactment Date 02/05/2007] [18]
5. Forest Law [Law Number 6831, Enactment Date 31/08/1956][19]

[14] Retrieved from http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/kguc(1-13)/4.xls, page 4.

[15] http://www.resmigazete.gov.tr/main.aspx?home=http://www.resmigazete.gov.tr/eskiler/2013/03/20130330.htm&main=http://www.resmigazete.gov.tr/eskiler/2013/03/20130330.htm

[16] Retrieved from http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf

[17] Retrieved from http://rega.basbakanlik.gov.tr

[8]Retrieved from http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc

All the alternatives to the project outlined in Step 1a above are in compliance with applicable laws and regulations.

Outcome of Step 1b

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

Step 2: Investment analysis

The investment analysis for Alaşehir geothermal Energy Power plant project in this Step 2 will be evaluated the following the four sub-steps:

(i) Determine appropriate analysis method;
(ii) Apply analysis method;
(iii) Calculation and comparison of financial indicators;
(iv) Sensitivity analysis.

Sub-step 2a: Determine appropriate analysis method

The "Tool for the demonstration and assessment of additionally, ver 07.0.0", lists three possible analysis methods;

- Option I. Simple cost analysis;
- Option II. Investment comparison analysis; and
- Option III. Benchmark analysis.

Option I cannot be used, since the financial and economic benefits generated by the proposed project activity.
Between Option II and Option III, benchmark analysis method (Option III) is preferred as the investment analysis method for the proposed project.

Sub-step 2b: Option III. Apply benchmark analysis

To select or calculate a benchmark with reliable and valid is very difficult in due to the market volatility (government bond rates etc.), its changes over time and project type has its own characteristics (supply, demand, price etc.). Institutional capacity is necessary for these calculations. In this regard, the recognized and accepted widely the calculations (indicators) of international institutions (WB, IMF, UNCTAD, IFF etc.) can be used as benchmark. Since this IRR refers to geothermal plant in the republic of Turkey, the Equity IRR of World Bank can be used which is 15% for geothermal. [20] This accepted benchmark IRR provides a more accurate and conservative view of the investment analysis effort. Eventually, the benchmark (15%) will be applied for comparison with the equity IRR determined in this investment analysis of the Alaşehir GEPP project.
As is known, there are also benchmarks for other countries in the appendix of "Guidelines on the assessment of investment analysis, version 05" When it is seen, the highest benchmark is %17 and

[19] Retrieved from http://web.ogm.gov.tr/birimler/merkez/kadastro/Dokumanlar/KD1/Mevzuat/6831%20ORMAN%20KANUNU.pdf

[20] Retrieved from World bank-Project Appraisal Document on a IBRD Loan and a Proposed Loan from Clean Technology Fund to TKSB an TB with the Guarantee of Turkey (Report No: 46808-TR, dated May 1, 2009, page 81)

the lowest benchmark is % 9,5 among the lots of countries for energy industries. In this Tool, the benchmark IRR (The expected return on equity) is composed of four elements: (a) a risk free rate of return; (b) an equity risk premium; (c) a risk premium for the host country; and (d) an adjustment factor to reflect the risk of projects in different sectorial scopes. All values are expressed in real terms.

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

The internal rate of return (IRR) calculation is a convenient technique for Türkerler GPP Project in benchmark analysis. As it is known, IRR is a percentage figure that describes the yield or return of an investment over a multiyear period. For a given series of cash flows, the IRR is the discount rate that results in a net present value (NPV) of zero.
IRR can be calculated using directly the main parameters of project and other relevant financial items. In accordance with the "Guidelines on the assessment of investment analysis, version 05", EB 62, and Annex 5, 5th clause, All input values used in the investment analysis are referred to the Türkerler GPP Financial Model Summary conducted in December 2014.

Table 9 Main parameters used for investments analysis

Parameters	Unit	Data Value	Reference
Installed Capacity	MW	24	Alaşehir GEPP Electricity Generation License
Electricity Generated	MWh	177.840	Alaşehir GEPP Electricity Generation License
Investment Cost	USD	89.535.653	IRR Calculations
VAT amount	USD	7.398.533	Investment Cost x 0,085
Investment Cost +VAT	USD	96.934.186	Investment Cost + VAT
Feed-in Tariff	USc/KWh	10,5	Türkerler Geothermal Financial Model
Expected VERs price	USD/ tCO2	6,0	Türkerler Geothermal Financial Model
Corporate Tax	%	20	"Corporate Tax Law" published on the official gazette on 21/06/2006, no 26205, clause 32
VAT	%	8,5	Türkerler Geothermal Financial Model

The main parameters and items have been considered in the table above for the cash inflow and cash outflow of the Project.

(i) The cash inflow or income stream

The primary legislation for a reasonable projection of income stream is the "Law on the Renewable Energy Sources for Electric Generation Use" (No.5346)". According to Article 6 of the Law, the price to be applicable to the electrical energy to be purchased within the scope of Law for each year shall be the Turkish average wholesale electricity price in the previous year determined by the Energy Market Regulatory Agency (EMRA). This applicable price may not be less than the Turkish Lira equivalent of 5 euro cent per KWh and may not be more than the Turkish Lira equivalent of 5,5 Eurocent per KWh. However, legal entities (project participant) that hold licenses based on renewable energy resources and which have the opportunity to sell above the limit of 5,5 Eurocent per KWh in the market shall benefit from this opportunity.

We considered 1 USD = 2,25 TL[21] and 1 EURO = 2,75[22] TL (exchange rate/selling). When the generation was taken as 17784 MWh, in the case of selling the generated electricity with the price of 8,61 Eurocent/KWh [23], **18.673.200,00 USD** will be earned. It is assumed constant selling price of electricity during the 29 years of operation. There are four key elements in determining policies of electricity sale prices in Turkey. These are oil prices, climate, government strategies and economic stability of Turkey. During the license period of 29 years, it cannot be known how these four concepts will change. Oil prices changes globally. Energy production decreases and increases with changes in climatic conditions. The other two issues are relevant to on-going financial situation in Turkey. Therefore, it is inevitable of assuming selling prices constant for 29 years.

In the framework of Project, the Government gave guarantee to proposed project to buy 100 percent of power to be generated from power plant only first ten years. After the first 10 yearly periods, electricity sales prices and amounts will depend on electricity market condition. As it can be seen above, main assumption (conservative approach) is to adopt the same income stream projections in both the first 10 years and following 40 years. Besides, there is no export competence in the scope of license and the Project is derived from regional market potential (EU etc.). Hence, the income stream projections are based on rather the conservative assumptions.

(ii) The cash outflow and costs (investment costs & operational costs)

Costs can be classified into two categories: Investment costs and operational costs. DSI unit prices is used (except electromechanical equipment) in investment cost calculations. The total project cost, VAT, financial cost and investment costs are itemized as follows:

Table 10: Türkerler GPP Project and Investment Costs (USD)

Units	Total	References of Inputs
Construction and Subsystems	4.740.134	Türkerler GPP Financial Model Summary
Well Costs	26.707.272	Türkerler GPP Financial Model Summary
Mobilization-Demobilization	381.482	Türkerler GPP Financial Model Summary
Construction Works Cost TOTAL	31.828.888	Sum of the first three units
Turbine-Generator-EMT (Ormat),	27.000.000	Türkerler GPP Financial Model Summary
Turbine-Generator –EMT (Montage)	7.711.051	Türkerler GPP Financial Model Summary
Mist Collection Systems and Electrical Systems	4.137.309	Türkerler GPP Financial Model Summary
Electro mechanic Equipment	38.848.360	Sum of the three units above
Estimated Cost TOTAL	70.677.248	Sum of Construction work total cost and electro mechanic cost
Energy Transmission Line and Grid Connection	1.875.726	Türkerler GPP Financial Model Summary
Plant Cost TOTAL	**72.552.975**	The summation of two rows above.
Project, Consultancy and Administrative Costs + Invisible Costs	11.401.444	Türkerler GPP Financial Model Summary
Expropriation + Land	2.643.705	Türkerler GPP Financial Model Summary
PROJECT COST	**86.598.124**	The summation of two rows above.
Interest During Construction	2.937.529	Interest expense of first 2 years.
TOTAL INVESTMENT COST	**89.535.653**	The summation of two rows above.
VAT	7.398.533	VAT is 8,5% indicated in Türkerler GPP Financial Model Summary Investment Section
TOTAL INVESTMENT COST + VAT	**96.934.186**	The summation of two rows above.

[21] The exchange rate on Türkerler GPP Financial Model Summary Dated 08.12.2014

[22] The exchange rate on Türkerler GPP Financial Model Summary Dated 08.12.2014

[23] The conservative approach is preferred with the highest earning amount.

In accordance with the conducted Feasibility Study Report of the proposed project, the expense of operation and maintenance is tabulated below;

Table 11: The Türkerler GPP project annual expenses (USD)

	Administration Share	Operating Personnel	General Expenses	Insurance	Maintenance, Repair	Licence Payment	System Cost
1	32.985	126000,00	38281,00	70182,00	102083	0,00	21580,00
2	178.977	504000,00	153124,00	280727,00	408331	0,00	86320,00
3	178.977	504000,00	153124,00	280727,00	408331	0,00	86320,00
4	178.977	504000,00	153124,00	280727,00	408331	0,00	86320,00
5	178.977	504000,00	153124,00	280727,00	408331	0,00	86320,00
6	178.977	504000,00	153124,00	280727,00	408331	0,00	172641,00
7	178.977	504000,00	153124,00	280727,00	408331	0,00	172641,00
8	178.977	504000,00	153124,00	280727,00	408331	0,00	172641,00
9	178.977	504000,00	153124,00	280727,00	408331	2273,00	172641,00
10	178.977	504000,00	153124,00	280727,00	408331	2273,00	172641,00
11	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
12	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
13	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
14	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
15	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
16	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
17	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
18	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
19	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
20	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00
21	172641,00	504000,00	153124,00	280727,00	408331	2273,00	172641,00

Note: Please follow the IRR calculations excel sheet for more details. The information are retrieved from the Türkerler Geothermal Financial model.

(iii) Earnings before Interest, Depreciation (EBITD)

These gross earnings figures are tabulated and included in the accounts and stated in the IRR excel sheet briefly.

(iv)Depreciation

Depreciation related to the project, which has been deducted in estimating gross earnings on which tax is calculated, added back to net profits in line with the suggestion in the tool "Tool for the demonstration and assessment of additionality, version 7.0.0", EB 70.

According to the tool[24], the technical lifetime of the gas turbines up to 50 MW capacity is 150 000 hr (20years), lifetime of the diesel fired generators is 50000 hr, lifetime of the transformers is 30 years, lifetime of the heater, chillers and pumps is 15 years. Therefore the lifetime of the all electronic equipment is taken as approximately 20 years.

(v) Interest Expenses

Interest expenses are applied with respect to expected credit conditions on the year of feasibility study applied.

[24] Tool to determine the Remaining lifetime of equation ver. 01.' EB.50

(vi)Corporate Tax Base

Corporate Tax Base = Revenue – Costs – Depreciation – Interest Expenses

(vii) Corporate Tax Amount

Corporate income tax is applied at 20% rate on the tax amount as per the Corporate Tax Law (published on official gazette on 21/06/2006, no: 26205, clause 32). However taxpayers pay provisional tax at the rate of corporate tax, these payments are deducted from corporate tax of current period. It is important that when business profit (dividend) is distributed company holders as project participants, the income tax is levied on the income of these persons from business activities as well as corporate tax liability.

(viii) Net Earnings

Net Earnings = Tax Base – Tax Amount

(ix) Deduction of Input VAT

Project participant has the right to deduct input VAT of investment cost. Paid input VAT in the investment period is deducted the VAT amount in the following years.[25] VAT is 18% as per the VAT Law (no: 3065 , date: 25/10/1984).

(x) Instalment Payment

Repayments of principal are tabulated and included in the accounts and stated in the IRR excel sheet briefly.

(xi) Net Cash Flow

Net Earnings + Depreciation + Netting of VAT – Instalment Payment

(xi) Net present value (NP) and Equity IRR

For a given series of net cash flows (the difference between the present value of cash inflows and cash outflows), Equity IRR of the Türkerler GPP Project 8,64 % is the discount rate that results in an NPV of zero (without considering the carbon revenue).

With respect to "Guidelines on the Assessment of Investment Analysis", version 05; the fair value of project activity assets at the end of the assessment period should be included as a cash inflow in the final year. Hence, the fair value was calculated in accordance with local accounting regulations and included as a cash inflow in the final year.

However, as per *4628 numbered Law* of Turkish Legislations, at the end of electricity production license as of 29 years, the project activity with all units shall be granted to government with no salvage value. Hence, in reality, the salvage value of project activity assets will be not be given to investor.

[25] Türkerler GPP Financial Model Summary

When we consider to today's technology, high capital stock will be transferred from Project to the public contributing to public welfare. Therefore, this salvage value can be seen positive impact on community (public utility) in terms of sustainability development matrix.

(xii) Equity IRR, VER Income and the Benchmark

As is mentioned above, Equity IRR has been calculated as 8,64 % without considering the carbon revenue. When benchmark IRR is taken as 15%, the Project is not financially attractive. We consider 3 EURO VER Sales Unit Price (conservative prediction) and taxation. When we include the carbon revenues in the cash flows, the Equity IRR increases to nearly 9,16 %. The IRR even with VERs remains lower than the benchmark of 15%.[26]

Sub-step 2d: Sensitivity Analysis

Sensitivity analysis is used to determine how different values of independent variables will affect dependent variables under a given set of assumptions. This subchapter can cover a diversity of complexities and difficulties that may arise in an investment analysis, including issues of electricity generation, electricity price, and corporate tax and other financial burdens, electricity demands etc. The aim is to bring to the attention of persons concerned a number of issues that are known in cash flows circles and IRR calculations.

Independent variables and accepted affecting IRR as a dependent variable is assessed below.

(i) The cash inflow or income stream

- Constant selling price of electricity during the 27 years of operation (2 years construction period)

Independent variables affecting pricing: The Government as the main driver mostly determines the price level in the market. Due to slow progress in market liberalization, there may not be change in this situation in short and medium term. It is generally expected that the **public sector borrowing requirement (PSBR) to be rise, pressure on the level of electricity price to increase.** After the global crises, Turkish Government's manoeuvring ability within the budget is very limited. Moreover, significant opposition from consumers (household, industry etc.) may meet the increasing electricity price. Therefore, price movement may remain flat in the coming years.

On the other hand, privatization of the important parts of Turkey's Electricity Distribution Industry has carried out recently. The privatization of electricity distribution companies will aid the fight against **illegal electricity usage in Turkey**. The rate of illegal electricity usage in Turkey increased from 14.4 % to 17.7% from 2008 to 2009, according to the recent data from the Turkish Electricity Distribution Company (TEDAŞ)[27]. According to the data in 2013, 162 billion kWh electric distributed and 31 billion kWh of that was lost energy[28]. It means %19 of energy is lost. As seen in data the illegal usage is increasing every year. Therefore, increased energy costs to consumers and public fall. As the rate of illegal electricity usage decreases, institutional structure of market; transparency is strengthening. Right price signals lead to efficient choices among existing alternatives for consumer, producer and the Government.

[26] Please see the excel sheet of IRR analysis.

[27] http://www.emo.org.tr/ekler/46f664ab2833d59_ek.pdf?dergi

[28] http://enerjienstitusu.com/2015/03/17/kacak-elektrik-ile-mucadele-uzerine-bir-degerlendirme/

- Constant annual generation of electricity during operation period

Independent variables affecting generation: The independent variables are the climatic conditions and **catastrophic risks.** As it is known, the estimated electricity generation based on historical hydrological data. Big deviation can be seen in the context of global climate change. Therefore, these effects on generation may be negative or positive. Both of them are risks on the proposed project.

It is assumed that annual generation (100%) will be sold during the operation period. It is not considered the demand conditions of electricity market. Besides, there is no export competence in the scope of license and the Project is derived from vast market potential (EU etc.).

Independent variables affecting the demands: To assess the predictions for demands of using more realistic assumptions, it is needed to develop a framework of multi-dimensional analysis. For instance, growth scenarios, a short and long run the price and income elasticity of demand for electricity etc. are main subjects.[29] There is no doubt that it is not possible to handle the dimensions with all its aspects. We only underline importance of GDP and industrial (especially manufacturing) sector in the demand context.

In Turkey, growth rate is an important variable which affected the electricity consumption positively in the long term.[30] Export-led growth as model is valid in Turkey.[31] The growth performance predominantly depends on global demand and falling global demand could have a major impact. Industry (especially manufacturing) with input-output connections is also the key sector in terms of growth performance and constituted more than 40% of total Turkey electrical consumption. Therefore, the electricity demand conditions of domestic market are drastically affected by the global economy cycles. On the other hand the largest elasticity is found in industry. Household demand for electricity is much less elastic than industrial energy use.[32] After the first ten years, income stream of Project will be able to fluctuate.

(ii) The cash outflow and costs

- Independent variables affecting investment costs: Especially important differences between predicted construction costs and realized construction costs can be revealed in disfavor and favor of the Project.

Independent variables affecting operational costs: Constant annual wages during the 50 years of operation is assumed. In other words, it is not considered possible reel wage increases and decreases. Indeed real wages that have been adjusted for inflation is more than predicted (constant) level in order to prosperity over time. The possible changes of wages, and other current expenses, the fiscal liabilities (especially levied by the local administration) are not considered in baseline analysis.

[29] The price elasticity of demand is, by definition, the percentage change in demand that is caused by a one per cent change in price. This definition is also validated for the income elasticity.

[30] KAPUSUZOGLU, Ayhan and KARAN, Mehmet Baha (2010), "An Analysis of the Co-integration and Causality Relationship between Electricity Consumption and Gross Domestic Product (GDP) in the Developing Countries: An Empirical Study of Turkey", *Business and Economics Research Journal, Volume* 1, Number 3.

[31] BİLGİN, Cevat and SAHBAZ, Ahmet (2009): "Türkiye'de Büyüme ve İhracat Arasındaki Nedensellik İlişkileri", published in *Gaziantep Üniversitesi Sosyal Bilimler Dergisi*, Vol. 8, No. 1 (2009): pp. 177-198. This paper is to investigate the relations between export and growth for Turkey by using 1987-2006 monthly data. According to the test results, export-led growth is verified for the specified period.

[32] ACKERMAN, Frank, (2008). "Carbon Markets and Beyond: The Limited Role of Prices and Taxes in Climate and Development Policy," *G-24 Discussion Papers* 53, United Nations Conference on Trade and Development.

Despite possible limitations –especially in absence of compound effects and probability distribution– this sensitivity analysis provides a general outlook of the investment analysis effort. A range of 10% fluctuations in parameters (electricity price and costs) can be taken in this analysis.[33]

Table 12 The Sensitivity Analysis for Türkerler GPP Project

Parameter	Variation	IRR
Investment Cost	increased 10%	7,00 %
	decreased 10%	10,61 %
Annual Cost	increased 10%	7,05 %
	decreased 10%	9,81 %
Sale price of electricity	increased 10%	10,59 %
	decreased 10%	6,66 %
Amount of electricity generated	increased 10%	10,59 %
	decreased 10%	6,66 %

The income has two variables; amount of electricity generated and unit price of electricity.[34] Therefore, income can be a parameter just by the way of variation in these 2 variables, which means that the increase in income can be a result of either increase in amount of electricity generated or increase in unit price of electricity. The decrease in income can be a result of either decrease in amount of electricity generated or decrease in unit price of electricity.

It may be seen from the sensitivity analysis that the 29 years Equity IRR value for the proposed project activity is less than the benchmark IRR (15%). Likewise, this analysis has not been considered macro risks (a projection about budget deficits, current account deficits, saving deficits, public and private debt stock etc. of Turkey economy) as well as micro risks (project, sectoral etc.).

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the Equity IRR and make the project more attractive for investors. Considering that figures above do not precisely reflect the investment risk (systematic and unsystematic risks) the role of the carbon income is significant to enable the project to proceed and for a favourable investment decision taken. Based on the analysis and information above, it is concluded that project is not the attractive and can be considered as additional to the baseline scenario for indicated benefits in the first chapter.

The plant load factor is a measure of average capacity utilization. As per "Guidelines for the Reporting and Validation of Plant Load Factors, version 1" EB48, Annex 11;

The plant load factor shall be defined ex-ante in the CDM-PDD according to one of the following three options:
(a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval;

[33] Guidelines on the assessment of investment analysis, version 05, EB 62

[34] Income = electricity generated (KWh) x unit price of electricity (USD/KWh)

(b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company);

(b) was satisfied, since the components of the equation of plant load factor was determined by the engineering company which conducted the Feasibility Study. The PLF determined in line with (b) was provided to the bank to receive credit.
By definition, the ratio of average load to total capacity and the equation is;

$$PLF = \frac{Gross\ Generation}{Installed\ Capacity\ x\ Number\ of\ hours}$$

Where;

PLF	= Plant Load Factor
Gross generation	= Annual electricity generation (MWh)
Installed Capacity	= the installed generation capacity within the project activity (MWe)
Number of hours	= number of hours in a year (hrs.)

$$PLF = 17784\ MWh / 24\ MW^{3536} \times (365\ day \times 24\ hrs/day)$$

$$PLF = (17784\ MWh / 210.240\ MWh) \times 100 = 84{,}59\%$$

The milestones of the project are given below:

Table 13: Milestones of the Project

TASK NAME	DATES	References
Board Decision as prior consideration of CDM	23/01/2012	Board Decision
EIA Affirmative Decision	13/01/2012	EIA Document
Electricity Production License by EMRA	01/02/2012	Electricity Production License by EMRA
Contract with TEIAS about grid connection	11/10/2013	Contract with TEIAS
Contract with EN-ÇEV (the Consultant of Carbon Credits)	7/04/2014	Contract with EN-ÇEV
Turbine Contract and Mechanical Equipment	29/12/2011	Supply Contract (ORMAT)
LSC Meeting	26/06/2014	Local Stakeholder Consultation Report Feedback
Investment Decision Date	29/12/2011	Supply Contract (ORMAT)
The starting date of the project activity	October 2010	Magnetotelluric Surveys 3D Modelling Report
Application to amendment of EMRA Electricity Generation License	22/05/2012 – Partnership Amendment 03/10/2012 –	Electricity Production License by EMRA

[35] Türkerler GPP Financial Model Summary

[36] Türkerler GPP Financial Model Summary

TASK NAME	DATES	References
	Transformer Station Amendment 11/07/2013 – Transformer Station Amendment	
Commissioning Date	December 2011	The information retrieved from the owner company via email.

Step 3: Barrier analysis

The barrier analysis step has not been applied for the proposed project.

Step 4: Common practice analysis

This section includes the analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region.

The following Sub-steps discuss the existing common practice.

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

Table 14 The List of Operational Geothermal Power Plant[37][38][39]

Plant	Province	Installed Capacity	Company	Phase	Scale	CDM	Technology
KEN 3 JES	AYDIN	24,8	KEN KİPAŞ ELEKTRİK ÜRETİM A.Ş.AYDIN ŞUBESİ	Construction	Large Scale		
Mis-1	MANİSA	15	MİS ENERJİ ÜRETİM ANONİM ŞİRKETİ	Construction	Large Scale		
Ken Kipaş Santrali	AYDIN	24	KEN KİPAŞ ELEKTRİK ÜRETİM A.Ş.AYDIN ŞUBESİ	Operation	Large Scale		
Özmen-1 JES	MANİSA	23,52	SİS ENERJİ ÜRETİM ANONİM ŞİRKETİ	Construction	Large Scale		
Alaşehir JES 2	MANİSA	24	TÜRKERLER JEOTERMAL ENERJİ ARAMA VE ÜRETİM A.Ş	Construction	Large Scale		

[37] http://lisans.epdk.org.tr/epvys-web/faces/pages/lisans/elektrikUretim/elektrikUretimOzetSorgula.xhtml

[38] http://geka.org.tr/yukleme/dosya/5f60844e55155eb66280abe69e42aa51.pdf

[39] https://pangea.stanford.edu/ERE/db/WGC/papers/WGC/2015/01046.pdf

Plant	Province	Installed Capacity	Company	Phase	Scale	CDM	Technology
Kızıldere-3 JES	DENİZLİ	95,2	ZORLU DOĞAL ELEKTRİK ÜRETİMİ A.Ş.	Construction	Large Scale		Binary
Kuyucak JES	AYDIN	18	TURCAS KUYUCAK JEOTERMAL ELETRİK ÜRETİM ANONİM ŞİRKETİ	Construction	Large Scale		
Çelikler Sultanhisar Jeotermal Elektrik Üretim Tesisi	AYDIN	13,8	ÇELİKLER SULTANHİSAR JEOTERMAL ELEKTRİK ÜRETİM ANONİM ŞİRKETİ.	Construction	Small Scale		
Umurlu-2 JES	AYDIN	12	KARKEY KARADENİZ ELEKTRİK ÜRETİM ANONİM ŞİRKETİ	Construction	Small Scale		
Pamukören JES 3	AYDIN	22,51	ÇELİKLER PAMUKÖREN JEOTERMAL ELEKTRİK ÜRETİM ANONİM ŞİRKETİ	Operation	Large Scale		
Greeneco JES	DENİZLİ	25,6	GREENECO ENERJİ ELEKTRİK ÜRETİM ANONİ ŞİRKETİ	Partial Construction (12.8 in construction, 12.8 in operation)	Large Scale		
PAMUKÖREN JES 2	AYDIN	22,51	ÇELİKLER PAMUKÖREN JEOTERMAL ELEKTRİK ÜRETİM ANONİM ŞİRKETİ	Operation	Large Scale		Binary
Tosunlar 1 JES	DENİZLİ	3,807	AKÇA ENERJİ ÜRETİM OTOPRODÜKTÖR GRUBU ANONİM ŞİRKETİ	Operation	Small Scale		
Kerem JES	AYDIN	24	MAREN MARAŞ ELEKTRİK ÜRETİM SANAYİ VE TİCARET A.Ş.	Operation	Large Scale		
Kızıldere II JES	DENİZLİ	80	ZORLU DOĞAL ELEKTRİK ÜRETİMİ A.Ş.	Operation	Large Scale		Double Flash
Enerjeo Kemaliye Santrali	MANİSA	24,9	ENERJEO KEMALİYE ENERJİ ÜRETİM A.Ş.	Operation	Large Scale		
Efeler JES	AYDIN	162,3	GÜRMAT ELEKTRİK ÜRETİM A. Ş.	Partial Construction (47.4 in construction, 114.9 in	Large Scale		

Plant	Province	Installed Capacity	Company	Phase	Scale	CDM	Technology
				operation)			
Babadere Jeotermal Elektrik Üretim Tesisleri	ÇANAKKALE	8	MTN ENERJİ ELEKTRİK ÜRETİM SANAYİ VE TİCARET ANONİM ŞİRKETİ	Operation	Small Scale	Listed	
Gök JES	DENİZLİ	3	İN-ALTI TERMAL TURİZM SAĞLIK TEKSTİL GIDA VE TEMİZLİK MADDELERİ SANAYİ VE TİCARET LİMİTED ŞİRKETİ	Construction	Small Scale		
Dora IV JES	AYDIN	17	MENDERES GEOTHERMAL ELEKTRİK ÜRETİM A.Ş.	Operation	Large Scale		
Deniz (Maren II) JES	AYDIN	24	MAREN MARAŞ ELEKTRİK ÜRETİM SANAYİ VE TİCARET A.Ş.	Operation	Large Scale		
Jeoden	DENİZLİ	2,52	TÜRKERLER JEOTERMAL ENERJİ ARAMA VE ÜRETİM A.Ş	Construction	Small Scale		
Kiper JES	AYDIN	20	KİPER ELEKTİRİK ÜRETİM ANONİM ŞİRKETİ	Construction	Large Scale		
Çelikler Pamukören Jeotermal Elektrik Üretim Tesisi	AYDIN	67,53	ÇELİKLER JEOTERMAL ELEKTRİK ÜRETİM ANONİM ŞİRKETİ	Operation	Large Scale	Listed	Binary
Gümüşköy JES	AYDIN	13,2	GÜMÜŞKÖY JEOTERMAL ENERJİ ÜRETİM ANONİM ŞİRKETİ	Operation	Small Scale	Registered	
Karkey Umurlu JES	AYDIN	12	KARKEY KARADENİZ ELEKTRİK ÜRETİM ANONİM ŞİRKETİ	Operation	Small Scale	Registered	
Sanko JES	MANİSA	15	SANKO ENERJİ SANAYİ VE TİCARET ANONİM ŞİRKETİ	Construction	Large Scale		
Dora III JES	AYDIN	34	MENDERES GEOTHERMAL ELEKTRİK ÜRETİM A.Ş.	Operation	Large Scale	Listed	Binary

Plant	Province	Installed Capacity	Company	Phase	Scale	CDM	Technology
Maren Santrali	AYDIN	44	MAREN MARAŞ ELEKTRİK ÜRETİM SANAYİ VE TİCARET A.Ş.	Operation	Large Scale	Registered	
Kızıldere JES	DENİZLİ	15	ZORLU DOĞAL ELEKTRİK ÜRETİMİ A.Ş.	Operation	Large Scale		Single Flash
Dora-2 Jeotermal Enerji Santrali	AYDIN	9,5	MENDERES GEOTHERMAL ELEKTRİK ÜRETİM A.Ş.	Operation	Small Scale	Issued	Binary (ORC)
Tuzla	ÇANAKKALE	7,5	TUZLA JEOTERMAL ENERJİ A.Ş.	Operation	Small Scale	Issued	Binary (ORC)
Galip Hoca Jeotermal Elektrik Santrali	AYDIN	47,4	GÜRMAT ELEKTRİK ÜRETİM A. Ş.	Operation	Large Scale		
Kızıldere	DENİZLİ	6,85	BEREKET JEOTERMAL ENERJİ ÜRETİM ANONİM ŞİRKETİ	Operation	Small Scale		Binary
Dora-1	AYDIN	7,951	MENDERES GEOTHERMAL ELEKTRİK ÜRETİM A.Ş.	Operation	Small Scale	Registered	Binary (ORC)

CDM Activities
Small Scale
Other tech. than Binary
Large Scale and Binary

As it seen in the Table which shows the Operational Geo-Thermal Power Plants, there are 36 Geo-thermal power plant and 27 of them is neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. 4 of them are both large scale and they use Binary as a technology. There is not any plant which has different investment requirement therefore N_{diff} also 4.

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

$N_{all}= 4$

$N_{diff} = 4$

$F=1-1 = 0$

This ratio is below the 0,2 percent. And $N_{all}-N_{diff} =0$ that is smaller than 3. Therefore this plant is not a common practice. In the sense of the investment and renewable energy of the Turkey, this project needed to be encouraged.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

Project Emissions

The project activity makes use of ACM0002 as the main methodology. According to ACM0002 the project emission shall be calculated by using the following equation.

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \textbf{(Equation 2)}$$

PE_y = Project emissions in year y (t CO_{2e}/yr)

$PE_{FF,}$ = Project emissions from fossil fuel consumption in year y (t CO_2/yr)

$PE_{GP,}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO_{2e}/yr)

$PE_{HP,}$ = Project emissions from water reservoirs of hydro power plants in year y (t CO_{2e}/yr)

1. Project emissions from fossil fuel consumption

For geothermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ shall be calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, ver 02".

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(Equation 3)}$$

$PE_{FC,j,y}$ = $PE_{FF,y}$= Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr);

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

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

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

The CO_2 emission coefficient COEFi,y is calculated based on net calorific value and CO2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \textbf{(Equation 4)}$$

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

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

$EF_{CO2,i,y}$ = Is the weighted average CO2 emission factor of fuel type i in year y (tCO2/GJ)

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

2. Project emissions from the operation of geothermal power plants due to the release of non-condensable gases

$PE_{GP,y}$ is calculated as follows:

$$PE_{GP,y} = (w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}) \times M_{steam,y} \quad \textbf{(Equation 5)}$$

$PE_{GP,}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO_{2e}/yr)

$w_{steam,2,y}$ = Average mass fraction of CO_2 in the produced steam in year y (t CO_2/t steam)

$w_{steam,4,y}$ = Average mass fraction of CH_4 in the produced steam in year y (t CH_4/t steam)

GWP_{CH4} = Global warming potential of CH_4 valid for the relevant commitment period (t CO_{2e}/t CH_4)

$M_{steam,}$ = Quantity of steam produced in year y (t steam/yr)

3. Project emissions from water reservoirs of hydro power plants

The project is a geothermal power plant project. Hence, the project emission from water reservoir of hydro power plants is zero.

Baseline Emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{pj,y} \times EF_{grid,CM,y} \quad \textbf{(Equation 1)}$$

BE_y = Baseline emissions in year y (t CO_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)

$EF_{grid,,}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

1. **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)**

The planned project is a new geothermal power plant (Greenfield power plant). Therefore, when the EGPJ,y is calculated, the next equation is used.

$$EG_{pj,y} = EG_{facility,y} \quad \textbf{(Equation 6)}$$

$EG_{PJ,y}$ = 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)

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

2. **Combined margin CO_2 emission factor for grid connected power generation in year y**

The combined margin CO2 emission factor is calculated using "Tool to calculate the emission factor for an electricity system, ver. 05.0".

The following six steps below are used to determine combined margin (CM) emission factor:

Step 1: Identify the relevant electricity systems;

According to the "Tool to calculate the emission factor for an electricity system, version 05.0", a grid/Project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints. In Turkey, only one transmission system which is national transmission system is defined and only TEİAŞ is in the charge of all transmission system.

Correspondingly, in this project activity the project electricity system include the project site and all power plants attached to the Interconnected Turkish National Grid.

Electricity imports are defined as transfers from connected electricity systems to the project electricity system. Hence, determining the operating margin emission factor, 0 tCO2/MWh emission factor has been determined for net electricity imports from the connected electricity system.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

For the calculation of the operating margin and build margin emission factor, "Option I: Only grid power plants are included in the calculation", is used.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods;

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

Options (b) and (c) are not preferred due to the scarcity of data for Turkey. Option (d) is not preferred since low-cost/must run resources do not constitute more than 50% of total grid generation. Simple OM method will be used in the calculations. Other methods are not applicable due to lack of data.

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 net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated by following two options;

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.

Option B can only be used if; (1) no necessary data for option (A), (2) only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known, (3) off-grid power plants are not included in the calculation.

For the project in question, ***Option A*** is preferred since; Necessary data for Option A is available for the Türkerler Geo-thermal Power Plant Project.

Under ***Option A***, the simple OM emission factor is calculated based on the net electric generation of each power unit and an emission factor for each power unit as fallows;

$$EF_{grid,OM\ simple,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \textbf{(Equation 7)}$$

$EF_{grid,OM\ simple,y}$: Simple operating margin CO_2 emission factor in year y (t CO_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* (t CO_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 three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) on data vintage in step 3.

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

In terms of vintage data, the "Tool to Calculate the Emission Factor for an Electricity System, ver. 05.0", provides two options to be chosen; option 1 and option 2.

Option 1 states that; for the first crediting period, the BM 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 BM 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 the renewable of the crediting period to the DOE. For the third crediting period, the BM emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

In this respect, **option 1** was chosen to identify the vintage data.

The sample group of power unit ***m*** used to calculate the build margin should be determined as per the procedure in the tool.

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 to CDM project starting with power units, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} ($SET_{\geq 20\%}$) and their annual electricity generation ($AEG_{SET\geq 20\%}$ 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.

Turkey's total electricity generation in 2013 is 240,154.00 GWh. The 20% of AEG total was calculated as 48,030.00 GWh, accordingly.

The selected set of power units ($SET_{\geq 20\%}$) which was started to supply electricity to the grid most recently and comprise $20\% \text{ of } AEG_{total}$ is the capacity addition is selected from year 2012 to 2010. Power plants registered as CDM projects were excluded from the set. Because of the data after the 2012 cannot be reached, we are continue to use these data.

The $AEG_{SET \geq 20\%}$ is calculated as 49,155.40 GWh as per the set of power units.

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:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \textbf{(Equation 8)}$$

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

$EG_{m, y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)

$EF_{EL, m, y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$)should be determined as per the guidance in Step 4 section 6.4.1 for the simple OM, using Options A1, A2 or A3, using for y the most recent

historical year for which electricity generation data is available, and using form the power units included in the build margin.

Option A2 is preferred because plant specific fuel consumption data is not available for Turkey. The calculation of the CO_2 emission factor for each power unit m ($EF_{EL,m,y}$) is shown below.

$$EF_{EL,my} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \qquad \textbf{(Equation 96)}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of the power unit m in year y (tCO_2/MWh)

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type I used in power unit m in year y (tCO_2/GJ)

$n_{m,y}$ = Average net energy conversion efficiency of power unit *m* in year *y* (ratio)

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

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor**,** $EF_{grid,\ CM,\ y}$**,** is based on the following methods;

a) Weighted average CM

b) Simplified CM

The weighted average CM method is preferred to calculate.

a) Weighted average CM method:

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(Equation 10)}$$

$EF_{grid, CM, y}$ = Combined 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)

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

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

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

"Tool to calculate the emission factor for an electricity system, ver. 05.0" states that;

The following default values should be used for $\mathbf{w_{OM}}$ and $\mathbf{w_{BM}}$:

• Wind and solar power generation project activities: $\mathbf{w_{OM}}$ = 0,75 and $\mathbf{w_{BM}}$ = 0,25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

• All other projects: $\mathbf{w_{OM}}$ = 0,5 and $\mathbf{w_{BM}}$ = 0,5 for the first crediting period, and $\mathbf{w_{OM}}$ = 0,25 and $\mathbf{w_{BM}}$ = 0,75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Emission Reductions (ER_y)

Emission reductions are calculated as follows:

$$ERy = BEy - PEy \quad \textbf{(Equation 11)}$$

ER_y = Emission reductions in year y (t CO_2e/y)

BE_y = Baseline Emissions in year y (t CO_2e/y)

PE_y = Project emissions in year y (t CO_2e/y)

B.6.2. Data and parameters fixed ex ante

Table 15: EF grid, OM simple, y Data

Data / Parameter	**EF grid, OM simple, y**
Unit	t CO2/MWh
Description	Simple operating margin CO_2 emission factor in year y
Source of data	Calculated by equation 7
Value(s) applied	0,631 by Table 28
Choice of data or Measurement methods and procedures	The used data in formula is taken from justified sources as is seen from other tables in part B.6.2 of this PDD.
Purpose of data	EFgrid,CM
Additional comment	

Table 16: EGy Data

Data / Parameter	**EGy**
Unit	MWh
Description	Net electricity generated and delivered to the grid by all power sources serving the system, excluding low-cost/must-run units/plants, in year y
Source of data	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey's gross electricity generation-imports-exports and demand 1975-2014[40], Annual development of electricity generation-consumption-losses in Turkey between 1984 and 2014[41].
Value(s) applied	Table 27
Choice of data or Measurement methods and procedures	According to ''Turkish Statistics Law and Official Statistics Program'' TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Purpose of data	**EFEL,m,y**
Additional comment	

[40] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg.25

[41] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 35

Table 17: $FC_{i,y}$ Data

Data / Parameter	**$FC_{i,y}$**
Unit	ton/m^3 gas
Description	Amount of fossil fuel consumed in the project electricity system by generation sources in year y
Source of data	TEIAS (Turkish Electricity Transmission Company) Fuels consumed in thermal power plants in Turkey by the electric utilities for year y[42].
Value(s) applied	Table 26
Choice of data or Measurement methods and procedures	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Purpose of data	**$NCV_{i,y}$, $EF_{EL,m,y}$**
Additional comment	

Table 18 Heat Value Data

Data / Parameter	**Heat Value**
Unit	MJ
Description	Amount of heat produced by the consumption of a unit quantity of fuel types consumed in thermal power plants
Source of data	TEIAS (Turkish Electricity Transmission Company) Heating values of fuels consumed in thermal plants in Turkey by the electricity utilities (2006-2014)[43]
Value(s) applied	Table 26
Choice of data or Measurement methods and procedures	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available. Heat value is divided by FC to determine NCV[44].

[42] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 50

[43] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 52

[44] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1 of Volume 2,Box 1.1

Purpose of data	NCVi,y
Additional comment	In order to convert the data from Tcal to GJ; the equations below are used. 1Tcal=1000Gcal, 1GJ = 0.238846 Gcal, Density of natural gas is considered to be 0,695kg/m3

Table 19 NCV $_{i, y}$ Data

Data / Parameter	**NCV $_{i, y}$**
Unit	MJ/kg
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	TEIAS (Turkish Electricity Transmission Company) Fuels consumed in thermal power plants in Turkey by the electric utilities for year y[45]. Heating values of fuels consumed in thermal plants in Turkey by the electricity utilities (2006-2014)[46].
Value(s) applied	Table 26
Choice of data or Measurement methods and procedures	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Purpose of data	**$EF_{EL,m,y}$**
Additional comment	In order to convert the data source units to the required units; 1ton=1000 kg.

Table 20 EF $_{C02,i,y}$ Data

Data / Parameter	**EF $_{C02,i,y}$**
Unit	tones CO_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 and Annex 1 for sub-bituminous of Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventory[47].
Value(s) applied	Table 26, Table 30

[45] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 50

[46] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 52

[47] https://www.ipcc.ch/meetings/session25/doc4a4b/vol2.pdf

Choice of data or Measurement methods and procedures	There is no information on the fuel specific default emission factor in Turkey, hence, IPCC values has been used as referred in the ‘‘Tool to calculate the emission factor for an electricity system, version 04.’’.
Purpose of data	**$EF_{EL,m,y}$**
Additional comment	In order to convert the data source units to the required units; 1ton=1000 kg.

Table 21 $EF_{grid, BM, y}$ Data

Data / Parameter	**$EF_{grid, BM, y}$**
Unit	tCO2/MWh
Description	Build margin CO_2 emission factor in year y
Source of data	Calculated by equation 8 at Table 32
Value(s) applied	0,4
Choice of data or Measurement methods and procedures	Calculated *ex-ante* and comprised capacity addition of power plants between years 2012-2010 according to the “Tool to calculate emission factor for an electricity system, version 05.0”
Purpose of data	**$EF_{grid,}$** CM
Additional comment	

Table 22 $EF_{EL, m, y}$ Data

Data / Parameter	**$EF_{EL, m, y}$**
Unit	tCO_2e/MWh
Description	CO_2 emission factor of power unit *m* in year *y*
Source of data	Calculated by equation 9
Value(s) applied	Table 31
Choice of data or Measurement methods and procedures	Calculated *ex-ante* according to the “Tool to calculate emission factor for an electricity system” version 05.0”
Purpose of data	**$EF_{grid, BM, y}$**
Additional comment	

Table 23 $\eta_{m,y}$ Data

Data / Parameter	$\eta_{m,y}$
Unit	-
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	Tool to calculate the emission factor for an electricity system, ver. 05.0, Annex 1 (new units after 2000)
Value(s) applied	Table 29
Choice of data or Measurement methods and procedures	Since there is no current efficiency values of power units in Turkey, the efficiency values o are retrieved from Tool, ver. 05.0, Annex 1.
Purpose of data	$EF_{EL,m,y}$
Additional comment	

Table 24 $EG_{m,y}$ Data

Data / Parameter	$EG_{m,y}$
Unit	MWh
Description	Net quantity of electricity generated and delivered to the grid by power unit *m*, in year *y*
Source of data	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey's gross electricity generation of primary energy sources between 2006-2014[48]
Value(s) applied	Table 27
Choice of data or Measurement methods and procedures	According to ''Turkish Statistics Law and Official Statistics Program'' TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Purpose of data	$EF_{grid,BM,y}$
Additional comment	In order to convert the data from GWh to MWh GJ; the equation below is used. 1GWh=1000 MWh

Table 25 $EF_{grid,CM,y}$ Data

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2e/MWh
Description	Combined margin CO_2 emission factor in year *y*
Source of data	Calculated data applied to the equation 10

[48] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm pg 38

Value(s) applied	0,515
Choice of data or Measurement methods and procedures	Calculated *ex-ante* according to the "Tool to calculate emission factor for an electricity system, version 05.0"
Purpose of data	BE_y
Additional comment	

B.6.3. Ex ante calculation of emission reductions

For the purpose of calculation of emission reductions, the following steps have to be applied:

Project Emissions

1. Project emissions from fossil fuel consumption

$$PE\times = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(Equation 3)}$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \textbf{(Equation 47)}$$

2. Project emissions from the operation of geothermal power plants due to the release of non-condensable gases $PE_{GP,y} = (w_{steam,CO2,y} + w_{steam,CH4} \times GWP_{CH4}) \times M_{steam,y}$

(Equation 58)

Baseline Emissions

1. 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)

$$BE_y = EG_{pj,y} \times EF_{grid,CM,y} \quad \textbf{(Equation 19)}$$

$$EG_{pj,y} = EG_{facility} \quad \textbf{(Equation 610)}$$

2. Combined margin CO_2 emission factor for grid connected power generation in year y

The operating margin emission factor

For the calculation of the Simple OM, the amounts of fuel consumption (FCi, y) values for relevant years are given in table below for year 2012.

Table 26 Heat Values, FC, NCV and EF_{CO2} values of each fuel source in 2014

Fuel Type	FC (ton/m^3 gas) [49]	Heat Value (MJ)[50]	NCV (MJ/kg)*	EF_{CO2} (kg/TJ = tones/ GJ)	
				Upper	Lower
Hard Coal+Imported Coal+Asphaltite	14501934,00	346744816000,00	23,91	92800,00	100000,00
Lignite	57696139,00	409680544000,00	7,10	90900,00	115000,00
Fuel Oil	754283	31145696000,00	41,29	75500,00	78800,00
Diesel Oil	119988	5209080000,00	43,41	72600,00	74800,00
LPG	0	0,00	0,00	61600,00	65600,00
Naphta	0	0,00	0,00	69300,00	76300,00
Natural Gas	25426014	952483416000,00	37,46	54300,00	58300,00
*NCV is calculated as Heat Value divided by FC [51]					

The values of the other years' can be found in Appendix 3 in a tabular form.

In order to calculate the OM, the net electricity generated and delivered to the grid by all sources excluding the low-cost/must run resources is required. However, net generation national data is only available for total of power sources. Due to this fact, the internal consumption ratio is used to identify the net electricity generation by thermal sources. The difference of low-cost/must-run generation and supplied to grid amount is the generation by thermal sources. The internal consumption of thermal plants is determined by means of ratio. The thermal generation excluding internal consumption gives the net generation excluding low-cost/must-run as is followed by next table. After addition of import electricity, the EGy is determined.

Table 27 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* (GWh)

Electricity Generation (GWh)	Supplied to grid[52]	Low-cost/ must - run[53]	Thermal	Internal consumption (%)	Internal consumption of thermal	Net generation	Import	EG y (Wh)
2010	204189,9	55380,10	155827,6	3,86	6021,57	149806,03	1143,8	150949827,21

[49] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm, pg:50

[50] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2014/istatistik2014.htm, pg: 52

[51] 2006 IPCC Guidelines for National Greenhouse Gas Inventories Ch.1 Volume 2,Box 1.1

[52] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2013/uretim%20tuketim(23-47)/34(84-13).xls

[53] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2013/uretim%20tuketim(23-47)/24.xls

Electricity Generation (GWh)	Supplied to grid[52]	Low-cost/ must - run[53]	Thermal	Internal consumption (%)	Internal consumption of thermal	Net generation	Import	EG y (Wh)
2011	222113,5	57756,80	171638,3	5,16	8856,99	162781,31	4555,8	150949827,21
2012	233534,0	64625,10	174871,7	4,92	8608,26	166263,44	5826,7	150949827,21
2013	236406,4	68341,50	171812,45	4,65	7996,28	163816,17	7429,4	150949827,21
2014	247402,2	51546,20	200416,6	4,97	9953,84	190462,76	7953,3	150949827,21
Total *	1143646	297649,70	874566,7	23,56	41436,94	833129,7	26909	754749136,1
* Low-cost/must run resources constitute less than 50% of total grid generation in average of five most recent years. Therefore Simple OM method can be used.								

Table 28 Electricity Weighted $EF_{grid, OMsimple, y}$ (tCO_2/MWh)

	2012	**2013**	**2014**
	EF grid, OM simple, y, i (tCO_2/MWh)		
Hard Coal+Imported Coal+Asphaltite			
Lignite	0,17	0,15	0,16
Fuel Oil	0,26	0,15	0,19
Diesel Oil	0,01	0,01	0,01
LPG	0,00	0,00	0,00
Naphtha	0,00	0,00	0,00
Natural Gas	0,00	0,00	0,00
Total	0,29	0,27	0,26
3-year generation weighted average (tCO2/MWh)	0,631		

The build margin (BM) emission factor

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 equation 8.

In order to use equation 8, it is required to know $EF_{EL,m,y}$.

$EF_{EL,m,y}$ is determined according to equation 9. In this process, average net energy conversion efficiency and other required data are given in next tables.

Table 29 Average net energy conversion efficiency by energy sources (%)

Average Net Energy Conversion Efficiency by Energy Sources (%)						
Hard Coal+Imported Coal+Asphaltite	Lignite	Fuel-oil	Diesel-oil	LPG	Naphtha	Natural Gas
0,390	0,390	0,390	0,390	0,390	0,390	0,390

Table 30 Average CO_2 emission factor by fuel types (tCO_2/Tj)

EF CO_2 (t CO_2/ GJ)						
Hard Coal+Imported Coal+Asphaltite	Lignite	Fuel-oil	Diesel-oil	LPG	Naphtha	Natural Gas
0,0928	0,0909	0,0755	0,0726	0,0616	0,0693	0,0543

Table 31 $EF_{EL,m,y}$ Calculation

Fuel Type	EF CO_2 (tCO_2/Gj)	η Generation Efficiency (%)	$EF_{EL,m,y}$ (tCO_2/MWh)
Hard Coal+Imported Coal+Asphaltite	0,0928	0,390	0,8566
Lignite	0,0909	0,390	0,8391
Fuel Oil	0,0755	0,460	0,5909
Diesel Oil	0,0726	0,460	0,5682
LPG	0,0616	0,460	0,4821
Naphta	0,0693	0,460	0,5423
Natural Gas	0,0543	0,600	0,3258

The multiplication of emission factor and electricity generation of capacity addition by source is the amount of emission by source which is divided by total capacity addition between year 2012- 2014 which comprises 20% of total generation, excluding projects registered to CDM, gives the build margin CO_2 emission factor (see equ. 8). Next table shows the data applied.

Table 32 BM calculation by capacity addition

Fuel Type	Electricity generation Capacity addition (GWh)	EF,EL,m,y (tCO_2/MWh)	Emission by source
IMPORTED COAL+ASPHALTITE	13052,77	0,8566	11181,204
LIGNITE	0	0,8391	0
Fuel-oil	1289,95	0,5909	762,19
Natural Gas	23520,44	0,3258	7662,959
Wind	751,40	0	0
Geothermal	532,00	0	0
Hydro	9455,21	0	0
Waste	553,63	0	0
Total	49155,40	-	19606,35

$EF_{grid, BM, y}$ = 19606,35 / 49155,40 = 0,4 tCO_2/MWh

The combined margin (CM) emission factor

"Tool to calculate the emission factor for an electricity system, ver. 05.0" states that;
The following default values should be used for w_{OM} and w_{BM}:
• Wind and solar power generation project activities: w_{OM} = 0,75 and w_{BM} = 0,25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;
• All other projects: w_{OM} = 0,5 and w_{BM} = 0,5 for the first crediting period, and w_{OM} = 0,25 and w_{BM} = 0,75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.
Since the proposed project is GEPP, the weighs for the operating margin and build margin emission factors are 0,50 and 0,50 respectively. Therefore;

$EF_{grid, CM}$ = (0,631 *x* 0, 50) + (0,4 *x* 0, 50) = **0, 515 tCO_2/ MWh**

Project Emissions

1. Project emissions from fossil fuel consumption

For geothermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

Emissions from diesel engines have not been considered in ex-ante GHG emission reduction calculations as it is envisaged that the diesel engine shall be used only in emergency situations. Therefore;

$PE_{FF,y}$ = 0 t CO_{2e}/yr

2. Emissions from the operation of geothermal power plants due to the release of non-condensable gases

According to the tests of wells which are analyzed by the Türkerler Jeotermal Enerji Arama ve Üretim A.Ş., the fractions of the gases in the geothermal fluid are calculated.

According to the measurements the 5,8 % of the geothermal fluid is steam. The measurements showed that there are 5 released gases probably in NCG and they are CO_2, N_2, O_2, CH_4, H_2S. In addition to that as volumetrically %99.99 of these gases (NCG) is CO_2.

The design amount of the geothermal fluid is 1460 t/h. In the management step of the Türkerler Alaşehir Geo-thermal Power Plant Project, gas emission is expected only from steam in geothermal fluid.

Total quantity of steam is

$M_{steam,y}$ = (1460 t/h) * 0,058 (steam content) = 85 t/h

$W_{steam,NCGcontent}$= % 30

NCG= (85 t/h)*30/100 = 25,5 t/h

With this expectation, predicted CO_2 emission was calculated with;

25,5 t/h *0,99 = 25,24 t/h

This CO_2 emission will be used in carbon dioxide snow (dry ice) production and food freezing.

$W_{steam,CH4,y}$= 0%

➔ $PE_{GP,y}$ =25,24 t/h * 24h/day* 365d/y = 221146 t/yr.

3. Project emissions from water reservoirs of hydro power plants

The project is a geothermal power plant project. Hence, the project emission from water reservoir of hydro power plants is zero.

$PE_{HP,} = 0$.

PE_y = 221146 t CO_2/yr

However, non-condensable gases resulting from the operation (221146 t CO_2/yr) will be captured and carried out of the project boundary with pipelines to be used as industrial gas in production. Therefore; project emission will be zero.

Emission Reductions (ER_y)

The emission reduction is:

(177840 MWh/y x 0,515 t CO_2e/MWh) – 0 = 91597,72 t CO2e/yr

B.6.4. Summary of ex ante estimates of emission reductions

Based on the calculations in section B.6.3, the resulting emission reductions (in tCO2e) for the whole project activity for the years 2014-2021 is show in table below:

Table 33 Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Emission reductions (t CO_2e)
25.09.2014-31.12.2014	24426,06	0	24426,06
2015	91597,72	0	91597,72
2016	91597,72	0	91597,72
2017	91597,72	0	91597,72

Year	Baseline emissions ($t CO_2e$)	Project emissions ($t CO_2e$)	Emission reductions ($t CO_2e$)
2018	91597,72	0	91597,72
2019	91597,72	0	91597,72
2020	91597,72	0	91597,72
01.01.2021-25.09.2021	67171,66	0	67171,66
Total	641184,04	0	641184,04
Total number of crediting years	7 years		
Annual average over the crediting period	91597,72	0	91597,72

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$M_{steam,y}$
Unit	t steam/yr
Description	Quantity of steam produced in year y
Source of data	Project Developer – main inlet steam flow-meter and the periodically calculations.
Value(s) applied	85 t/y as calculations above
Measurement methods and procedures	The steam quantity discharged from the geothermal wells should be measured with a flow meter (or other equipment with at least the same accuracy). But the measurements of the flowmeters are not reliable values. The steam rate and CO2 rate is certain. Therefore they calculate the amount of the steam that leaves the system. Pressure and temperature upstream of the venture meter is measured using the same flow meter to define the steam properties. The measurement results will be summarised transparently in regular production reports.
Monitoring frequency	Daily continuous measurement-calculations
QA/QC procedures	Meters will be calibrated according to the manufacturer standard. Period of calibration: every year
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$W_{steam,CO2,y}$
Unit	tCO2/t steam

Description	Average mass fraction of carbon dioxide in the produced steam in year y
Source of data	The NCG data is taken from sampling as prescribed in the methodology
Value(s) applied	30 % of steam
Measurement methods and procedures	Non-condensable gases sampling should be carried out every year in the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only) by a third independent party or internal laboratory. The CO2 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks.
Monitoring frequency	Every year
QA/QC procedures	PGE Laboratory QA / QC Procedure
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	w_{steam},CH_4,y
Unit	tCH4/t steam
Description	Average mass fraction of methane in the produced steam in year y
Source of data	Project activity site
Monitoring frequency	As per the procedures outlined for $w_{steam,CO2,y}$
QA/QC procedures	-
Purpose of data	-
Additional comment	Applicable to dry, flash steam and binary geothermal power projects. The planned project does not cause trace amount of CH_4 emission.

Data / Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Project Developer – revenue meter (electricity sales)
Value(s) applied	Annual production : 177,840 MWh/yr
Measurement methods and procedures	Electricity produced will be measured by a watthour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Net electricity generation will be calculated according to internal consumption and loss. In the case of main revenue meter failure, a cross-check meter will be used as a back-up meter to measure both power delivered to the grid and received from the grid.
Monitoring frequency	Continuous basis with monthly reports

QA/QC procedures	The QA/QC will be conducted through cross checking with electricity sales receipts. Meters will be calibrated according to the Standard Operation Procedures.
Purpose of data	Baseline emission calculation
Additional comment	Standard Operation Procedures (SOPs).

Data / Parameter	**Mworking fluid,y**
Unit	t workingfluid/yr
Description	Quantity of working fluid leaked/reinjected in year y
Source of data	Project Site
Measurement methods and procedures	Measured via log books and maintenance reports of the plant
Monitoring frequency	Annually
QA/QC procedures	Measured from the amount of working flow reinjected to the binary system of the geothermal plant. Cross check with the purchase invoices.
Additional comment	

B.7.2. Sampling plan

All monitoring procedures and requirements of the proposed project activity will be in accordance with the methodologies ACM0002 "Grid-connected electric generation from renewable sources, version 17", EB 89.

The project developer has planned and will implement monitoring procedures and measures with regard to the monitoring methodology chosen for this project activity, guaranteeing that emission reductions are calculated in an accurate and conservative manner. The project developer will designate a person in charge for monitoring and recording of all the required information and documentation related with the GHG emissions covered in this PDD. The designated person in charge will be directly under the control of the Managing Director of the company. S/he will collect, record and store all the information for further archival or verification. Detailed responsibilities and authorities for project management, monitoring procedures and QA/QC procedures would be drawn up for the purpose and put in place. The collected information will be stored in the form of raw data in log books developed especially for the purpose of monitoring and recording data related to VER GS protocols.

These records will form part of the registered monitoring protocol for the use by verification companies. All the parameters monitored under the monitoring plan will be kept for a specific period after the end of the crediting period or the last issuance of GS VERs, whichever occurs later.

B.7.3. Other elements of monitoring plan

Operating Manager: Includes overall responsibilities about compliance with VER monitoring plan and operation of plant.

Operator-Technician: Responsible for keeping data to day running of plant, recording, monitoring of relevant data and periodical reporting. Staff will responsible for day to day operation and maintenance of the plant and equipment. All staff will be trained and will have certificate for working with high voltage equipment.

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

EN-ÇEV Energy Environmental Investments Consultancy Inc. (The Consultant):
Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

The potential sustainable development benefits of Alaşehir Geothermal Power Plant will be monitored as per effected indicators of sustainable development matrix. Those indicators are either crucial for an overall positive impact on sustainable development or particularly sensitive to changes in the framework conditions.

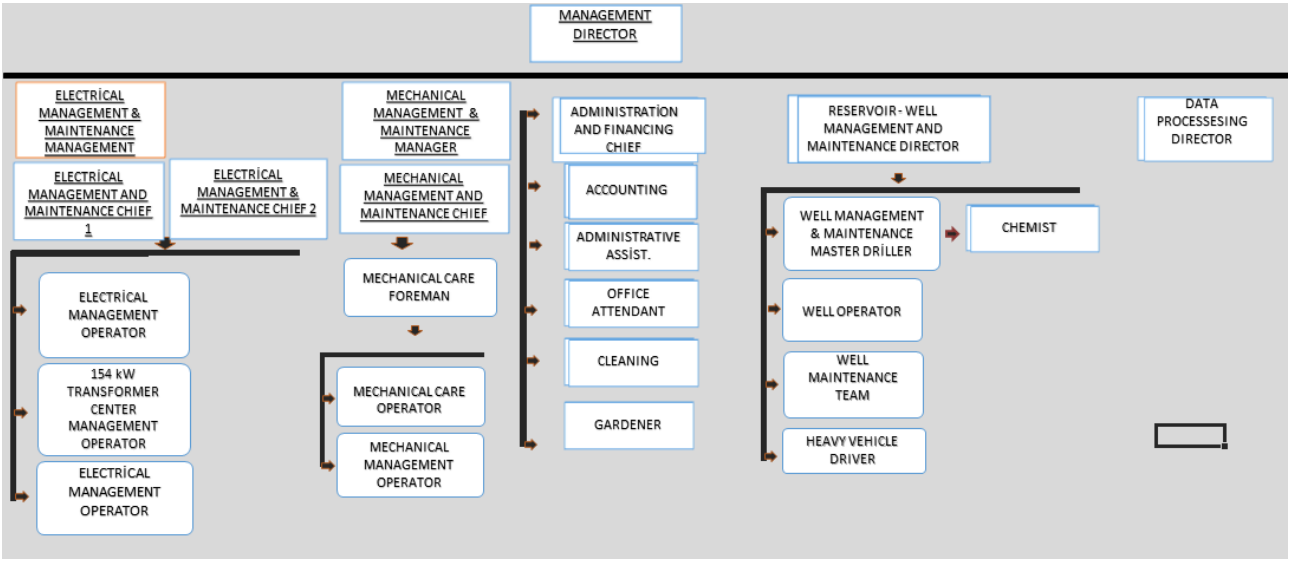

Figure 9 Operational and Management Flowchart

Accuracy levels of the instruments are showed in the following tables[54];

Table 34 Accuracy levels of the revenue meter with serial number 65006645

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,06	
3 – phase 0.05.ln 57.7 V		- 0,07
3 – phase Imax 230 V	0,06	0,03

Table 35 Accuracy levels of the revenue meter with serial number 65006646

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,04	
3 – phase 0.05.ln 57.7 V		-0,05
3 – phase Imax 230 V	0,06	0,06

Table 36 Accuracy levels of the revenue meter with serial number 65006640

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,17	
3 – phase 0.05.ln 57.7 V		-0,11
3 – phase Imax 230 V	0,03	0,01

Table 37 Accuracy levels of the revenue meter with serial number 65006641

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,09	
3 – phase 0.05.ln 57.7 V		0,05

[54] The information are retrieved from the Test Certifications of the electrical energy meters.

3 – phase Imax 230 V	0,12	0,02

Table 38 Accuracy levels of the revenue meter with serial number 65006638

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,08	
3 – phase 0.05.ln 57.7 V		-0,04
3 – phase Imax 230 V	0,05	0,04

Table 39 Accuracy levels of the revenue meter with serial number 65006639

Watt –h	PF + 1	PF + 0,5 ind
3 – phase 0.01.ln 57.7 V	0,01	
3 – phase 0.05.ln 57.7 V		-0,05
3 – phase Imax 230 V	0,09	0,04

Note that; all electricity meters brands are ITRON SL7000.And the calibration dates are 03/03/2013

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

Date of completing the final draft of this baseline section: 19/08/2016

Name of entity determining the baseline:

EN-ÇEV Energy, Environmental Investments Consultancy Inc.

EN-ÇEV which is the carbon consultant of Alaşehir Geothermal Power Plant Project is not a project participant.

Address: Mahatma Gandhi Caddesi, No: 92/2-3-4-6-7 06680 G.O.P – Ankara/ TURKEY

Tel: +90 312 447 26 22

Fax: +90 312 446 38 10

Contact Person: Pelin ZENGİN, Emrah ÖZTÜRK

E-mail: *emrah@encev.com.tr*, *pelin@encev.com.tr*

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

October /2010 – The first working on the project site. Magneto telluric Surveys 3D Modelling Report

C.1.2. Expected operational lifetime of project activity

29 years – Retrieved from Generation License.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Renewable, first crediting period

C.2.2. Start date of crediting period

25/09/2014 – Provisional Acceptance Document.

C.2.3. Length of crediting period

7 years – It starts on 25.09.2014 and to complete 7 years end date is 25.09.2021.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

TÜRKERLER JEOTERMAL ENERJİ ARAMA VE ÜRETIM A.Ş. (TÜRKERLER Geo-Thermal Energy Exploration and Generation Joint Stock Co.) plans to install a Geo – Thermal Power Plant near the Sub-District of Piyadeler, District of Alaşehir, and Province of Manisa to generate electricity. The project has 3.837,50 hectare licenced field. It is planned to install Geo-Thermal Power Plant with the 24 MW capacities. Within the scope of this project, 3 production wells installation are planned and the applicable one of these wells or the low efficient one of the other wells that are going to dig after a while, will be used as a reinjection well. Approximately, 177 GWh/yr electric will be produced. Depending on the variation on the demand of the Power Plant, the number of production and the reinjection well may increase or decrease.

The project is going to install to the Sub-District of Piyadeler, District of Alaşehir, and Province of Manisa, Site of Yörükler as 23.595 m^2. In accordance with the law "Law on the Renewable Energy

Sources for Electric Generation Use" no. 5346 date.10.05.2005, the making common the usage of these sources with the aim of energy production, to provide economy making these sources reliable, economic and in high quality, increasing the range of the sources, decreasing the greenhouse gases emissions, putting wastes to good use, protecting the environment and improving the manufacturing sector in order to achieve these goals are aimed.

According to "Environmental Impact Assessment Regulation", which has taken force upon promulgation in Official Gazette Issue No 26939 of 17.06.2008, the project falls in to Annex 2 (Projects require an Project Description File). Therefore, a project description file has been prepared[55].

According to "Environmental Impact Assessment Regulation", which has taken force upon promulgation in Official Gazette Issue No 26939 of 17.06.2008 the precautions indicated in the Project Description File found adequate and the "EIA Not Required" decision has been issued .The environmental impacts of the project have evaluated and the following mitigation measures are proposed in the environmental management plan.

The project will contribute to improve the environmental situation in the region and in the country. The project activity itself will not have any significant negative impacts on humans, plants, animal life and biodiversity. Necessary environmental impacts and results were considered and needed precautions were taken. No environmental impact has been considered significant as a result of the preliminary environmental impact assessment and "EIA Not Required" decision has been issued[56].

Türkerler Alaşehir Geo-Thermal Power Plant Project has a potential to meet these demands and this project aims the use the geo-thermal energy potential as a beneficial way. In the scope of this project, for the national grid connection of the produced energy, necessary negotiations were completed with TEDAŞ and TEİAŞ. The result of these negotiations, connection with Transformer Station is established by 34,5 kV Energy Transmission Line[57].

It is predicted that, in the land preparation and the construction steps approximately 200 employees and in the management step approximately 30 employees will be responsible. During the

[55] http://www.resmigazete.gov.tr/main.aspx?home=http://www.resmigazete.gov.tr/eskiler/2008/07/20080717.htm&main=http://www.resmigazete.gov.tr/eskiler/2008/07/20080717.htm

[56] http://www.resmigazete.gov.tr/main.aspx?home=http://www.resmigazete.gov.tr/eskiler/2008/07/20080717.htm&main=http://www.resmigazete.gov.tr/eskiler/2008/07/20080717.htm

[57] Alaşehir Geothermal Power Plant Project, Project Description File, pg 2

construction part of the project, unqualified employees will be employed from local people as far as possible. In case of management part permanent employees will be hired from the local people also in order to contribute the local economy. The employees which will be work on the construction step will have a place to sleep in the worksite[58].

D.2. Environmental impact assessment

Air quality:	Loading and unloading shall be carried out without hurling and if necessary, it shall be ensured by spraying that soil is kept humid for the purpose of preventing dust emission which would generate during land preparation works.[59] The emission to be generated by the vehicles to be operated in construction Works would be of very low volumes and emissions originating from equipment would not have any adverse effects on the present air quality. In order to minimize the emissions that would arise from the vehicles which would operate at the stage of construction, routine controls shall be commissioned on any vehicles and equipment and such vehicles requiring maintenance would be taken under maintenance and other vehicles would be used in their place until completion of their maintenance.[60] In operating phase, non-condensable gases resulting from the operation will be captured and carried out of the project boundary with pipelines to be used as industrial gas in production. Therefore; project emission will be zero.
Water quality and quantity	Such volumes of waste water which would potentially generate at the stages of construction and operation under the project would be collected at a cesspit to be built impermeably and when the cesspit is full, wastes would be taken out and disposed by means of a cesspit emptier to be obtained from Piyadeler Municipality on payment.[61] Re-injection process was decided by project owner after further thought about discharge methods of geothermal fluid. The re-injection process is the best alternative in terms of environmental and economic issue. In the planned project, the energy production process will be conducted with re-injection. The facility will not operate if the re-injection is put into use.

[58] Alaşehir Geothermal Power Plant Project, Project Description File, pg 6

[59] Alaşehir GPP, Project Description File, page 20

[60] Alaşehir GPP, Project Description File, page 12

[61] Alaşehir GPP, Project Description File, page 7

	The freshwater aquifers will not be damaged during both construction phase and operation phase [62]. The reinjection process will increase the life of the reservoir and prevent the environmental problems. Therefore the pressure drop and heat loss will be prevented. The reinjection process will be conducted in a closed loop and the control systems will be installed against leakage. Hence, there will not be any negative impact into the ground water and underground water.[63]
Soil condition	The Project Area is flatland and only foundation excavation would be carried out in the area where the power plant building would be located. Prior to commencement of Works, vegetal soil would be scraped off on the Project Area and subsequently spread on the suitable parts of land as per applicable technique thereof. It would be stored in an area inside the Project Area in such a manner and to such an extent ensuring that its height would not exceed 2 meters and that there would be oxygen circulation into soil. On rainy days, no operations would be carried out in connection with top soil and soil which is scraped off would not be stored inside any water deposits. Materials which would generate in excavation Works would be collected inside the Project Area throughout excavation and used in landscaping Works following completion of construction works.[64]
Other pollutants	Noise: There would be noise emission originating from such machinery and equipment to be used in the land preparation and construction Works of the project. The Residential Areas nearest to the Project Area is Piyadeler Municipality which is located approximately 100 m east of the Project Area. Therefore, noise which would generate at the stage of construction in the Project Area would not be expected to have any adverse effects on the existing structures. In addition, because land preparation Works would be carried out outdoors under the project, it would be very difficult to take measures against noise. Noise would vary during a day throughout the Works but because Works would be carried out during day time (07.00-19.00), generation of noise emission would thus be limited. 65 In addition, necessary measures shall be taken to

[62] Alaşehir GPP, Project Description File, page 8

[63] Alaşehir GPP, Project Description File, page 18

[64] Alaşehir GPP, Project Description File, page 19

[65] Alaşehir GPP, Project Description File, page 20

	protect workers from risks, especially those related to hearing, which would occur in terms of health and safety due to their exposure to noise. It shall be ensured by providing those working on the machines and equipment at the stage of construction with suitable protective aids and gadgets such as heatgears, earpieces or ear plugs. Thus, the levels of noise that would originate due to such machinery and equipment used in Works would have been reduced to such a level which would not disturb workers and local residents. In addition, the values which are stipulated by the Regulations would also be met and thus, noise to be caused to the surroundings would be kept at a minimum.[66] Solid Waste: The domestic wastes from personnel and non-recyclable waste will be collected separately in closed containers that installed around the plant. The collected waste will be sent to the disposal sites of Piyadeler Municipality periodically. [67] **Waste Oil:** Maintenance of any mechanical equipment to be used during production will be made the closest authorized technical service. However, if there is a necessity about making maintenance in the site, waste management shall be achieved in such a manner and to such an extent ensuring that such waste generation could be minimized pursuant to the Regulation on the Control of Hazardous Wastes as regards Waste Oils and Regulation on the Control of Waste Oils, which took force after it was issued in the Official Gazette Issue No 26952 of 30.07.2008 as regards Waste Oils again and such types of wastes shall be temporarily stored in impermeable tanks and sent to the licensed disposal facilities according to the analysis results in connection therewith. 68 In the operation phase, the isolation oil will be used. The isolation sample will be taken periodically by maintenance crew in order to determine air and gas ratio. The The oil includes more air and gas will be used again after vacuuming. The life of isolation oil is between 25-30 years. The isolation oil completed the lifetime will be handled according to Waste Oil Control Regulation[69]

[66] Alaşehir GPP, Project Description File, page 21

[67] Alaşehir GPP, Project Description File, page 18-19

[68] Alaşehir GPP, Project Description File, page 9

[69] Alaşehir GPP, Project Description File, page 9-10

Biodiversity	Flora&Fauna: There are no such plant species in the activity area and its surroundings, which are endemic, rare and endangered among such taxon's having a higher possibility to exist there due to the habitat characteristics, which must be placed under control as per Annex 1 List of the "Convention on the Protection of Wildlife and Habitats in Europe" (BERN CONVENTION) and which are included in the "Convention on the International Trade of Endangered Species of Wild Animals and Plants (CITES)" [70] The terrestrial fauna species are not such species which would particularly suffer harm and they are not under any threat and considered part of such species causing least concern. In addition, necessary warnings shall be issued by the activity owner to such staff members who would be involved in the Project so that no damages would be inflicted on the fauna species [71].
Quality of employment	Unqualified staff members would be recruited locally to the largest extent possible at the stage of construction under the project and permanent staff members would again be locally recruited at the operation stage and thus, contribution would be made to the local economy though to a low extent. Such staff members who would work at the stage of construction of the project would have accommodation at the job site to be built inside the Project Area.[72]

[70] Alaşehir GPP, Project Description File, page 32

[71] Alaşehir GPP, Project Description File, page 38

[72] Alaşehir GPP, Project Description File, page 6

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The Local Stakeholder Meeting was carried by EN-ÇEV ENERJİ ÇEVRE YATIRIMLARI DANIŞMANLIĞI HARİTACILIK İMAR İNŞAAT A.Ş.

Local Stakeholder Consultation Meeting

According to the Gold Standard requirements, local stakeholders were identified including local people, local and national NGOs, project developers and entities involved in implementation and operation of the project activity. A list of project participants invited for the stakeholder consultation meeting is presented in the stakeholder meeting report. According to the guidelines in the Gold Standard Toolkit, the project proponent EN-ÇEV ENERJİ ÇEVRE YATIRIMLARI DANIŞMANLIĞI HARİTACILIK İMAR İNŞAAT A.Ş. invited local residents, local/national policy makers, and local/national/international NGOs via mail and follow-up calls. An invitation letter was sent out in Turkish phone/mail to the above mentioned stakeholders mentioned above. Furthermore, an invitation letter was published in Turkish in the regional newspaper "HÜR IŞIK" on 13/06/2014. Within the invitation process many local people, local authorities, village headmen and organizations have been invited. But even if we insisted on their attendance, none of the NGO's or authorities attended the meeting. During the Stakeholder Feedback Round, we will be getting in touch with them, organize appointments if possible to get their opinions about the project. As seen from the participation list above and the original copies attached in Appendix 1, 31 local people attended the meeting. We can easily say that the local people's interest and support on the project is far beyond our expectations. The Mayor of Manisa Municipality, Mr. Cengiz Ergün and The Mayor of Alaşehir Municipality, Mr. Gökhan Karaçoban could not attend the LSC meeting. They responded the invitation as a fax and post.

The Local Stakeholder Consultation meeting was organized to the purpose of public briefing about the planned project and raising public awareness about green gas emission and emission reduction of Alaşehir Geothermal Power Plant with 24 MW total installed power on Sub-District of Piyadeler, District of Alaşehir, Province of Manisa obtaining opinions and proposals and creating awareness to accelerate the projects reducing greenhouse gas emissions is realized in 26.06.2014 with the attendance of 25 local residents. In the meeting, it was requested that the workers should be chosen

from local people. In addition to this, local stakeholders think that the project improves the region in terms of social and economic.

The place of meeting was chosen to be the closest place to the project area and all local people are informed about meeting in advance by coffeehouse, municipality announcements and local newspaper announcements. Before presentation, agenda of the meeting was explained and non-technical Project summary was distributed to the participants.

Project presentation and description was made by EN-ÇEV Energy & Environmental Investments Consultancy Co. including information about project developers, the technology and operation of the power plant, estimated emission reduction amount of the plant, the importance of revenue from emission reduction, information about Gold Standard.

Prior to blind sustainable development exercise, questions and comments were taken from participants about further clarification of project. Questions and comments raised by participants were addressed in assessment of comments part.

E.2. Summary of comments received

In the meeting,

-It was observed that the stakeholders supported the project. On the other hand, they expressed their concerns about the project. The concerns;

- Will the separate wells be opened in order to irrigate greenhouses (vegetable glasshouses)? What will be the benefits of these wells?
- Will the waste water from wells and waste materials damage to environment?
  The answers of these concerns;

- The energy import will be reduced with increasing power plant. Hence, the welfare of our country will develop. The geothermal energy source is the most powerful source in renewable energy sources. The villagers have opened the wells insensibly. As a consequence, the quantity of boron has been increasing. State Hydraulic Works is trying to take action to this increase.
- 18 wells have been opened since 2011. The depth of the wells opened by villagers is smaller than geothermal wells. Therefore, the water used by villagers is not affected.

- The system of wells used in greenhouses is not the same as geothermal wells. The opened wells will not be used in greenhouse. The water will give to city heating system.

- The water includes boron. The water can be harmful for vegetables. Therefore, the water must be use after rarefaction with distilled water for irrigation.

The concerns are handled with the answers above.

- It was requested that the workers should be chosen from local people.

- Local stakeholders think that the project improves the region in terms of social and economic.

The mitigation measures and relevant indicators will be explained. Since, the local people will be work for the project, the opinions and comments of them regarding the project will be important and thus has chance to involve other locals to the project by discussions accordingly. However, monitoring parameters are air quality nearby residential areas, Boron level in water streams, rivers and soil, water quality, soil condition, noise generation on the nearest settlement and paid wages to the workers. Therefore, there is no indicator that can be monitored by local people.

E.3. Report on consideration of comments received

Based on the comments from stakeholders, there is no need to make any alterations on the project design. The company will take all the precautions about the concerns of the stakeholders such as excavation due to the project and will try to do its best to provide contributions to the region. The company will give priority to the local labor force and provide in contributions for infrastructure improvements upon the requests of the stakeholders.

F. Approval and authorization

Appendix 1. Original Participants List

MANİSA İLİ, ALAŞEHİR İLÇESİ, PİYADELER BELDESİ, ALAŞEHİR JEOTERMAL ENERJİ SANTRALİ PROJESİ PAYDAŞ TOPLANTISI KATILIM LİSTESİ 26.06.2014

AD-SOYAD	KURUM	ADRES	TEL / FAKS	E-POSTA	İMZA
Bülent Kurkutlu		Çağlayan mlesi	05332756518		
Ahmet Ayhan		Gürsu Mah	0535 3178622		
Ali Özcan		Piyadeler	0539 3269277		
Mustafa Aygün		Gürsu Mah			
Muharrem Akar		Gürsu Mah	05376290725		
CANDAN Mustafa		Piyadeler-Köyü	05355709107		
R. Şerif Şen		piyadeler	0532522194		
İshak Demir		Piyadeler			

MANİSA İLİ, ALAŞEHİR İLÇESİ, PİYADELER BELDESİ, ALAŞEHİR JEOTERMAL ENERJİ SANTRALİ PROJESİ PAYDAŞ TOPLANTISI KATILIM LİSTESİ 26.06.2014

AD-SOYAD	KURUM	ADRES	TEL / FAKS	E-POSTA	İMZA
Zeki KARTA	Çiftçi	Piyadeler	05376543795	—	
Hasan Yavuz	Çiftçi	Piyadeler	05383711346		
Mehmet Bozkurt	Muhtar	piyadeler	0532 7060353		
Halil Güleç	Çiftçi	Piyadeler mh Alaşehir	05324202544		
İbrahim Ertürk		"			
Mustafa Akçay		"			
Ali Başak		"			
Ramazan Bayram	Muhtar	Şahinyan	05386488641		

MANİSA İLİ, ALAŞEHİR İLÇESİ, PİYADELER BELDESİ, ALAŞEHİR JEOTERMAL ENERJİ SANTRALİ PROJESİ PAYDAŞ TOPLANTISI KATILIM LİSTESİ 26.06.2014

AD-SOYAD	KURUM	ADRES	TEL / FAKS	E-POSTA	İMZA
Mahmut Karadağ	Türkerler	Türkerler			
Cemil SEÇKİN	Türkerler	Türkerler			
Süleyman ülküer					
mehmet	Gündü	Türkerler			
Mehmet	Özderler	Piyadeler			

MANİSA İLİ, ALAŞEHİR İLÇESİ, PİYADELER BELDESİ, ALAŞEHİR JEOTERMAL ENERJİ SANTRALİ PROJESİ PAYDAŞ TOPLANTISI KATILIM LİSTESİ 26.06.2014

AD-SOYAD	KURUM	ADRES	TEL / FAKS	E-POSTA	İMZA
Reşit Bilgiç		Piyadeler	0532 5591303		
Necdet Türk	Alaşehir Ziraat odası	Alaşehir	05326738687		
Sami Çetinkaya	Alaşehir Belediyesi	"			

MANİSA İLİ, ALAŞEHİR İLÇESİ, PİYADELER BELDESİ, ALAŞEHİR JEOTERMAL ENERJİ SANTRALİ PROJESİ PAYDAŞ TOPLANTISI KATILIM LİSTESİ 26.06.2014

AD-SOYAD	KURUM	ADRES	TEL / FAKS	E-POSTA	İMZA
İbrahim Candan	Çiftçi	Alaşehir Piyadeler mahallesi	05552081625 Hasan	Hasan Zafer Sokak Uncalı	

Appendix 2. Affirmation regarding public funding

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ANNEX D - OFFICIAL DEVELOPMENT ASSISTANCE DECLARATION

Date: 09.07.2014

The Gold Standard Foundation

79 Avenue Louis Casai

Geneva Cointrin, CH-1216

Switzerland

RE: Declaration of Non-Use of Official Development Assistance (ODA) by Project Owner of GS 3380 – ALAŞEHİR GEOTERMAL POWER PLANT 24 MW

TURKERLER JEOTERMAL ARAMA VE ÜRETİM A.Ş.

As Project Owner of the above-referenced Project, and acting on behalf of all Project Participants, I now make the following representations:

EN-ÇEV ENERJİ ÇEVRE YATIRIMLARI VE DANIŞMANLIĞI HARİTACILIK İMAR İNŞAAT A.Ş.

I hereby declare that I am duly and fully authorized by the Project Owner of the above-referenced project to act on behalf of all Project Participants and make the following representations:

I. The Gold Standard Documentation

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

In the event the Project is a Programmes of Activities where the CME is also implementing one or more Component Project Activities (CPAs) or Voluntary Project Activities (VPAs), I further acknowledge and understand that this Declaration is applicable to all of the CPAs/VPAs where the CME and the CPA/VPA implementing entity is the same.

II. Duty to Notify Upon Discovery

If I learn or if I am given any reason to believe at any stage of project design or implementation that ODA has been used to support the development or implementation of the Project covered by this Declaration, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the carbon credits generated from the Project as a condition of

The Gold Standard®

investment, I will notify The Gold Standard immediately using the Amended ODA Declaration Form provided below.

III. Investigation

The Gold Standard reserves the right to conduct an investigation into any project it reasonably believes may be receiving ODA with the condition that some or all of the carbon credits from the Project will be transferred to the ODA donor country.

IV. Sanctions

I am fully aware that the sanctions identified in The Gold Standard Terms and Conditions may be applied to me or the above-referenced Project in the event that any of the information provided above is false or I fail to notify The Gold Standard of any changes to ODA in a timely manner.

I swear that all of the statements contained herein are true to the best of my knowledge.

Signed: _____

Name: Hulusi KARA

Title: General Manager

On behalf of: _____

Place: _____

Influence. Innovate. Inspire.

The Gold Standard®

AMENDED OFFICIAL DEVELOPMENT ASSISTANCE DECLARATION

Date: 09.07.2014

The Gold Standard Foundation

79 Avenue Louis Casai

Geneva Cointrin, CH-1216

Switzerland

RE: Amended Official Development Assistance Declaration For [insert project GS ID number]

I, [insert full name], on behalf of [insert name of Company], and in reference to [insert project GS ID number], submitted the Official Development Assistance Declaration to The Gold Standard on [insert date]. It has come to my attention that there has been a material change in the role of ODA for the development or implementation of GS-3380

[Please explain the changes here]

[For POAs where the CME is also a CPA/VPA implementing entity, please list all of the CPAs/VPAs that are receiving ODA, and the CPAs/VPAs covered by the original Declaration that are not receiving ODA.]

I understand that The Gold Standard will contact me to discuss the consequences of these changes for this project.

I swear that all of the statements contained herein are true to the best of my knowledge.

Signed: _____

Name: Hulusi KARA

Title: General Manager

On behalf of: _____

Place: _____

Appendix 3. Further background information on ex ante calculation of emission reductions

2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
FC (Unit:Ton/gas 103 m3)					Heat Value (Tcal.)				
7419703,00	10574434,00	12258462,00	12105930,00	14501934,00	39.546	57.567	71.270	68.785	82.874
56689392,00	61507310,00	55742463,00	47120306,00	57696139,00	96.551	107.210	93.587	81.676	97.916
891782	531608	564796	573534	754283	8.569	5.280	5.625	5.837	7.444
20354	15047	176379	129359	119988	209	155	1.884	1.363	1.245
0	0	0	0	0	0	0	0	0	0
13140	0	0	0	0	105	0	0	0	0
21783414	22804587	23090121	22909746	25426014	194.487	202.064	203.766	203.244	227.649

2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
		Heat Value (MJ)					NCV (MJ/kg.)		
165462543448,00	240861457680,00	298194320152,00	287795436425,76	346744816000,00	22,30	28,20	24,33	23,48	23,91
403969363080,00	448564673520,00	391566493392,00	341733388160,00	409680544000,00	7,13	6,37	7,02	6,13	7,10
35853227368,00	22090976080,00	23534012576,00	24423003792,00	31145696000,00	40,20	44,27	41,67	43,24	41,29
876472688,00	648854720,00	7881170680,00	5703745952,00	5209080000,00	43,06	523,77	44,68	32,34	43,41
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
439859736,00	0,00	0,00	0,00	0,00	33,47	0,00	0,00	0,00	0,00
813734674920,00	845436194400,00	852558500448,00	850371628248,00	952483416000,00	37,36	37,39	36,92	36,83	37,46

lower		upper	2010	2011	2012	2013	2014
EF CO2 (kg/TJ)					EG y (MWh)		
92800,00		100000,00	150949827,21	167337105,18	172090143,41	171245566,10	198416095,41
90900,00		115000,00					
75500,00		78800,00					
72600,00		74800,00					
61600,00		65600,00					
69300,00		76300,00					
54300,00		58300,00					

Appendix 4. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Türkerler Jeothermal Enerji Arama Üretim A.Ş.
Street/P.O. Box	Turan Güneş Bulvarı, Galip Erdem Caddesi
Building	No:11
City	Ankara
State/Region	Çankaya
Postcode	06550
Country	TURKEY
Telephone	+90 (312) 492 03 06
Fax	+90 (312) 492 03 67
E-mail	
Website	www.turkerler.com
Contact person	Metin YAZMAN
Title	
Salutation	Mr.
Last name	YAZMAN
Middle name	
First name	Metin
Department	Energy
Mobile	
Direct fax	+ 90 (312) 492 03 67
Direct tel.	+90 (312) 492 03 06
Personal e-mail	Myazman@turkerler.com

Appendix 5. Baseline Information

2012

COMPANY	INSTALLED POWER (MW)	TYPE	ELEC. GENERATION
ACARSOY TERMİK KOM.ÇEV.SANT. (ACARSOY EN.)	50	NATURAL GAS	375,0
AFYON DGKÇ (DEDELİ DOĞALGAZ ELEKTRİK ÜR.)	126,1	NATURAL GAS	945,0
AGE DOĞALGAZ KOM. ÇEV. SANT. (AGE DENİZLİ)	94	NATURAL GAS	1057,0
AGE DOĞALGAZ KOM. ÇEV. SANT. (AGE DENİZLİ)	47	NATURAL GAS	
ALES DOĞALGAZ KOM. ÇEV. SANT. (ALES ELEKT.)	49	NATURAL GAS	370,0
BİLECİK DOĞALGAZ ÇS. (TEKNO DOĞALGAZ ÇEV.)	25,8	NATURAL GAS	190,0
BİLECİK DOĞALGAZ KÇS. (DEDELİ DOĞALGAZ EL.)	19,4	NATURAL GAS	945,0
BİLECİK DOĞALGAZ KÇS. (DEDELİ DOĞALGAZ EL.)	107,03	NATURAL GAS	
BİNATOM ELEKTRİK ÜRETİM A.Ş. (Emet/KÜTAHYA)	2,145	NATURAL GAS	78,0
BİNATOM ELEKTRİK ÜRETİM A.Ş. (Emet/KÜTAHYA)	2,145	NATURAL GAS	
BİNATOM ELEKTRİK ÜRETİM A.Ş. (Emet/KÜTAHYA)	4,044	NATURAL GAS	
BİNATOM ELEKTRİK ÜRETİM A.Ş. (Emet/KÜTAHYA)	2,022	NATURAL GAS	
BİS ENERJİ(Sanayi/ Bursa)	458	NATURAL GAS	3450,0
BOSEN ENERJİ ELEKTRİK ÜRETİM AŞ.(Bursa)	27,96	NATURAL GAS	209,9
ENERJİ-SA (ÇANAKKALE)	0,915	NATURAL GAS	7,3
ENERJİ-SA (KÖSEKÖY)	120	NATURAL GAS	930,0
ENERJİ-SA (MERSİN)	1,465	NATURAL GAS	11,5
ENERJİ-SA (Zeytinli/ADANA)	0,83	NATURAL GAS	5,8
İŞBİRLİĞİ ENERJİ ÜRETİM SAN. VE TİC. A.Ş.	19,46	NATURAL GAS	146,0
NAKSAN ENERJİ ELEKTRİK ÜRETİM A.Ş.	8	NATURAL GAS	60,0
NAKSAN ENERJİ ELEKTRİK ÜRETİM A.Ş.	8	NATURAL GAS	60,0
ODAŞ DOĞALGAZ KÇS (ODAŞ ELEKTRİK ÜRETİM)	54,96	NATURAL GAS	414,1
ODAŞ DOĞALGAZ KÇS (ODAŞ ELEKTRİK ÜRETİM)	18,32	NATURAL GAS	138,0

OFİM ENERJİ SANTRALI (OSTİM FİNANS VE İŞ MER.)	2,05	NATURAL GAS	16,0
PANCAR ELEKTRİK ÜRETİM A.Ş.	17,46	NATURAL GAS	260,0
PANCAR ELEKTRİK ÜRETİM A.Ş.	17,46	NATURAL GAS	
SODA SANAYİ A.Ş. (Mersin)	252,2	NATURAL GAS	1765,0
ŞANLIURFA OSB (RASA ENERJİ ÜRETİM A.Ş.)	11,72	NATURAL GAS	82,1
YENİ UŞAK ENERJİ ELEKTRİK SANTRALI	8,73	NATURAL GAS	71,0
YENİ UŞAK ENERJİ ELEKTRİK SANTRALI	1	NATURAL GAS	
ZORLU ENERJİ (B.Karıştıran)	25,7	NATURAL GAS	192,8
	1582,916	NATURAL GAS	11779,58

AKKÖY II HES (AKKÖY ENERJİ A.Ş.)	114,84	HYDRO	899
AKKÖY II HES (AKKÖY ENERJİ A.Ş.)	114,84	HYDRO	
AKKÖY-ESPİYE HES (KONİ İNŞAAT SAN. A.Ş.)	8,912	HYDRO	40
ALABALIK REG. VE HES SANTRALI I-II (DARBOĞAZ ELK. ÜR. SAN.)	13,84	HYDRO	41
ANAK HES (KOR-EN KORKUTELİ ELEK. ÜRET. SAN.)	3,76	HYDRO	15
ARAKLI-1 REG. VE HES(YÜCEYURT ENERJİ ÜRETİM)	10,203	HYDRO	38,94
ARAKLI-1 REG. VE HES(YÜCEYURT ENERJİ ÜRETİM)	13,067	HYDRO	50
ARCA HES (GÜRSU TEMİZ ENERJİ ÜRETİM A.Ş.)	5,45	HYDRO	65
ARCA HES (GÜRSU TEMİZ ENERJİ ÜRETİM A.Ş.)	10,9	HYDRO	
ARPA REG. VE HES (MCK ELEKTRİK ÜRETİM A.Ş.)	32,412	HYDRO	78
AVCILAR HES (AVCILAR ENERJİ ELEKTRİK ÜRET.)	16,743	HYDRO	49
AYANCIK HES (İLK ELEKTRİK ENERJİ ÜRETİMİ SN.)	15,6	HYDRO	65
AYRANCILAR HES (MURADİYE ELEKTRİK ÜRETİM)	9,359	HYDRO	38,112
BAĞIŞTAŞ II HES (AKDENİZLİ ELEKTRİK ÜRETİM)	32,4	HYDRO	122
BALKUSAN BARAJI VE HES 1 NOLU SANT. (KAREN)	13	HYDRO	40
BALKUSAN BARAJI VE HES 2 NOLU SANT. (KAREN)	25	HYDRO	80
BANGAL REG. VE KUŞLUK HES (KUDRET ENERJİ)	17	HYDRO	56
BEKTEMUR HES (DİZ-EP ELEKTRİK ÜRETİM LTD.)	3,492	HYDRO	20

BOYABAT BARAJI VE HES (BOYABAT ELEKTRİK)	513	HYDRO	1468
BÜYÜKDÜZ HES (AYEN ENERJİ A.Ş.)	68,862	HYDRO	192
CAN 1 HES (HED ELEKTRİK ÜRETİM A.Ş.)	1,844	HYDRO	10
CEYHAN HES (BERKMAN HES) (ENOVA EN ÜRET.)	12,605	HYDRO	50,35
CUNİŞ REG. VE HES (RİNERJİ RİZE ELEKTRİK ÜR.)	2,8	HYDRO	36
CUNİŞ REG. VE HES (RİNERJİ RİZE ELEKTRİK ÜR.)	5,6	HYDRO	
ÇAĞLAYAN HES (ÇAĞLAYAN HES ENERJİ ÜRETİM)	6	HYDRO	21
ÇARŞAMBA HES (ÇARŞAMBA ENERJİ ELEKTRİK)	11,31	HYDRO	63
ÇINAR-1 HES (AYCAN ENERJİ ÜRETİM TİC. VE SN.)	9,26	HYDRO	34
ÇUKURÇAYI HES (AYDEMİR ELEKTRİK ÜRETİM A.Ş.)	1,8	HYDRO	4
DEMİRCİLER HES (PAK ENERJİ ÜRETİMİ SAN.)	3,124	HYDRO	35
DEMİRCİLER HES (PAK ENERJİ ÜRETİMİ SAN.)	5,317	HYDRO	
DOĞANKAYA HES (MAR-EN ENERJİ ÜRET. TİC.)	20,55	HYDRO	98
DUMLU HES (DUMLU ENERJİ ELEKTRİK ÜRETİM)	3,982	HYDRO	9
EGER HES (EGER ELEKTRİK ÜRETİM LTD. ŞTİ.)	1,92	HYDRO	10
ESENDURAK HES (MERAL ELEKTRİK ÜRETİM)	9,33	HYDRO	43
FEKE 1 HES (AKKUR ENERJİ ÜRETİM TİC. VE SAN.)	29,4	HYDRO	117
FEKE 2 BARAJI VE HES (AKKUR ENERJİ ÜRETİM)	69,34	HYDRO	223
FINDIK I HES (ADV ELEKTRİK ÜRETİM LTD. ŞTİ.)	11,25	HYDRO	48
GEMCİLER REG. VE HES (BOZTEPE ENERJİ ÜRET.)	7,98	HYDRO	35
GÖKGEDİK HES (UHUD ENERJİ ÜRETİM TİC.)	20,49	HYDRO	100
GÖKGEDİK HES (UHUD ENERJİ ÜRETİM TİC.)	3,776	HYDRO	
GÜDÜL 2 HES (YAŞAM ENERJİ ELEKTRİK ÜRETİM)	4,88	HYDRO	20
GÜLLÜBAĞ BARAJI VE HES (SENENERJİ ENERJİ)	96	HYDRO	384
GÜNDER REG. VE HES (ARIK ENERJİ ÜRETİM A.Ş.)	28,22	HYDRO	84
GÜNDER REG. VE HES (ARIK ENERJİ ÜRETİM A.Ş.)	0	HYDRO	
HORU REG. VE HES (MARAŞ ENERJİ YATIRIM SN.)	4,24	HYDRO	34
HORU REG. VE HES (MARAŞ ENERJİ YATIRIM SN.)	4,24	HYDRO	

HORYAN HES (HORYAN ENERJİ A.Ş.)	5,68	HYDRO	23
KARTALKAYA HES (SIR ENERJİ ÜRETİM SAN.)	8,001	HYDRO	27
KAYAKÖPRÜ 2 HES (ARSAN ENERJİ A.Ş.)	10,2	HYDRO	36
KIRIKDAĞ HES (ÖZENİR ENERJİ ELEKTRİK ÜRET.)	16,86	HYDRO	71
KOZDERE HES (ADO MADENCİLİK ELEKTRİK ÜR.)	6,12	HYDRO	9,21
KÖKNAR HES (AYCAN ENERJİ ÜRETİM TİC.)	8,024	HYDRO	25
KÜRCE REG. VE HES (DEDEGÖL ENERJİ)	12,046	HYDRO	48
MENGE BARAJI VE HES (ENERJİSA ENERJİ)	44,71	HYDRO	102
MİDİLLİ REG. VE HES (MASAT ENERJİ ELEKTRİK)	20,97	HYDRO	81
MURAT I-II REG. VE HES (MURAT HES ENERJİ EL.)	35,628	HYDRO	189
MURATLI REG. VE HES (ARMAHES ELEKTRİK ÜR.)	11	HYDRO	27,43
MURSAL I HES (PETA MÜHENDİSLİK ENERJİ)	4,18	HYDRO	17
NİKSAR HES (NİKSAR ENERJİ ÜRETİM LTD. ŞTİ.)	20,08	HYDRO	248
NİKSAR HES (NİKSAR ENERJİ ÜRETİM LTD. ŞTİ.)	20,08	HYDRO	
ÖREN REG. VE HES (ÇELİKLER ELEKTRİK ÜRETİM)	19,932	HYDRO	21,73
PAPART HES (ELİTE ELEKTRİK ÜRETİM)	22	HYDRO	106
PAPART HES (ELİTE ELEKTRİK ÜRETİM)	4,6	HYDRO	
POLAT HES (ELESTAŞ ELEKTRİK ÜRETİM A.Ş.)	3,28	HYDRO	28
POLAT HES (ELESTAŞ ELEKTRİK ÜRETİM A.Ş.)	3,28	HYDRO	
SANCAR REG. VE HES (MELİTA ELEKTRİK ÜRETİM)	0,74	HYDRO	3
SARIHIDIR HES (MOLU ENERJİ ÜRETİM A.Ş.)	6	HYDRO	24
SEYRANTEPE HES (SEYRANTEPE ELEKT. ÜRET.)	56,84	HYDRO	207
SIRAKONAKLAR HES (2M ENERJİ ÜRETİM A.Ş.)	18	HYDRO	69
SULUKÖY HES (DU ELEKTRİK ÜRETİM A.Ş.)	6,924	HYDRO	28
ŞİFRİN REG. VE HES (BOMONTİ ELK. MÜH. MÜŞ.)	6,744	HYDRO	18
TELEME REG. VE HES (TAYEN ELEKTRİK ÜRET.)	1,57	HYDRO	11
TELLİ I-II HES (FALANJ ENERJİ ELEKTRİK ÜRET.)	8,72	HYDRO	32
TUĞRA REG. VE HES (VİRA ELEKTRİK ÜRETİM A.Ş.)	4,9	HYDRO	18

TUNA HES (NİSAN ELEKTROMEKANİK ENERJİ)	37,19	HYDRO	92
TUZKÖY HES (BATEN ENERJİ ÜRETİMİ A.Ş.)	8,44	HYDRO	68
TUZLAKÖY-SERGE REG. VE HES (TUYAT ELEKT.)	7,14	HYDRO	21
UMUT I REG. VE HES (NİSAN ELEKTROMEKANİK)	5,8	HYDRO	21
ÜÇKAYA HES (ŞİRİKÇİOĞLU ELEKTRİK ÜRETİM A.Ş.)	1,04	HYDRO	5
VİZARA REG. VE HES (ÖZTÜRK ELEKT. ÜRET. LTD.)	8,578	HYDRO	27
YAĞMUR REG. VE HES (BT BORDO ELK. ÜR.)	8,946	HYDRO	32
YAMANLI III KAPS. GÖKKAYA HES (MEM ENERJİ)	28,54	HYDRO	105
YAMANLI III KAPS. HİMMETLİ HES (MEM ENERJİ)	26,98	HYDRO	100
YAVUZ HES (AREM ENERJİ ÜRETİM A.Ş.)	5,8	HYDRO	14
YEDİSU HES (ÖZALTIN ENERJİ ÜRETİM VE İNŞAAT)	15,14	HYDRO	72
YEDİSU HES (ÖZALTIN ENERJİ ÜRETİM VE İNŞAAT)	7,57	HYDRO	
YILDIRIM HES (BAYBURT ENERJİ ÜRETİM VE TİC.)	7,118	HYDRO	39
YILDIRIM HES (BAYBURT ENERJİ ÜRETİM VE TİC.)	3,559	HYDRO	
YOKUŞLU KALKANDERE HES (SANKO ENERJİ)	5,2	HYDRO	23,40
ZEYTİN BENDİ HES (ZEYTİN ENERJİ ÜRET. SAN.)	5,2	HYDRO	18
ZEYTİN BENDİ HES (ZEYTİN ENERJİ ÜRET. SAN.)	0	HYDRO	0
	1987,288	HYDRO	6922,172

AKSU RES (AKSU TEMİZ ENERJİ ELEKTRİK ÜRETİM)	36	WIND	216
AKSU RES (AKSU TEMİZ ENERJİ ELEKTRİK ÜRETİM)	30	WIND	
AKSU RES (AKSU TEMİZ ENERJİ ELEKTRİK ÜRETİM)	6	WIND	
BALIKESİR RES (BARES ELEKTRİK ÜRETİM A.Ş.)	13,75	WIND	434
BALIKESİR RES (BARES ELEKTRİK ÜRETİM A.Ş.)	16,5	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	24,75	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	16,5	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	19,25	WIND	

BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	22	WIND	
BANDIRMA RES (YAPISAN ELEKTRİK ÜRETİM A.Ş.)	5	WIND	20
BOZYAKA RES (KARDEMİR HADDECİLİK VE ELEKT.)	12	WIND	38
DAĞPAZARI RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	36	WIND	120
DAĞPAZARI RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	3	WIND	
DİNAR RES (OLGU ENERJİ YATIRIM ÜRETİM)	16,1	WIND	60
GÜNAYDIN RES (MANRES ELEKTRİK ÜRETİM A.Ş.)	10	WIND	40
İNNORES ELEKTRİK YUNTDAĞ RÜZGAR (Aliağa-İZMİR)	5	WIND	20,26
KARADAĞ RES (GARET ENERJİ ÜRETİM)	10	WIND	34
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	7,5	WIND	129
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	25	WIND	
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	6,5	WIND	
KOZBEYLİ RES (DOĞAL ENERJİ ELEKTRİK ÜRETİM)	20	WIND	70
METRİSTEPE RES (CAN ENERJİ ENTEGRE ELEKT.)	27,5	WIND	85
METRİSTEPE RES (CAN ENERJİ ENTEGRE ELEKT.)	11,5	WIND	
POYRAZ RES (POYRAZ ENERJİ ELEKTRİK ÜRETİM)	14	WIND	156,4
POYRAZ RES (POYRAZ ENERJİ ELEKTRİK ÜRETİM)	20	WIND	
SAMURLU RES (DOĞAL ENERJİ ELEKTRİK ÜRET.)	12	WIND	70
SAMURLU RES (DOĞAL ENERJİ ELEKTRİK ÜRET.)	10	WIND	
SOMA RES (SOMA ENERJİ ELEKTRİK ÜRETİM A.Ş.)	24	WIND	82,27
SÖKE-ÇATALBÜK RES (ABK ENERJİ ELEKTRİK)	18	WIND	110
SÖKE-ÇATALBÜK RES (ABK ENERJİ ELEKTRİK)	12	WIND	
ŞENKÖY RES (EOLOS RÜZGAR ENERJİSİ ÜRETİM)	26	WIND	87
	515,85	**WIND**	**1771,93**

AREL ENERJİ BİYOKÜTLE TESİSİ (AREL ÇEVRE)	1,2	WASTE	18
AREL ENERJİ BİYOKÜTLE TESİSİ (AREL ÇEVRE)	1,2	WASTE	
BEREKET ENERJİ ÜRETİM A.Ş. (BİOGAZ)	0,635	WASTE	5
EKİM BİYOGAZ (EKİM GRUP ELEKTRİK ÜRETİM)	1,2	WASTE	10
ITC ADANA ENERJİ ÜRETİM (ADANA BİOKÜTLE SNT)	4,245	WASTE	31,83
ITC BURSA ENERJİ ÜRETİM SAN. VE TİC. A.Ş.	7	WASTE	80
ITC BURSA ENERJİ ÜRETİM SAN. VE TİC. A.Ş.	1,4	WASTE	
ITC BURSA ENERJİ ÜRETİM SAN. VE TİC. A.Ş.	1,4	WASTE	
İZAYDAŞ (İZMİT ÇÖP)(Köseköy)	0,33	WASTE	2,2
KAYSERİ KATI ATIK DEPONİ SAHASI (HER ENERJİ)	1,305	WASTE	9,9
KOCAELİ ÇÖP BİYOGAZ (LFG) (KÖRFEZ ENERJİ)	1,2	WASTE	18
KOCAELİ ÇÖP BİYOGAZ (LFG) (KÖRFEZ ENERJİ)	1,063	WASTE	
ORTADOĞU ENERJİ (KÖMÜRCÜODA) (Şile/İSTANBUL)	2,83	WASTE	22,04
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İSTANBUL)	4,092	WASTE	31,805
SAMSUN AVDAN KATI ATIK (SAMSUN AVDAN EN.)	2,4	WASTE	18
SEZER BİO ENERJİ (KALEMİRLER ENERJİ ELEKTR.)	0,5	WASTE	4
	32	WASTE	250,775
	64	WASTE	501,55

DENİZ JEOTERMAL (MAREN MARAŞ ELEKTRİK)	24	GEOTHERMAL	191
SİNEM JEOTERMAL (MAREN MARAŞ ELEKTRİK)	24	GEOTHERMAL	191
	48	GEOTHERMAL	382

AKSA AKRİLİK KİMYA SAN. A.Ş. (İTHAL KÖM.+D.G)	75	COAL	525
EREN ENERJİ ELEKTRİK ÜRETİM A.Ş.	30	COAL	195,97
	105	COAL	720,97

2011

COMPANY	INSTALLED POWER (MW)	TYPE	ELEC. GENERATION
ADİLCEVAZ (MOSTAR ENERJİ ELEKTRİK)	0,394	HYDROLIC	0,8
AHLAT (MOSTAR ENERJİ ELEKTRİK)	0,201	HYDROLIC	0,6
AKSU REG. VE HES (KALEN ENERJİ)	5,2	HYDROLIC	16
ALKUMRU BARAJI VE HES (LİMAK HİD.)	174,18		828
ALKUMRU BARAJI VE HES (LİMAK HİD.)	87,09	HYDROLIC	
AYRANCILAR HES (MURADİYE ELEKTRİK)	18,718	HYDROLIC	128
AYRANCILAR HES (MURADİYE ELEKTRİK)	13,377		
AYVACIK RES (AYRES AYVACIK RÜZG.)	5	HYDROLIC	17
BALKONDU I HES (BTA ELEKTRİK ENERJİ)	9,191	HYDROLIC	33
BAYBURT (BOYDAK ENERJİ)	0,396	HYDROLIC	7,9
BAYRAMHACILI BARAJI VE HES	47	HYDROLIC	175
BERDAN	10,2	HYDROLIC	47,2
BESNİ KAYSERİ VE CİVARI ENERJİ)	0,272	HYDROLIC	0,5
BOĞUNTU HES (BEYOBASI ENERJİ)	3,801	HYDROLIC	17
BÜNYAN (KAYSERİ VE CİVARI EL. T.A.Ş)	1,156	HYDROLIC	3,4
CEVHER I-II REG. VE HES (ÖZCEVHER EN.)	16,36	HYDROLIC	65
ÇAĞ-ÇAĞ (NAS ENERJİ A.Ş.)	14,4	HYDROLIC	25
ÇAKIRMAN REG. VE HES (YUSAKA EN.)	6,98	HYDROLIC	22
ÇAMARDI (KAYSERİ VE CİVARI EL. T.A.Ş)	0,069	HYDROLIC	0,2
ÇAMLICA III HES (ÇAMLICA ELEKTRİK)	27,618	HYDROLIC	43
ÇAMLIKAYA REG.VE HES (ÇAMLIKAYA EN)	2,824	HYDROLIC	6,31
ÇANAKÇI HES (CAN ENERJİ ENTEGRE)	4,633	HYDROLIC	39

ÇANAKÇI HES (CAN ENERJİ ENTEGRE)	4,633		
ÇEMİŞKEZEK (BOYDAK ENERJİ)	0,116	HYDROLIC	0,8
ŞELALE HES (MURADİYE ELEKTRİK ÜR.)	13,377	HYDROLIC	56,57
	467,186	**HYDROLIC**	**1532,28**

AKIM ENERJİ BAŞPINAR (SÜPER FİLM)	25,32	NATURAL GAS	177,00
AKSA AKRİLİK (İTHAL KÖM.+D.G)	25	NATURAL GAS	175,00
AKSA ENERJİ (Antalya)	300	NATURAL GAS	3600,00
AKSA ENERJİ (Antalya) (İlave)	300		
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	130,95	NATURAL GAS	1054,00
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	8,73		
BOSEN ENERJİ ELEKTRİK ÜRETİM AŞ.	93	NATURAL GAS	698,09
CENGİZ ÇİFT YAKITLI K.Ç.E.S.	131,335	NATURAL GAS	985,00
CENGİZ ENERJİ SAN.VE TİC.A.Ş.	35	NATURAL GAS	281,30
GLOBAL ENERJİ (PELİTLİK)	4	NATURAL GAS	29,90
GOREN-1 (GAZİANTEP ORGANİZE SAN.)	48,65	NATURAL GAS	277,00
HAMİTABAT (Lisans Tadili)	36	NATURAL GAS	237,90
HG ENERJİ ELEKTRİK ÜRET. SAN.TİC. A.Ş.	52,38	NATURAL GAS	366,00
NUH ENERJİ EL. ÜRT.A.Ş. (ENERJİ SANT.-2)	119,98	NATURAL GAS	900,00
ODAŞ DOĞALGAZ KÇS (ODAŞ ELEKTRİK)	54,96	NATURAL GAS	415,00
SAMSUN TEKKEKÖY EN. SAN. (AKSA EN.)	131,335	NATURAL GAS	980,00
ŞANLIURFA OSB (RASA ENERJİ ÜR. A.Ş.)	116,76	NATURAL GAS	800,00
TİRENDA TİRE ENERJİ ÜRETİM A.Ş.	58,38	NATURAL GAS	410,00
YENİ UŞAK ENERJİ ELEKTRİK SANTRALI	8,73	NATURAL GAS	65,00
ZORLU ENERJİ (B.Karıştıran)	7,2	NATURAL GAS	54,07
	1687,71	**NATURAL GAS**	**11505,26**

AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	20	WIND	165,00
AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	20		
AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	3,75		
BAKİ ELEKTRİK ŞAMLI RÜZGAR (İlave)	24	WIND	92,60
BANDIRMA ENERJİ (BANDIRMA RES)	3	WIND	10,97
ÇANAKKALE RES (ENERJİ-SA ENERJİ)	25,3	WIND	92,00
ÇANAKKALE RES (ENERJİ-SA ENERJİ)	4,6		
ÇATALTEPE RES (ALİZE ENERJİ ELEKTRİK)	16	WIND	52,00
İNNORES ELEKTRİK YUNTDAĞ RÜZGAR	10	WIND	40,57
KİLLİK RES (PEM ENERJİ A.Ş.)	20	WIND	86,00
KİLLİK RES (PEM ENERJİ A.Ş.) (İlave)	15		
KİLLİK RES (PEM ENERJİ A.Ş.) (İlave)	5		
	166,65	**WIND**	**539,14**

AYDIN/GERMENCİK JEOTERMAL	20	**GEOTHERMAL**	**150**

BOLU BELEDİYESİ ÇÖP TOP. TES. BİYOGAZ	1,131	WASTE	7,50
CEV ENERJİ ÜRETİM(GAZİANTEP ÇÖP BİOGAZ)	4,524	WASTE	29,40
ITC ADANA ENERJİ ÜRETİM (İlave)	1,415	WASTE	10,40
ITC-KA EN. (ASLIM BİYOKÜTLE) KONYA	4,245	WASTE	44,50
ITC-KA EN. (ASLIM BİYOKÜTLE) KONYA	1,415		
ITC-KA ENERJİ MAMAK KATI ATIK TOP.	2,826	WASTE	18,91
ITC-KA ENERJİ (SİNCAN) (İlave)	1,416	WASTE	44,50
KAYSERİ KATI ATIK DEPONİ SAHASI	1,56	WASTE	12,00
	18,532	**WASTE**	**167,21**

BATMAN	0,475	FUEL-OIL	3,30
KARKEY (SİLOPİ 1)	100,44	FUEL-OIL	701,15
MARDİN-KIZILTEPE (AKSA ENERJİ)	32,1	FUEL-OIL	225,00
MOSB Enerji Elektrik Üretim Ltd. Şti.(İlave)	43,5	FUEL-OIL	360,50
	176,515	**FUEL-OIL**	**1289,95**

BEKİRLİ TES (İÇDAŞ ELEKTRİK EN.)	600	**IMPORTED COAL**	**4320,00**

2010

COMPANY	**INSTALLED POWER (MW)**	**TYPE**	**ELEC. GENERATION**
AKSA ENERJİ (ANTALYA)	25	NATURAL GAS	385
AKSA ENERJİ (ANTALYA)	25	NATURAL GAS	
ALİAĞA ÇAKMAKTEPE ENERJİ (İlave)	69,84	NATURAL GAS	557,92
ALTEK ALARKO ELEKTRİK SANTRALLARI	60,1	NATURAL GAS	567
ALTEK ALARKO ELEKTRİK SANTRALLARI	21,89	NATURAL GAS	
ATAER ENERJİ ELEKTRİK ÜRETİM A.Ş.	49	NATURAL GAS	277,88
BİNATOM ELEKTRİK ÜRETİM A.Ş.	2	NATURAL GAS	13
CAN ENERJİ ELEKTRİK ÜR. A.Ş.(Tekirdağ)	29,1	NATURAL GAS	203
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101,95	NATURAL GAS	1604
CENGİZ ENERJİ SAN. VE TİC. A.Ş. (Tekkeköy)	101,95	NATURAL GAS	
ENERJİ-SA (BANDIRMA)	1.000,00	NATURAL GAS	7540
GLOBAL ENERJİ (PELİTLİK)	3,544	NATURAL GAS	27,06
RASA ENERJİ (VAN)	26,19	NATURAL GAS	231
RASA ENERJİ (VAN) (İlave)	10,124	NATURAL GAS	
SÖNMEZ ENERJİ ÜRETİM (UŞAK)	33,242	NATURAL GAS	276,06
SÖNMEZ ENERJİ ÜRETİM (UŞAK) (İlave)	2,564	NATURAL GAS	
UĞUR ENERJİ ÜR. TİC.VE SAN. A.Ş. (İlave)	12	NATURAL GAS	506

UĞUR ENERJİ ÜRETİM TİC. VE SAN. A.Ş.	48,2	NATURAL GAS	
	1621,694	**NATURAL GAS**	**12187,92**

ALAKIR HES (YURT ENERJİ ÜRETİM)	2,06	HYDROLIC	6,00
AKIM ENERJİ (CEVİZLİK REG. VE HES)	91,4	HYDROLIC	330,00
ASA ENERJİ (KALE REG.ve HES)	9,57	HYDROLIC	32,00
BAYBURT HES (BAYBURT ENERJİ ÜRET.)	14,631	HYDROLIC	51,00
BEYTEK EL. ÜR. A.Ş. (ÇATALOLUK HES)	9,54	HYDROLIC	31,00
BİRİM HİDR. ÜRETİM AŞ. (ERFELEK HES)	3,225	HYDROLIC	19,00
BİRİM HİDR. ÜRETİM AŞ. (ERFELEK HES)	3,225	HYDROLIC	
BULAM REG. VE HES (MEM ENERJİ ELK.)	7,03	HYDROLIC	33,00
BURÇ BENDİ VE HES (AKKUR ENERJİ)	27,33	HYDROLIC	113,00
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	12,605	HYDROLIC	201,00
CEYHAN HES (BERKMAN HES)(ENOVA EN.)	12,605	HYDROLIC	
CEYHAN HES (OŞKAN HES) (ENOVA EN.)	23,889	HYDROLIC	
CİNDERE HES (İlave)	9,065	HYDROLIC	28,28
ÇAKIT HES (ÇAKIT ENERJİ A.Ş.)	20,18	HYDROLIC	96,00
ÇAMLIKAYA REG. VE HES	5,648	HYDROLIC	19,00
DAMLAPINAR HES (CENAY ELEKTRİK ÜR.)	16,424	HYDROLIC	92,00
DİM HES (DİLER ELEKTRİK ÜRETİM)	38,25	HYDROLIC	123,00
DİNAR HES (ELDA ELEKTRİK ÜRETİM)	4,44	HYDROLIC	15,00
DOĞUBAY ELEKTRİK (SARIMEHMET HES)	3,1	HYDROLIC	10,00
EGEMEN 1 HES (ENERSİS ELEKTRİK)	8,82	HYDROLIC	72,00
EGEMEN 1B HES (ENERSİS ELEKTRİK)	11,1	HYDROLIC	
ERENKÖY REG. VE HES (TÜRKERLER)	21,456	HYDROLIC	87,00
ERENLER REG. ve HES (BME BİR.MÜT.EN.)	45	HYDROLIC	85,00

ERİKLİ-AKOCAK REG. ve AKOCAK HES	41,25	HYDROLIC	257,00
ERİKLİ-AKOCAK REG. ve AKOCAK HES	41,25	HYDROLIC	257,00
FEKE 2 BARAJI VE HES (AKKUR ENERJİ)	69,34	HYDROLIC	223,00
FIRTINA ELEKTRİK ÜR. A.Ş. (SÜMER HES)	21,6	HYDROLIC	70,00
GÖK REG. ve HES (GÖK ENERJİ EL. SAN.)	10,008	HYDROLIC	43,00
GÜDÜL I REG. VE HES (YAŞAM ENERJİ)	2,36	HYDROLIC	14,00
GÜZELÇAY-I HES (İLK ELEKTRİK ENERJİ)	3,14	HYDROLIC	43,00
GÜZELÇAY-II HES (İLK ELEKTRİK ENERJİ)	4,96	HYDROLIC	
HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1,2	HYDROLIC	5,00
KAHRAMAN REG. VE HES (KATIRCIOĞLU)	1,42	HYDROLIC	6,00
KAHTA I HES (ERDEMYILDIZ ELEK. ÜRT.)	7,12	HYDROLIC	35,00
KALE REG. VE HES (KALE ENERJİ ÜR.)	34,14	HYDROLIC	116,00
KALKANDERE REG. VE YOKUŞLU HES	14,54	HYDROLIC	63,00
KARADENİZ EL. (UZUNDERE-1 HES)(İlave)	31,076	HYDROLIC	165,00
KARADENİZ EL.ÜRET. (UZUNDERE-1 HES)	31,076	HYDROLIC	
KAR-EN KARADENİZ EL.A.Ş. ARALIK HES	12,41	HYDROLIC	56,00
KARŞIYAKA HES (AKUA ENERJİ ÜRET.)	1,592	HYDROLIC	8,00
KAYABÜKÜ REG. VE HES (ELİTE ELEKT.)	14,58	HYDROLIC	49,00
KİRPİLİK REG. VE HES (ÖZGÜR ELEKTRİK)	6,24	HYDROLIC	22,00
KOZAN HES (SER-ER ENERJİ)	4	HYDROLIC	9,00
KULP IV HES (YILDIZLAR EN.ELK.ÜR.AŞ.)	12,298	HYDROLIC	41,00
MURGUL BAKIR (Ç.Kaya) (İlave)	19,602	HYDROLIC	40,50
NARİNKALE REG. VE HES (EBD ENERJİ)	3,1	HYDROLIC	10,00
NİSAN E.MEKANİK EN. (BAŞAK REG. HES)	6,85	HYDROLIC	22,00
NURYOL ENERJİ (DEFNE REG. VE HES)	7,23	HYDROLIC	22,00
ÖZGÜR ELEKTRİK (AZMAK I REG.VE HES)	5,913	HYDROLIC	43,00
ÖZGÜR ELEKTRİK (AZMAK I REG.VE HES)	5,913	HYDROLIC	
PAŞA REG. VE HES (ÖZGÜR ELEKTRİK)	8,68	HYDROLIC	34,00

PETA MÜHENDİSLİK EN. (MURSAL II HES)	4,5	HYDROLIC	19,00
REŞADİYE 1 HES (TURKON MNG ELEKT.)	15,68	HYDROLIC	126,00
REŞADİYE 2 HES (TURKON MNG ELEKT.)	26,14	HYDROLIC	210,00
SABUNSUYU II HES (ANG ENERJİ ELK.)	7,35	HYDROLIC	21,00
SELEN ELEKTRİK (KEPEZKAYA HES)	28	HYDROLIC	124,00
SELİMOĞLU REG. VE HES	8,8	HYDROLIC	35
TEKTUĞ ELEKTRİK (ANDIRIN HES)	40,5	HYDROLIC	106,00
ULUABAT KUVVET TÜNELİ VE HES	48,51	HYDROLIC	372,00
ULUABAT KUVVET TÜNELİ VE HES (İlave)	48,51	HYDROLIC	372,00
UMUT III REG. VE HES (NİSAN ELEKTR.)	12	HYDROLIC	26,00
UZUNÇAYIR HES (Tunceli) (İlave)	27,33	HYDROLIC	216,64
UZUNÇAYIR HES (Tunceli) (İlave)	27,33	HYDROLIC	216,64
YAVUZ REG. VE HES (MASAT ENERJİ)	22,5	HYDROLIC	83,00
YEDİGÖZE HES (YEDİGÖZE ELEKTRİK)	155,33	HYDROLIC	474,00
	1295,961	HYDROLIC	5498,06

ALİZE ENERJİ (KELTEPE RES)	1,8	WIND	6,35
AKDENİZ ELEKTRİK (MERSİN RES)	33	WIND	100,00
ASMAKİNSAN (BANDIRMA 3 RES)	20	WIND	85,00
ASMAKİNSAN (BANDIRMA 3 RES)	4	WIND	
BAKRAS EN. ELKT.ÜR. A.Ş. ŞENBÜK RES	15	WIND	47,00
BELEN ELEKTRİK (BELEN RES) (İlave)	6	WIND	19,00
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	52,5	WIND	355,00
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	37,5	WIND	
BORASKO ENERJİ (BANDIRMA RES)	12	WIND	47,78
BOREAS ENERJİ (BOREAS I ENEZ RES)	15	WIND	49,00
DENİZ ELEKTRİK (SEBENOBA RES)	10	WIND	36,66
KUYUCAK RES (ALİZE ENERJİ ÜR.) (İlave)	17,6	WIND	110,00

KUYUCAK RES (ALİZE ENERJİ ÜRET.)	8	WIND	
MAZI-3 RES ELEKTRİK (MAZI-3 RES)	7,5	WIND	26,25
ROTOR ELEKTRİK (GÖKÇEDAĞ RES)	20	WIND	84,97
ROTOR ELEKTRİK (GÖKÇEDAĞ RES) (İlave)	2,5	WIND	84,97
ROTOR ELEKTRİK (OSMANİYE RES)	20	WIND	207,70
ROTOR ELEKTRİK (OSMANİYE RES)	17,5	WIND	
ROTOR ELEKTRİK (OSMANİYE RES)	17,5	WIND	
SARES RES (GARET ENERJİ ÜRETİM)	15	WIND	60,00
SOMA ENERJİ ÜRETİM (SOMA RES)	4,5	WIND	114,00
SOMA ENERJİ ÜRETİM (SOMA RES)	7,2	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES)	7,2	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES)	6,3	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	9	WIND	
SOMA RES (BİLGİN RÜZGAR SAN) (İlave)	27,5	WIND	307,00
SOMA RES (BİLGİN RÜZGAR SAN. EN.ÜR.)	32,5	WIND	
SOMA RES (BİLGİN RÜZGAR SAN.)(İlave)	30	WIND	
TURGUTTEPE RES (SABAŞ ELEKTRİK ÜR.)	22	WIND	64,00
ÜTOPYA ELEKTRİK (DÜZOVA RES) (İlave)	15	WIND	46,00
ZİYARET RES (ZİYARET RES ELEK.)(İlave)	22,5	WIND	140,00
ZİYARET RES (ZİYARET RES ELEKTRİK)	12,5	WIND	
	528,6	WIND	1990,677

MENDERES GEOTERMAL DORA-2	9,5	GEOTHERMAL	73
TUZLA JEOTERMAL	7,5	GEOTHERMAL	55
	17	**GEOTHERMAL**	**128**

ITC-KA ENERJİ (SİNCAN)	1,416	WASTE	11,12
ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	4,245	WASTE	33,35
ITC ADANA BİOKÜTLE SANT.	11,32	WASTE	80
	16,981	WASTE	**124,47**

EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600	**IMPORTED COAL**	
EREN ENERJİ ELEKTRİK ÜR. A.Ş. (İlave)	600	**IMPORTED COAL**	**9080**
EREN ENERJİ ELEKTRİK ÜRETİM A.Ş.	160	**IMPORTED COAL**	
	1360	imported coal	

Registered As CDM Activities

2012

BALIKESİR RES (BARES ELEKTRİK ÜRETİM A.Ş.)	13,75	WIND	434
BALIKESİR RES (BARES ELEKTRİK ÜRETİM A.Ş.)	16,5	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	24,75	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	16,5	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	19,25	WIND	
BALIKESİR RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	22	WIND	

DAĞPAZARI RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	36	WIND	120
DAĞPAZARI RES (ENERJİSA ENERJİ ÜRETİM A.Ş.)	3	WIND	
GÜNAYDIN RES (MANRES ELEKTRİK ÜRETİM A.Ş.)	10	WIND	40
İNNORES ELEKTRİK YUNTDAĞ RÜZGAR (Aliağa-İZMİR)	5	WIND	20,26
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	7,5	WIND	129
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	25	WIND	
KAYADÜZÜ RES (BAKTEPE ENERJİ A.Ş.)	6,5	WIND	
METRİSTEPE RES (CAN ENERJİ ENTEGRE ELEKT.)	27,5	WIND	85
METRİSTEPE RES (CAN ENERJİ ENTEGRE ELEKT.)	11,5	WIND	
SOMA RES (SOMA ENERJİ ELEKTRİK ÜRETİM A.Ş.)	24	WIND	82,27
SÖKE-ÇATALBÜK RES (ABK ENERJİ ELEKTRİK)	18	WIND	110
SÖKE-ÇATALBÜK RES (ABK ENERJİ ELEKTRİK)	12	WIND	
	298,75	**WIND**	**1020,53**

ITC ADANA ENERJİ ÜRETİM (ADANA BİOKÜTLE SNT)	4,245	WASTE	31,83

KOCAELİ ÇÖP BİYOGAZ (LFG) (KÖRFEZ ENERJİ)	1,2	WASTE	18
KOCAELİ ÇÖP BİYOGAZ (LFG) (KÖRFEZ ENERJİ)	1,063	WASTE	
SAMSUN AVDAN KATI ATIK (SAMSUN AVDAN EN.)	2,4	WASTE	18
	8,908	**WASTE**	**67,83**

	Total	**1088,36**	

2011

ŞELALE HES (MURADİYE ELEKTRİK ÜR.)	**13,377**	**HYDROLIC**	**56,57**

AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	20	WIND	165,00
AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	20		
AKRES (AKHİSAR RÜZGAR EN. ELEKT.)	3,75		
BAKİ ELEKTRİK ŞAMLI RÜZGAR (İlave)	24	WIND	92,60
BANDIRMA ENERJİ (BANDIRMA RES)	3	WIND	10,97

ÇANAKKALE RES (ENERJİ-SA ENERJİ)	25,3	WIND	92,00
ÇANAKKALE RES (ENERJİ-SA ENERJİ)	4,6		
ÇATALTEPE RES (ALİZE ENERJİ ELEKTRİK)	16	WIND	52,00
İNNORES ELEKTRİK YUNTDAĞ RÜZGAR	10	WIND	40,57
KİLLİK RES (PEM ENERJİ A.Ş.)	20	WIND	86,00
KİLLİK RES (PEM ENERJİ A.Ş.) (İlave)	15		
KİLLİK RES (PEM ENERJİ A.Ş.) (İlave)	5		
	166,65	**WIND**	**539,14**
BOLU BELEDİYESİ ÇÖP TOP. TES. BİYOGAZ	1,131	WASTE	7,50
CEV ENERJİ ÜRETİM(GAZİANTEP ÇÖP BİOGAZ)	4,524	WASTE	29,40
ITC ADANA ENERJİ ÜRETİM (İlave)	1,415	WASTE	10,40
	7,07	**WASTE**	**47,3**
	Total	**643,01**	

2010

AKIM ENERJİ (CEVİZLİK REG. VE HES)	91,4	HYDROLIC	330,00
BEYTEK EL. ÜR. A.Ş. (ÇATALOLUK HES)	9,54	HYDROLIC	31,00
ÇAKIT HES (ÇAKIT ENERJİ A.Ş.)	20,18	HYDROLIC	96,00
KALKANDERE REG. VE YOKUŞLU HES	14,54	HYDROLIC	63,00
KAR-EN KARADENİZ EL.A.Ş. ARALIK HES	12,41	HYDROLIC	56,00
REŞADİYE 1 HES (TURKON MNG ELEKT.)	15,68	HYDROLIC	126,00
SELEN ELEKTRİK (KEPEZKAYA HES)	28	HYDROLIC	124,00
SELİMOĞLU REG. VE HES	8,8	HYDROLIC	35
ULUABAT KUVVET TÜNELİ VE HES	48,51	HYDROLIC	372,00
ULUABAT KUVVET TÜNELİ VE HES (İlave)	48,51	HYDROLIC	372,00
	297,57	**HYDROLIC**	**1605**

AKDENİZ ELEKTRİK (MERSİN RES)	33	WIND	100,00
BAKRAS EN. ELKT.ÜR. A.Ş. ŞENBÜK RES	15	WIND	47,00
BELEN ELEKTRİK (BELEN RES) (İlave)	6	WIND	19,00
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	52,5	WIND	355,00
BERGAMA RES EN. ÜR. A.Ş. ALİAĞA RES	37,5	WIND	
BOREAS ENERJİ (BOREAS I ENEZ RES)	15	WIND	49,00
KUYUCAK RES (ALİZE ENERJİ ÜR.) (İlave)	17,6	WIND	110,00
KUYUCAK RES (ALİZE ENERJİ ÜRET.)	8	WIND	
MAZI-3 RES ELEKTRİK (MAZI-3 RES)	7,5	WIND	26,25
ROTOR ELEKTRİK (OSMANİYE RES)	20	WIND	207,70
ROTOR ELEKTRİK (OSMANİYE RES)	17,5	WIND	
ROTOR ELEKTRİK (OSMANİYE RES)	17,5	WIND	
SARES RES (GARET ENERJİ ÜRETİM)	15	WIND	60,00
SOMA ENERJİ ÜRETİM (SOMA RES)	4,5	WIND	114,00

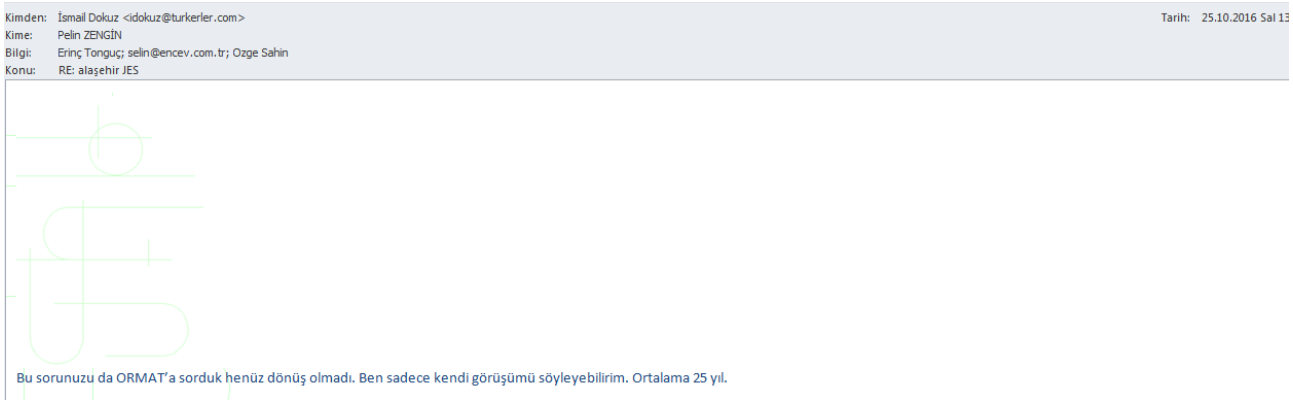
SOMA ENERJİ ÜRETİM (SOMA RES)	7,2	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES)	7,2	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES)	6,3	WIND	
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	9	WIND	
SOMA RES (BİLGİN RÜZGAR SAN) (İlave)	27,5	WIND	307,00
SOMA RES (BİLGİN RÜZGAR SAN. EN.ÜR.)	32,5	WIND	
SOMA RES (BİLGİN RÜZGAR SAN.)(İlave)	30	WIND	
TURGUTTEPE RES (SABAŞ ELEKTRİK ÜR.)	22	WIND	64,00
ZİYARET RES (ZİYARET RES ELEK.)(İlave)	22,5	WIND	140,00
ZİYARET RES (ZİYARET RES ELEKTRİK)	12,5	WIND	
	443,3	**WIND**	**1598,95**
MENDERES GEOTERMAL DORA-2	9,5	GEOTHERMAL	73
TUZLA JEOTERMAL	7,5	GEOTHERMAL	55
	17	**GEOTHERMAL**	**128**
ITC ADANA BİOKÜTLE SANT.	**11,32**	**WASTE**	**80**
	Total	**3411,95**	

Annex 6. Emails from the owner company

Kimden: İsmail Dokuz <idokuz@turkerler.com> Tarih: 25.10.2016 Sal 1
Kime: Pelin ZENGİN
Bilgi: Erinç Tonguç; selin@encev.com.tr; Ozge Sahin
Konu: RE: alaşehir JES

Pelin Hanım ek olarak belki faydası olur diye;

Bizde tek jeneratöre akuple iki türbin bulunmaktadır. Bu türbinler Level 1 ve Level2 olarak adlandırılır. L1 şaft Gücü:13,4 MW, L2 şaft gücü:11 MW tır. Her iki türbinin Gross Gücü:23,6 MW tır.



Kimden: İsmail Dokuz <idokuz@turkerler.com> Tarih: 25.10.2016 Sal 13
Kime: Pelin ZENGİN
Bilgi: Erinç Tonguç; selin@encev.com.tr; Ozge Sahin
Konu: RE: alaşehir JES

Bu sorunuzu da ORMAT'a sorduk henüz dönüş olmadı. Ben sadece kendi görüşümü söyleyebilirim. Ortalama 25 yıl.

Annex 7. Power Plant Diagram