**PROJECT DESIGN DOCUMENT FORM
FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	CEMEL HYDRO BUNDLE
Version number of the PDD	08
Completion date of the PDD	11/03/2014
Project participant(s)	Zeynep Enerji Üretim San. Ve Tic. A.Ş. (Project Owner) Global Tan energy Ltd(Project Developer)
Host Party(ies)	Turkey
Sectoral scope and selected methodology(ies)	Sectoral scope 1: Energy Industries (Renewable-/non-renewable sources) Methodology: ACM0002 "Consolidated baseline methodology for grid connected electricity generation from renewable sources"
Estimated amount of annual average GHG emission reductions	~~38,107~~40,006

SECTION A. Description of project activity
A.1. Purpose and general description of project activity

The Cemel HEPP project is a bundled a run-of-river type project located on Kızılırmak River, within the boundaries of Avanos district of Nevşehir province.

The project is licensed in 14/12/2006[1]and in 09/02/2011 all the legal rights of the project is given to Zeynep Enerji Üretim Sanayi A.Ş. for 44 years 11 months. The project consists of three cascade projects, each having its own turbines and generators which are used to transform the potential energy of water to mechanical energy at a first stage and later into electrical energy. This bundled project is composed of 6.567 MWe Cemel I HEPP, 7.055 MWe Cemel II HEPP and Cemel III HEPP [2] on the mid-section of Kızılırmak River basin. Because the purchase agreement of turbines for CEMEL III has not been signed yet, the exact capacity of CEMEL III is not identified. However, the total installed capacity of the project cannot be more than 20.4 MWe, so the third turbine will be selected such that total capacity does not exceed license figure.

The purpose of this project is to generate electricity by using the existing water without constructing any reservoir. The project type is run-of-river type project.

The proposed hydroelectric power plant is composed of:
- Weir house
- Derivation channel
- Power House
- Tail water channel[3]

The presented structural format is the same for all three Cemel. Technical specifications of the all three Cemel is tabulated below

	Cemel I	Cemel II	Cemel III
Drainage area	19613.0 km^2	19613.0 km^2	19613.0 km^2
Average flow rate	66,63 m^3/s		
Project flow rate	135 m^3/s	135 m^3/s	135 m^3/s
Crest elevation	922,5 m	916.0 m	909.5 m
Normal water elevation	921.5 m	915.0 m	908.5 m
Minimum water elevation	921.0 m	914.5 m	908.0 m
Thalweg elevation	916.5 m	910.0 m	903.5 m
Tailwater elevation	915.52 m	909.31 m	902.42 m
Gross Head	5,98 m	5.69 m	6.08 m
Net Head	5.941 m	5.681 m	6.079 m (average)
Length of cofferdam and derivation channel crest	85m / 147m	87m / 165m	129m / 109m
Length of tale water channel			
Type of Weir	Draw-door weir	Draw-door weir	Draw-door weir
Turbine type	Pit-type Kaplan turbines	Pit-type Kaplan turbines	Pit-type Kaplan turbines
Number of unite	2	2	2

[1] PIF page 9
[2] Equipment Agreement
[3] PIF page 35

Type of Generator	Horizontal Asynchronous; 50 Hz	Horizontal Asynchronous; 50 Hz	Horizontal Asynchronous; 50 Hz
Efficiency of Turbines at 135 m^3/s	0,92	0,92	0,92
Power factor of generator	0,85	0,85	0,85
Efficiency of Generator at Nominal Capacity[4]	96.78%	96.78%	96.78%

Table 1. Technical Characteristics[5]

The project will have a capacity of 21.6 MW_m and 20.4 MW_e and an expected production of 73.95 GWh. This corresponds to ~~38,107 tCO_2 avoided on the~~an average ~~and~~ of 40,006 tCO_2e emission reductions when all plants are commissioned.

Biçimlendirilmiş: Üst simge/Alt simgeAltı kesik çiziliDeğil

Electricity generated at project will be fed to the national grid via Avanos substation with energy transmission line of 8 km from Cemel I HEPP, 3.6km Cemel II HEPP and 4.4km from Cemel III HEPP.[6] Project is not located within any protected area as per the international agreements ratified by Turkey.[7]

Project will include an impoundment type weir and will cause limited land use since there exist no conveyance line and penstock is built at the bottom of the weir. There exist several Dams (Hirfanlı, Yamula, Bayramhacılı and Sarıhıdır) on the upstream and downstream of the project.[8] There exist agricultural areas around the river bed and several old sand quarry sites which will not be affected by the project activity due to the project type.

Main goals of the Cemel HEPP Projects include;

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

In terms of sustainable development project not only contributes to emission reduction through use of renewable resources and creating job opportunities, it also contributes sustainable development goals in the region as detailed in GS passport. In terms of environmental impact, project is considered to have positive impact on air quality due to avoided NOx, PM and SOx emissions whereas no negative impact on water quality other pollutants and biodiversity has been identified. Since the project is a compact type project and there is no diversion, project will not have any impact in terms of minimal flow or decreased water flow rate.

[5] PIF, page 1-2, Equipment Aggreements
[6] PIF page 42
[7] PIF page 168
[8] PIF page 166

According to the research conducted by State Planning Organization (SPO) on socio-economic levels of districts in Turkey, Avanos district is ranked as 227th among 872 districts and in terms of development level the area is classified as third(out of six) group. About 70.9% of the population works on agriculture and 21.0 % works on service sector (mainly tourism) whereas only 1.28% works on industry. The Avanos district is ranked as 291st in terms of per capita income. In that respect, direct and indirect contribution of project activities such as employment and supplying of needs from the region will have a significant effect on local economy. [9]

In addition to contribution to local economy, project will also contribute to use of local and renewable resources to meet the increasing energy demand of Turkey and reduce dependency on fossil fuels. According to Turkish Electricity Transmission Company (TEIAS) statistics, in 2010 about 73.8%[10] of the electricity has been generated via thermal power plants whereas 46.5% was from natural gas (NG) power plants which is fully imported and 21.8 bn m^3 NG has been consumed[11]. In terms of fuel dependency, corresponding to 42.286 GWh/year estimated generation, proposed project is expected to replace about 16.4 million m^3 NG and contribute to balance of payments which will, in addition, increase air quality and access to affordable energy services in national level.

Milestone	Date
Connection Agreement	20/03/2007
Preliminary EIA	16/11/2009
EIA Exemption Letter	04/06/2010
Water Right Utilization Agreement	05/11/2010
License Issuance	09/02/2011
Board Decision about carbon revenues	10/06/2011
Construction Subcontractor Agreement*	13/07/2011
Start of Construction	27/07/2011
EM Equipment Purchase Contract	13/09/2011
Carbon Agreement	20/10/2011
Commissioning Date (Cemel I)	27/06/2013
Expected Commissioning Date (Cemel II)	01/09/2013
Expected Commissioning Date (Cemel III)	~~01/06/2014~~01/09/2015

Table 2. Milestones for Cemel HEPP
*Date of investment decision

A.2. Location of project activity
A.2.1. Host Party(ies)

Host country is Turkey. Although Turkey, the Host Country, passed legislation in Parliament on 05/02/2009 to ratify the Kyoto Protocol - Turkey does not have a quantitative emission reduction limit yet and unlikely to have one within the year 2013. As such, Turkey will in the interim period continues to be eligible for voluntary emission reduction projects.

[9] http://www.dpt.gov.tr/DocObjects/Download/3159/ilce.pdf (Page 193)
[10] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/36.xls
[11] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls

A.2.2. Region/State/Province etc.

Project is located within boundaries of Nevşehir province in Turkey.

A.2.3. City/Town/Community etc.

Nearest location to the project site is Aladdin village of Avanos which is about 2km away from the project site.

A.2.4. Physical/Geographical location

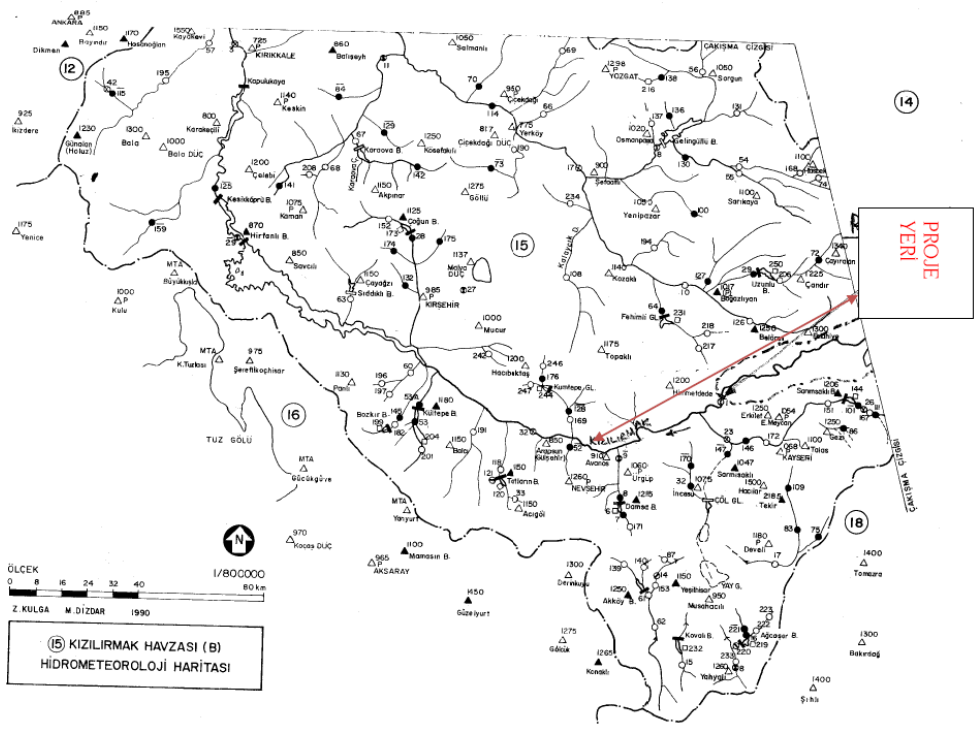
Project site is accessible from main road following a 3km route to Cemel I, 8.5km to Cemel II and 5.5km to Cemel III.

Cemel I HEPP	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38° 43' 25.93" N	657453.13
• Longitude	34° 48' 40.51" E	4287692.14
Cemel II HEPP	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38° 45' 15.48" N	651561.65
• Longitude	34° 44' 39.19" E	4290856.96
Cemel III HEPP	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38° 45' 25.58" N	648523.54
• Longitude	34° 42' 33.57" E	4291210.62

Cemel I HEPP Regulator Axis	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38.741016	657675
• Longitude	34.814239	4289600
Cemel I HEPP Weir house	38.741471	657650
	34.813963	4289650
Cemel II HEPP Regulator Axis	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38.763616	652340
• Longitude	34.753411	4292005
Cemel II HEPP Weir house	38.763262	652300
	34.752942	4291965
Cemel III HEPP Regulator Axis	**Coordinates**	
	WGS84 (DMS)	**ED50**
• Latitude	38.771499	648100

• Longitude	34.704800	4292800
Cemel III HEPP Weir house	38.771142	648080
	34.704561	4292760

Table 3. Project Coordinates.



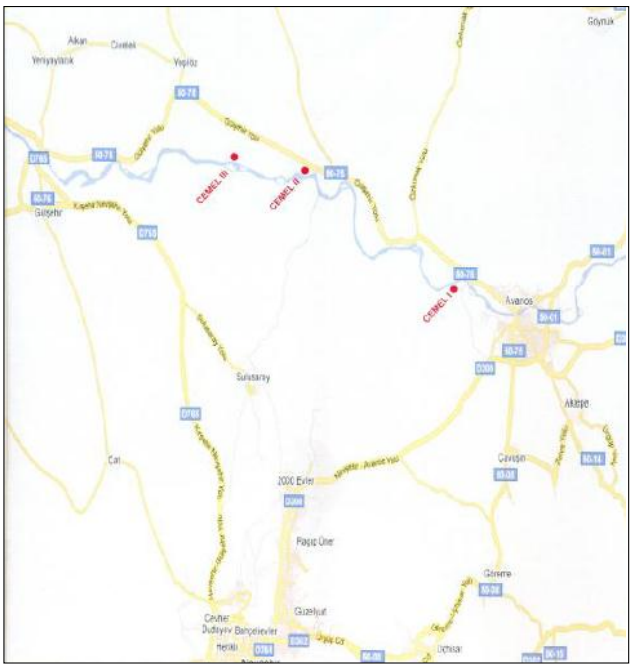


Figure 1. Layout of the projects on site map.

A.3. Technologies and/or measures

Project activity involves establishing a compact run-of-river type HEPP to utilize the running water of Kızılırmak River. Project will not have conversion line to divert water. The project consists of three cascade projects, each having its own turbines and generators which are used to transform the potential energy of water to mechanical energy at a first and later into electrical energy.

Project is located within central Anatolia and mainly influenced by continental climate. Average temperature is 10.5°C and precipitation is 331.70 mm. No extreme events are observed within the project site.

Hydrology: no water erosion has been determined during FSR and PIF preparation. Since there exists several large scale dams on the upstream, characteristics of the project(flood barrier) has been prepared accordingly and flood flow rates has been determined as follows:

Q5= 516.0 m³/s
Q10= 635.05 m³/s
Q100= 1167.62 m³/s
Q500= 1563.44 m³/s
Q1000= 1729.57 m³/s

Water logging in the region is made by DSI and feasibility of the project has been studied using DSI data obtained from existing gauging stations and results have been given in table 4-66 of the FSR.

There exists no wetland or protected area within the project site.[12]

A.4. Parties and project participants

Party involved (host) indicates a 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 (host)	**Zeynep Enerji Üretim San. ve Tic. A.Ş. (Project Owner-Private Entity)** **Global Tan Energy Ltd(Project Developer-Private Entity)**	**No**

A.5. Public funding of project activity

No public funding is used for the project.

SECTION B. Application of selected approved baseline and monitoring methodology
B.1. Reference of methodology
The UNFCCC approved baseline and monitoring methodology ACM0002, version 12.3.0[13] valid from 17/09/2010 was applied for the project activity.

ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 06.0,and,
- ''Tool to calculate the emission factor for an electricity system'', Version 02.2.1.

B.2. Applicability of methodology

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

- The proposed project activity is a greenfield, grid connected renewable electricity generation project,
- The project does not involve capacity additions, retrofit or replacement of power plant/units.
- The project does not involve combined heat and power generation activity
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.
- Project is a run-of-river type HEPP and does not have storage capacity.

[12] PIf page 170
[13] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

- The project activity is implemented in an existing river bed, with no change in the volume of any of the reservoirs

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

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 per cent between the systems during 60 per cent or more of the hours of the year.

- The transmission line is operated at 90% or more of its rated capacity during 90% per cent or more of the hours of the year.

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

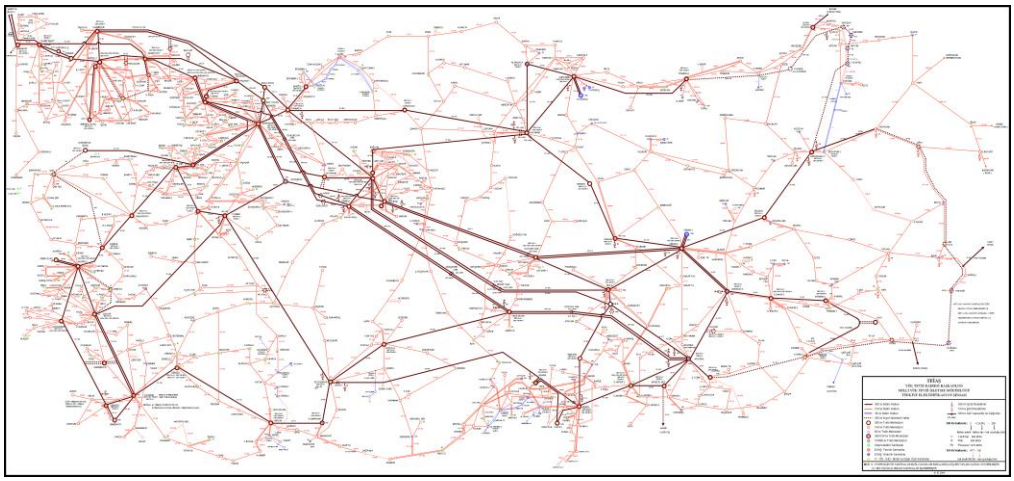


Figure 2. Turkish Electricity Grid

B.3. Project boundary

The project boundary is considered as the National Electricity Grid of Turkey according to applied tool. The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the power plant is connected to.

The flow diagram of the project boundary is illustrated below:

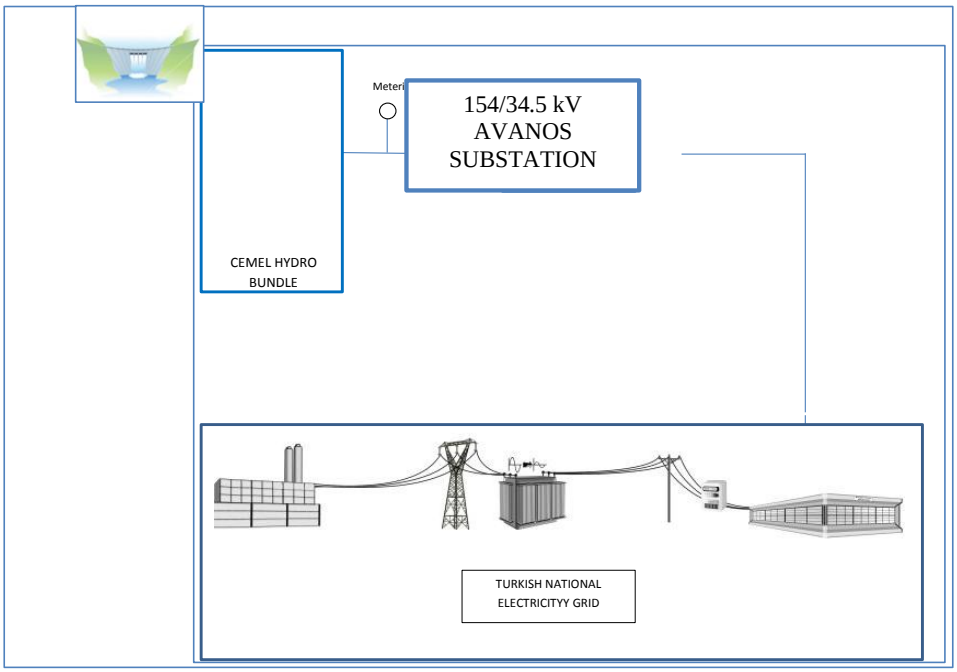


Figure 3. Flow Diagram of the Project Boundary

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in table:

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Electricity Generation by the grid connected power plants	CO_2	Yes	Major emission Source
		CH_4	No	Minor emission Source. Excluded for simplification
		N_2O	No	Minor emission Source. Excluded for simplification
Project scenario	Project Scenario	CO_2		Zero emission electricity generation from renewable resources. Emissions from diesel generator are excluded for simplification as it is a minor emission source.
		CH_4		Minor emission Source. Excluded for simplification
		N_2O		Minor emission Source. Excluded for simplification

B.4. Establishment and description of baseline scenario

According to the methodology baseline scenario has been identified as "*the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources*".

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

Keeping in mind the slow development of alternative energy sources, the trend in Turkey is to build new thermal power plants to satisfy the annual growth in energy demand. Turkey as a developing nation has been dealing with energy security by developing and constructing high capacity coal and natural gas power plants. The development of thermal power plants has also been encouraged by the large natural resource availability, especially the abundance of economically accessible lignite.

In the absence of the proposed project activity, the same amount of electricity would be required to be supplied by either the current power plants or the new thermal power plants which would lead to increasing GHG emissions.

According to the TEIAS statistics[14], share of HEPPs in total installed capacity of Turkey is about 32% whereas share of HEPPs in total generation is only 24.5%[15]. However, when the historical data is examined, it is observed that total installed capacity of thermal power plants has shown a rapid growth in parallel with the demand for electricity whereas hydroelectric power generation has grown at a much

[14] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kguc(1-12)/3.xls

[15] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/23.xls

slower rate - the energy generation proportion decreasing from 40% historically to current levels as shown in the figure below [16,17].

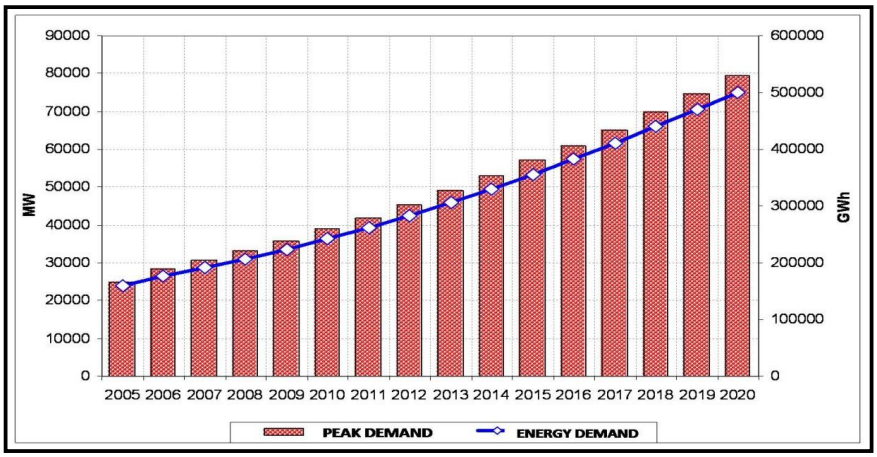


Figure 4.Peak Load and consumption projection for Turkish electricity system between 2005-2020[18]

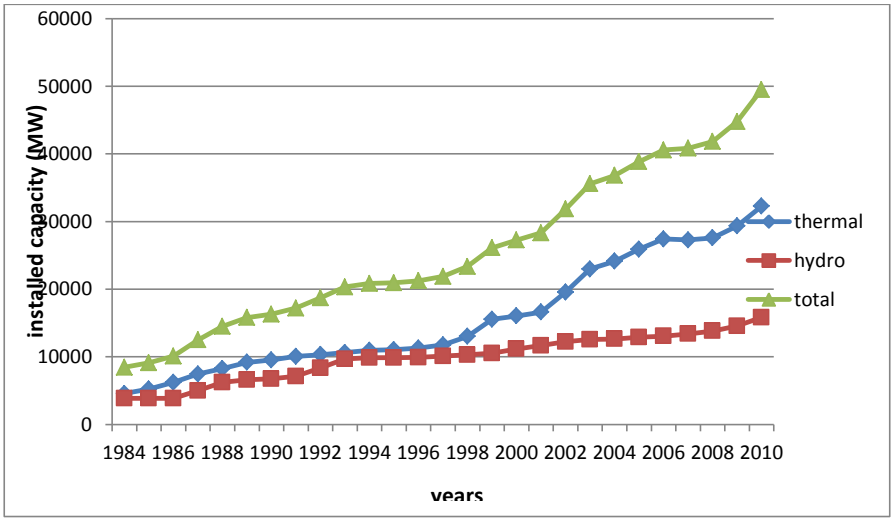


Figure 5. Annual Development of Turkey's Installed Capacity[19]

[16] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kquc(1-12)/3.xls
[17] IEA Turkey Country Report, 2005
[18] http://www.teias.gov.tr/apkuretimplani/veriler.htm

B.5. Demonstration of additionality

According to the applied methodology (ACM0002) the baseline scenario for the project has been defined as "generation of equal amount of electricity by the power plants connected to the grid". Emission factor for the baseline scenario has been calculated according to the combined margin approach as defined by the selected methodology. When all plants are operational, ~~Within this framework,~~ the project is expected to generate about 73.95 GWh of electricity and reduce on the average ~~38,107~~ 40,006 tCO_2 emissions annually through replacing the electricity that would be supplied via the National grid in the absence of the project activity. ~~When all plants are operational, annual emission reduction will be around 40,006tCO_2.~~ Additionality of the proposed project has been assessed according to the applied tool for demonstration of additionality as shown in following steps.

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

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

The most realistic and reliable alternatives to the project activity are:

1. Proposed project not undertaken as a VER project activity
2. Continuation of the current situation-supply of equal amount of electricity by the newly built grid connected power plants

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

Outcome of Step 1a

Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore new power plants should be constructed which includes mainly thermal power plants. Implementation of the project is additional to the baseline scenario which is alternative 2 above and therefore reduces the emissions.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law[20]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[21]
3. Energy Efficiency Law [22]
4. Forest Law[23]
5. Environment Law[24]

[19] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kguc(1-12)/3.xls

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

[21] Law number 5346, enactment date 18/05/2005 http://www.epdk.gov.tr/documents/10157/4b360128-53aa-4174-8104-a6c10434ac9c

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

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

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

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

Outcome of Step 1b

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

Step 2 - Investment analysis

The investment analysis has been done in order to make an economic and financial evaluation of the project. No public funding or ODA are available in Turkey for finance of this type of projects. Cemel HEPP has been financed through the company's own resources initially. For Cemel-III project, no loan agreement has been signed yet however company is intending to use loan for Cemel-III hepp if conditions are attractive. . Since the project is developed under single generation license and all permissions are taken as if it is a single project, investment analysis has also been carried out for total investment.

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

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

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

Since Project generates economic benefits from sales of electricity, the simple cost analysis is not applicable. Also, since the baseline of the project is generation of electricity by the grid, no alternative investment is considered at issue. So, it has been decided to use benchmark analysis for evaluation of the project investment.

Sub-step 2b **– Option III. Apply Benchmark Analysis**

For benchmark analysis, figure defined by World Bank for similar project types have been used which has been given as 15% [25] by a report generated in for similar projects. When we consider the minimum benchmark IRR which is 15%, for proposed project, in order to reach this IRR values, average electricity tariff must be above 11 $c/kWh in the absence of carbon revenue and assuming that initial investment figures are realized so that the investment will become reasonable.

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

Parameters	Unit	Data Value
Installed Capacity	MWe	20.4[26]
Grid Connected output	MWh	73.95[2626]
Capital Investment(ex-VAT)	Million $	51.9[27]

Biçimlendirilmiş: Dipnot Başvurusu;ftref

[25] Project Appraisal Document for a proposed IBRD Loan (page 81)
[26] Generation License
[27] Cemel Hepp FSR

Income tax rate	%	20[28]
Expected Tariff	$ Cents/kWh	7.3[29]
Expected VERs price	$/ tons CO_2e	8.0
Operation&Maintenance Cost	$/Year	1,152[30]
Equity	%	100

Table 4.Main financial parameters used for investment analysis (Figures in brackets show the values at time of investment decision and before project revision)

Equity IRR has been calculated according to the tool as stated in the applied methodology. Electricity tariff has been used as $7.3 Cent/kWh. Annual generation has been taken as 73.95 GWh and maintenance cost has been assumed as $1,152. Investment decision date has been identified as the date of construction agreement. For depreciation calculations, expected lifetime of construction and electromechanical equipment are determined as 40 year.[31] Calculation and estimations have been made conservatively therefore equity IRR value represents the most optimistic scenario in terms of capital investment and electricity generation. On the other hand electricity tariff is expected to increase so that the investment becomes attractive however as given below, expectations have not been realized yet due to the market conditions.

Expected return on investment for these types of projects should be above 15% as per WB document however, expectation of many investors is higher. Even if we consider the minimum benchmark equity IRR which is 15%, for proposed project, in order to reach this IRR values, average electricity tariff must be above 11 $c/kWh in the absence of carbon revenue and assuming that initial investment figures are realized so that the investment will become reasonable.

When the analysis is carried out for 44 years (remaining license period after construction), residual value of the project becomes zero since the project is delivered to government at the end of this period. However, since the lifetime of turbines are limited (assumed as 150,000 hours as per EB50 decision), it is seen that turbines should be replaced before end of license period. For simplicity, other maintenance cost of penstock, transmission line and conveyance line has not been included although these costs are expected to increase as the plant gets older. Equity IRR of the project has been calculated as 7.63% with these parameters which is still below the benchmark. . When we include the carbon revenue in the cash flow, equity IRR increases to 8.33 % and the project becomes more attractive and viable for the investors as coupled with the view that energy sale prices that can be achieved from the project will likely increase in future years. Expectation that the electricity prices will increase is the risk for investors whereas realization of this expectation will the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and risk of investment decision.

Following figure is given in order to reflect the actual electricity prices realized obtained from monthly reports of Market Settling and Balancing Centre[32] between 01/12/2009-01/01/2012. It should be considered that these prices are highest prices obtained and power plants which sell electricity through bilateral agreements have lower income. Figure shows that the actual prices have even been lower than guaranteed price in some cases therefore assumption of 7.3 $cents per kWh (or 73 $/MWh) is a realistic scenario as demonstrated below.

[28] http://www.mmmb.org.tr/default.aspx?pid=24826&nid=16297
[29] http://www.epdk.gov.tr/documents/10157/4b360128-53aa-4174-8104-a6c10434ac9c
[30] CEMEL HEPP Financial Model
[31] http://www.gib.gov.tr/fileadmin/user_upload/Yararli_Bilgiler/amortisman_oranlari.html
[32] http://pmum.teias.gov.tr/UzlasmaWeb/

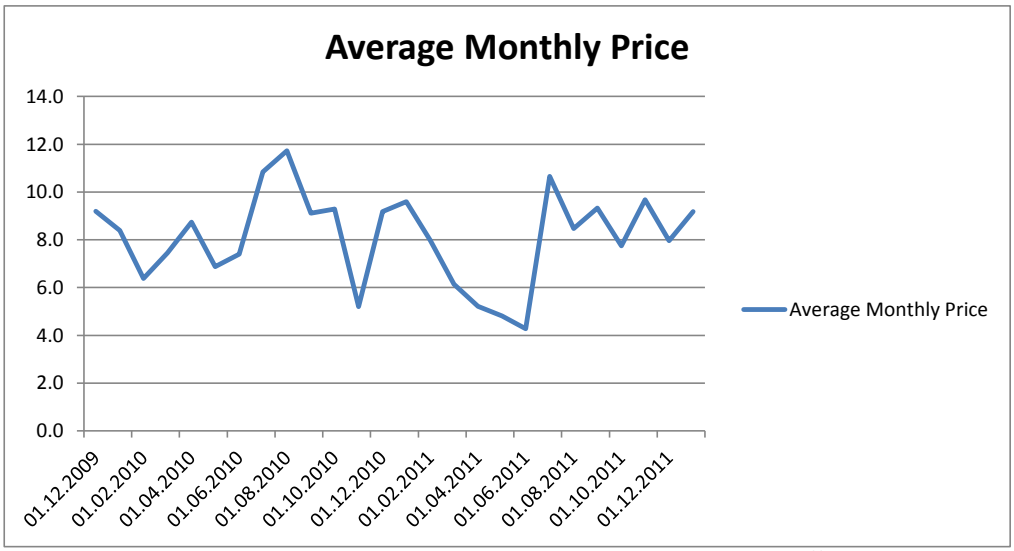


Figure 4. Highest tariffs observed between 01/12/2009-31/01/2012 ($ cents/kWh)[33]

This equity IRR value represents the most optimistic scenario in terms of capital investment and electricity generation whereas electricity tariff is expected to increase due to increasing electricity demand so that the investment becomes attractive.

For the proposed project, in order to reach the benchmark equity IRR values, average electricity tariff must be above 11$ c/kWh so that the investment will become reasonable. Considering that control of run-of-river hydroelectric power plants on generation period is limited, expectation that the floor electricity prices will increase is the risk for investors whereas realization of this expectation will increase the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and minimizing investment risk.

Sub-step 2d - Sensitivity Analysis

Sensitivity analysis has been carried out for three main parameters identified which constitute all income and expenses of the project effecting project return;

- Construction Cost
- Electromechanical Equipment Cost
- Electricity Income

For a range of ±15% fluctuations in parameters construction and EM equipment cost which ±30% fluctuation in electricity income, table below has been obtained. Parameters have been selected as per the Guidelines on Investment analysis which are defined as construction and EM equipment costs (54 % and 30 of initial investment respectively).[34]

[33] http://dgpys.teias.gov.tr/dgpys
[34] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

Fluctuation	-15	-10	-5	0	5	10	15
Construction Cost	10.22	9.25	8.39	7.63	6.93	6.31	5.74
EM Works	8.39	8.13	7.88	7.63	7.38	7.13	6.89
Fluctuation	**-30**	**-20**	**-10**	**0**	**10**	**20**	**30**
Electricity Income	4.11	5.35	6.51	7.63	8.17	9.77	10.82

Table 5 Sensitivity analysis for Cemel HEPP bundle project without carbon revenue

Sensitivity analysis has been carried out according to the conditions when the investment decision is given hence for 73.95 GWh generation and 7.3$ c/kWh guaranteed price.

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the Project remarkably. Considering that figures above are based on a higher price rather than the government guaranteed floor price, optimistic estimations for yearly generation and that those figures do not reflect the risk for investment, role of carbon income is a most significant number to enable the project to proceed.

According to local regulations, electricity price is determined daily according to Market Financial Settlement Centre (MFSC) as defined in the regulations and there exists three tariffs during day, peak and night hours. Thermal power plants and HEPPs with storage facilities have flexibility to schedule their generation at peak hours when the tariff is high. However, run-of-river type HEPPs do not have significant storage facility therefore may not be able to benefit from high prices realized at when demand is high. According to MFSC figures, electricity tariff fluctuated between 4.3 $c/kWh and 10.2 $c/kWh between 01/12/2009 and 31/01/2012 whereas the weighted average of the tariff has been calculated as 8.1$c/kWh in this period[35]. Since this value shows the spot price at the time of selected investment decision date, it does not provide any guarantee about the actual selling price as the control on generation period and tariff is limited and it may not be possible to generate and sell electricity during peak tariff periods. Also, considering that fluctuation in water resources is high and fact that a part of the electricity can be sold through bilateral agreements to free consumers with a discount rate over market price, guarantee price has been taken as reference in investment analysis which also provides input for evaluation of financing institutions.

Actual cost for investment has been realized as slightly below the figures in FSR. Operation cost does not have significant impact on IRR; therefore major parameter subject to change becomes electricity income which is a combination of tariff and generation. Electricity price is expected to increase to meet expectations so that the investment could be reasonable. However, there is no guarantee to reach that price as the tariffs in 2011 has clearly shown that average price is around 8.1 $cents/kWh and the fact that income is also dependent on generation and availability of water also creates significant risk. It should also be noted that average prices are calculated on average annual figures and electricity prices are higher in summer period where most of the hydros suffer from insufficient water resources to generate electricity and benefit from higher prices.

Based on the above information, it is seen that project is not the most attractive option. Therefore project is considered as additional to the baseline scenario.

[35] https://pmum.teias.gov.tr/UzlasmaWeb/

Step 3. Barrier analysis

This step is not applied as the additionality is demonstrated in previous steps.

Step 4. Common Practice Analysis

According to the "Tool for demonstration and assessment additionality (Version 06.0.0)", the common practice shall provide an analysis of any other activities that are similar to the Project Activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing etc.

Annex-8 , Guidelines on Common Practice version 02.0 has been followed.[36]

Sub-Step 4.1:Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The design capacity of the proposed project is 20.4 MWe at time of investment decision. Therefore, the applicable output range is from 10.2 MW to 30.6 MW

Sub-Step 4.2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step:

All power plants that have same capacity, within the range 10.2 MW to 30.6 MW[37] has been listed in common practice excel sheet. Properties of the power plants are also indicated in this excel sheet. After excluding the VER projects, there exist 37 power plants being operated in Turkey. These power plants have been operational before the start date of the proposed project.
Therefore;

N_{all}=35

Sub-Step 4.3: Within plants identified in Step 3, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

It has been determined that, all hydro power plants except ERENKOY HPP, SUMER HPP, YUKARI MANAHOZ HPP, PINAR HPP, SARMAŞIK I HPP, SARMAŞIK II HPP and YAVUZ HPP applied different technologies in terms of investment models compared to the proposed project and these three power plants were excluded from the list in order to follow a conservative approach since there was no available information regarding their applied technologies. Among the companies taken into consideration, for example in BOT (build-operate-transfer) type of projects, project owner receives a concession from public to finance, construct, operate, and they have a different financial model.

[36] http://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid44.pdf
[37] http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2011.pdf

Değiştirilmiş Alan Kodu

References for the projects are given in Annex-8 and common practice excel sheet. Simplified list of the power plants is tabulated below:

Hydroenergy Plant	Installed Capacity	License Type	Project Status
ALMUS	27.0	EUAS	Different Investment Model
TORTUM	26.2	EUAS	Different Investment Model
HAZAR I-II	30.1	Transfer of Operational Rights	Different Investment Model
AKSU (ÇAYKÖY)	16,0	BOT	Different Investment Model
FETHİYE	16,5	BOT	Different Investment Model
GAZİLER (Iğdır)	11,2	BOT	Different Investment Model
GİRLEVİK-II / MERCAN	11,0	BOT	Different Investment Model
GÖNEN	10,6	BOT	Different Investment Model
TOHMA MEDİK (ALARKO)	12,5	BOT	Different Investment Model
AKÇAY	28.8	GENERATION COMPANY	Built as AUTOP, Different Investment Model
ANADOLU ÇAKIRLAR	16,2	GENERATION COMPANY	GS Listed
BAYBURT HES	14,6	GENERATION COMPANY	Different Scale
CEYKAR BAĞIŞLI	29.6	GENERATION COMPANY	VCS Issued
BEREKET (GÖKYAR)	11,6	GENERATION COMPANY	Different Scale
BURÇBENDİ (AKKUR EN)	27,3	GENERATION COMPANY	VCS Registered
CEYHAN HES (BERKMAN HES-ENOVA)	25,2	GENERATION COMPANY	VCS-Issued
CEYHAN HES (OŞKAN HES-ENOVA)	23,9	GENERATION COMPANY	
CİNDERE (DENİZLİ)	28,2	GENERATION COMPANY	Built by DSI
ÇAKIT HES	20,2	GENERATION COMPANY	VCS-Issued
DAMLAPINAR(CENAY ELEK.)	16,4	GENERATION COMPANY	VCS-Issued
EGEMEN 1 HES (ENERSİS ELEK.)	19,9	GENERATION COMPANY	GS-Validated
ENERJİ-SA-AKSU-SAHMALLAR	14,0	GENERATION COMPANY	Different Scale
ENERJİ SA-SUGÖZÜ-KIZILDÜZ	15,4	GENERATION COMPANY	Built as BOT , Different Investment Model
ERENKÖY REG.(TÜRKERLER)	21,5	GENERATION COMPANY	No Info Available
FIRTINA ELEK.(ŞÜMER HES)	21,6	GENERATION COMPANY	No Info Available
FİLYOS YALNIZCA HES	14,4	GENERATION COMPANY	GS-Validated
HAMZALI HES (TURKON MNG ELEK.)	16,7	GENERATION COMPANY	GS-Issued
HİDRO KONTROL YUKARI	22,4	GENERATION COMPANY	No Info Available

Biçimlendirilmiş: Yazı tipi: Kalın

MANAHOZ			
İÇTAŞ YUKARI MERCAN	14,2	GENERATION COMPANY	Different Scale
KALKANDERE-YOKUŞLU HES(AKIM EN.)	14,5	GENERATION COMPANY	VCS Issued
KAR-EN KARADENİZ ELEK.(ARALIK HES)	12,4	GENERATION COMPANY	GS-Registered
KAYABÜKÜ HES (ELİTE ELEK.)	14,6	GENERATION COMPANY	GS-Validated
KAYEN ALFA EN.KALETEPE HES (tortum)	10,2	GENERATION COMPANY	Different Scale
KULP IV HES (YILDIZLAR EN.)	12,3	GENERATION COMPANY	Different Scale
MURGUL BAKIR	24,2	GENERATION COMPANY	Built as Autoproducer , Different Investment Model
ÖZGÜR ELEKTR.K.Maraş Tahta HES	12,5	GENERATION COMPANY	Different Scale
ÖZGÜR ELEKTR.AZMAK I	11,8	GENERATION COMPANY	VCS-Registered
PAMUK (Toroslar)	23,3	GENERATION COMPANY	Built as BOT
REŞADİYE I HES(TURKON MNG EL.	15,7	GENERATION COMPANY	GS-Registered
REŞADİYE II HES(TURKON MNG EL.	26,1	GENERATION COMPANY	GS-Validated
REŞADİYE III HES(TURKON MNG EL.	22,3	GENERATION COMPANY	GS-Listed
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,0	GENERATION COMPANY	No Info Available
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,6	GENERATION COMPANY	No Info Available
SELEN EL.(KEPEZKAYA HES)	28,0	GENERATION COMPANY	VCS Issued
TEKTUĞ-KARGILIK	23,9	GENERATION COMPANY	VCS-Issued
TEKTUĞ-KALEALTI HES	15,0	GENERATION COMPANY	VCS-Issued
TEKTUĞ-ERKENEK	13,0	GENERATION COMPANY	VCS-Issued
UMUT III HES(NİSAN EL.)	12,0	GENERATION COMPANY	VCS-Issued
YEŞİLBAŞ	14,0	GENERATION COMPANY	VCS Issued
YAPISAN HACILAR DARENDE	13,3	GENERATION COMPANY	Different Scale
YAVUZ HES (MASAT EN.)	22,5	GENERATION COMPANY	No Info Available
TÜM EN. PINAR	30,1	GENERATION COMPANY	No Info Available
BEYKÖY ZORLU	16,8	GENERATION COMPANY	Built By DSI. Privatized in 2008
KUZGUN ZORLU	20,9	GENERATION COMPANY	Built By DSI. Privatized in 2009
TERCAN ZORLU	15,0	GENERATION COMPANY	Built By DSI. Privatized in 2010
ÇILDIR ZORLU	15,4	GENERATION COMPANY	Built By DSI. Privatized in 2011
İKİZDERE ZORLU	18,6	GENERATION COMPANY	Built By DSI. Privatized in 2012
MERCAN ZORLU	20,4	GENERATION COMPANY	Built By DSI. Privatized in 2013

Therefore;

N_{diff}=28

Sub-Step 4.4: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity

$F=1-N_{diff}/N_{all}=1-(28/35) = 0.200$ (≤ 0.2)

According to the "Tool for the Demonstration and Assessment of Additionality" (version 06.0.0), if the factor F is greater than 0.2 and N_{all}-N_{diff} is greater than 3, then the proposed project is a "common practice".
For the proposed project, F=0.200, therefore, the proposed project is not a common practice within the region. Hence, the proposed project is additional.

Given the fact that all there are not many plants similar to the proposed project and built without carbon revenue, the proposed type of project should not be considered as a common practice in Turkey.

B.6. Emission reductions
B.6.1. Explanation of methodological choices
Emission factor has been calculated in a conservative manner as required by the methodology. Basic assumptions made are;

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

For the calculation of the emission factor of Turkish Grid, "Tool to Calculate the Emission Factor for an Electricity System", has been used.

Since the share of low-cost / must-run sources is below 50%, method (d) is eliminated. Also due to insufficiency of the available data, methods (b) and (c) are not considered and thus (a) simple OM method is used in calculations. The following table is used for demonstrating the share of low cost/must run resources.

ANNUAL DEVELOPMENT OF GENERATION IN TURKEY					
	GENERATION (GWh)				
YEARS	***THERMAL***	***HYDRO***	***GEOTHERM.WIND***	***TOTAL***	**% Low Cost Must Run**
1970	5590.2	3032.8	0	8623.0	35%
1971	7170.9	2610.2	0	9781.1	27%
1972	8037.7	3204.2	0	11241.9	29%
1973	9821.8	2603.4	0	12425.2	21%
1974	10121.2	3355.8	0	13477.0	25%
1975	9719.2	5903.6	0	15622.8	38%
1976	9908.0	8374.8	0	18282.8	46%
1977	11972.3	8592.3	0	20564.6	42%

1978	12391.3	9334.8	0	21726.1	43%
1979	12218.3	10303.6	0	22521.9	46%
1980	11927.2	11348.2	0	23275.4	49%
1981	12056.7	12616.1	0	24672.8	51%
1982	12384.8	14166.7	0	26551.5	53%
1983	16004.1	11342.7	0	27346.8	41%
1984	17165.1	13426.3	22.1	30613.5	44%
1985	22168.0	12044.9	6.0	34218.9	35%
1986	27778.6	11872.6	43.6	39694.8	30%
1987	25677.2	18617.8	57.9	44352.9	42%
1988	19030.8	28949.6	68.4	48048.8	60%
1989	34041.0	17939.6	62.6	52043.2	35%
1990	34314.9	23148.0	80.1	57543.0	40%
1991	37481.7	22683.3	81.3	60246.3	38%
1992	40704.6	26568.0	69.6	67342.2	40%
1993	39779.0	33950.9	77.6	73807.5	46%
1994	47656.7	30585.9	79.1	78321.7	39%
1995	50620.5	35540.9	86.0	86247.4	41%
1996	54302.8	40475.2	83.7	94861.7	43%
1997	63396.9	39816.1	82.8	103295.8	39%
1998	68702.9	42229.0	90.5	111022.4	38%
1999	81661.0	34677.5	101.4	116439.9	30%
2000	93934.2	30878.5	108.9	124921.6	25%
2001	98562.8	24009.9	152.0	122724.7	20%
2002	95563.1	33683.8	152.6	129399.5	26%
2003	105101.0	35329.5	150.0	140580.5	25%
2004	104463.7	46083.7	150.9	150698.3	31%
2005	122242.3	39560.5	153.4	161956.2	25%
2006	131835.1	44244.2	220.5	176299.8	25%
2007	155196.2	35850.8	511.1	191558.1	19%
2008	164139.3	33269.8	1008.9	198418.0	17%
2009	156923.4	35958.4	1931.1	194812.9	19%
2010	155827.6	51795.5	3584.6	211207.7	26%

Table 6 Breakdown by source of the electricity generation[38]

The methodology has been applied in a conservative manner. Tools addressed by the applied methodology have been used to calculate baseline, project and leakage emissions. The equations used are:

[38] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kgucunkullan%C4%B1m(13-21)/13.xls

• $EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,y} * NCV_{i,y} * EF_{CO_2,i.y}}{EG_y}$
• $\mathbf{EF}_{\text{grid, BM, y}} = \sum \mathbf{EG}_{m,y} . \mathbf{EF}_{EL,m,y} / \sum \mathbf{EG}_{m,y}$
• $\mathbf{EF}_{\text{grid, CM, y}} = \mathbf{w}_{OM} * \mathbf{EF}_{\text{grid, OM, y}} + \mathbf{w}_{BM} * \mathbf{EF}_{\text{grid, BM, y}}$
• $ERy = BEy - PEy - LEy \quad (4)$
• $BE_y = EG_y \times EF_y$
• $PD = \underline{Cap_{PJ} - Cap_{BL}} / \quad (A_{PJ} - A_{BL})$

Table 7 . Equations used for baseline calculations

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**EG_y,**
Unit	GWh
Description	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants in year y
Source of data	For gross generation electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must run power plants in year y : http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kgucunkullan%C4%B1m(13-21)/13.xls For net generation and imported electricity http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls
Value(s) applied	157,706.6 in 2008 151,144.7 in 2009 150,894,2 in 2010 459,745 .428 GWh between 2008-2010
Choice of data or Measurement methods and procedures	Data from Grid Operator has been used
Purpose of data	Data used for emission reduction calculation (for calculation of OM, Net-to-Gross electricity ratio and share of low-cost must-run sources)
Additional comment	-

Data / Parameter	$EF_{CO2, i, y i}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type "i" in year "y"
Source of data	-For EF of fossil fuels, IPCC values at the lower limit have been used.
Value(s) applied	**Fuel Source** / **EF(tCO2/Tj)** Coal 89.5 Lignite 90.9 Fuel Oil 75.5 Diesel 72.6 LPG 61.6 Naphtha 69.3 Natural Gas 54.3
Choice of data or Measurement methods and procedures	According to the applied tool, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.
Purpose of data	EF calculations
Additional comment	-

Data / Parameter	$\eta_{m,y}$
Unit	-
Description	average net energy efficiency of power unit m in year y
Source of data	Default values provided in Annex I of the "Tool to calculate the emission factor for an electricity system".
Value(s) applied	See Table 13 in Annex 4
Choice of data or Measurement methods and procedures	Data source is selected as per the applied tool.
Purpose of data	Data used for BM calculation
Additional comment	-

Data / Parameter	$FC_{i,y}$
Unit	Tons or 1000 m^3 for gases
Description	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data	TEIAS web page (http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls)
Value(s) applied	See Annex 4
Choice of data or Measurement methods and procedures	Data from Grid Operator has been used
Purpose of data	Data used for OM calculation
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	Tj/kt
Description	Net calorific value (energy content) of fossil fuel type i in y
Source of data	TEIAS web page (http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls)
Value(s) applied	See Annex 4
Choice of data or Measurement methods and procedures	Data has been calculated from Grid Operator's(TEIAS) statistics
Purpose of data	Data used for OM and BM calculation
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data	Project Site
Value(s) applied	0
Choice of data or Measurement methods and procedures	The project activity is the new grid-connected renewable power plant at a site where no renewable power plant was operated
Purpose of data	Data used for PE calculation
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full
Source of data	Project Site
Value(s) applied	0
Choice of data or Measurement methods and procedures	The project activity is the new grid-connected renewable power plant at a site where no renewable power plant was operated. There was no reservoir.
Purpose of data	Data used for PE calculation
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

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

Step 1. Identification of the relevant electrical power system

According to the ‘‘Tool to calculate the emission factor for an electricity system’’, Version 02.2.1, a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity, and that can be dispatched without significant transmission constraints. Therefore, in this project activity the project electricity system includes the project site and all power plants attached to the Interconnected Turkish National Grid, which has an installed capacity of 49,524.1 MW and gross generation about 211,207.7 by 2010[39,40].

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

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)
Option I has been chosen by the project developer hence only grid power plants are included in calculations.

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

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

[39] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kguc(1-12)/3.xls

[40] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/23.xls

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

- **Ex-ante option**
  A 3-year generation-weighted average, based on the most recent data available at the time of submission of the VER-PDD to the DOE for validation, without the requirement to monitor and recalculate the emissions factor during the crediting period, or
- **Ex-post option**
  The year in which the project activity displaces grid electricity, with the requirement that the emissions factor to be updated annually during monitoring.

For this project the ex-ante approach is selected. Data for calculating the three year average is obtained from the period 2008 – 2010, the most recent data available at the time of PDD submission to the DOE.

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 plants / units. The Simple OM has been calculated using option B which is based on 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 has been selected since;

- Generation and CO_2 data for individual power units are not available
- Only renewable are considered as low cost/must run resources
- Off-Grid power plants are not included in calculations.

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

$$EF_{grid,OMsimple,y} = \sum FC_{i,y} * NCV_{i,y} * EF_{CO2,i,y} / EG_y \quad \textbf{(1)}$$

where:

$EF_{grid, OM, y}$	Simple operating margin CO_2 emission factor in year "y" (tCO_2/GWh)
$FC_{i, y}$	Amount of fossil fuel type "i" consumed in the project electricity system in year "y" (mass or volume unit)
$NCV_{i, y}$	Net calorific value (energy content) of fossil fuel type "i" in year "y" (GJ / mass or volume unit)
$EF_{CO2, i,}$	CO_2 emission factor of fossil fuel type "i" in year "y" (tCO_2/GJ)
EGy	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must run power plants / units, in year "y" (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year "y"
y	Either the 3 most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the

applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

For the calculation of the Simple OM, the amount of fuel consumption ($FC_{i,y}$) and heating values of fuels are taken from website of TEIAS[41,42], the official source of related data. Fuel consumption values for the relevant years are given in table below:

	$FC_{i,y}$ unit [Ton, except for Natural Gas (NG) (1000 m^3)]			
Fuel Type	**2008**	**2009**	**2010**	**Total**
Hard Coal	6,270,008	6,621,177	7,419,703	20,310,888
Lignite	66,374,120	63,620,518	56,689,392	186,684,030
Fuel Oil	2,173,371	1,594,321	891,782	4,659,474
Diesel Oil	131,206	180,857	20,354	332,417
LPG	0	111	0	111
Naphtha	10,606	8,077	13,140	31,823
Natural Gas	21,607,635	20,978,040	21,783,414	64,369,089

Table 8 Fuel Consumption in thermal power plants

The NCV of the fuels consumed have been calculated using data from the TEIAS web page. The emission factors required for calculation of CO_2 emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories for fuels. Details of the data used for the calculations are given in Annex 4.

	COEF (tCO_2/kt)	**Consumption (2008 - 2010)** (tons or 1000m^3)	**Total Emission (2008 - 2010) (tCO_2)**
Coal	1,992	20,310,888	40,464,455
Lignite	617	186,684,030	115,098,675
Fuel Oil	3,008	4,659,474	14,014,770
Diesel Oil	3,079	332,417	1,023,654
LPG	2,863	111	318
Naphtha	2,756	31,823	87,719
Natural Gas	2,012	64,369,089	129,542,466
Total Emissions			**300,232,056**

Table 9 Calculation of emission factors for fuels

[41] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls

[42] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls

Net electricity generated and supplied to the Grid by thermal plants has been calculated using data obtained from the TEIAS web page[43]. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,\ y}$ requires the inclusion of electricity imports with an emission factor of 0 tCO_2/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

Year	Grid Loss[44]	Gross Gen. Thermal[45] (MWh)	Net Gen. Thermal (MWh)	Import[46] (MWh)	Total Supply to the Grid (MWh)
2008	2.3%	164,139	160364.1	789	161,154
2009	2.1%	156,923	153628.1	812	154,440
2010	2.8%	155,828	151464.4	1,144	152,608
		Total Net Thermal Gen.	465456.6	2,745	468,201.850

Table 6 Gross/Net electricity generation by Turkish Grid

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

$\mathbf{EF}_{grid,\ OM,\ y}$ = 300,232,056 tCO_2 / 468,201.850MWh
= 0.641 tCO_2/MWh.

In calculating the $EF_{grid,\ OM\ ,y}$, data for NCV has been calculated using weighted average values for each fuel.

Step 5. Calculate the build margin (bm) emission factor.

In terms of vintage of data, project participants can choose between one of the following two options to calculate $EF_{grid,BM,y}$
Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period,

[43] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/23.xls

[44] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls

[45] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/23.xls

[46] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/uretim%20tuketim(22-45)/23.xls

the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

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

In this PDD, **Option1** is chosen to calculate the build margin emission factor. The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units) and determine their annual electricity generation (AEGSET-5-units, in MWh);

Five Power Unit started the supply electricity to the grid has been tabulated below:

Name of Plant	Type of Fuel	Commissioning Date	Generation Capacity (MWh)
INTERNATIONAL HOSPITAL İSTANBUL AŞ.	Natural Gas	31.12.2010	6000
POLYPLEX EUROPA POLYESTER FİLM	Natural Gas	16.12.2010	61000
UMUT III REG. VE HES (NİSAN ELEKTR.)	HES (r-o-r)	13.12.2010	26000
YEDİGÖZE HES (YEDİGÖZE ELEKTRİK)	HES (reservoir)	02.12.2010	474000
SABUNSUYU II HES (ANG ENERJİ ELK.)	HES (r-o-r)	28.10.2010	21000
			588000

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

The list of the most recent capacity additions to the grid and their average and actual generation capacities are available at the TEİAŞ web page , .For determination of plants that comprise 20% of the system's generation, gross generation in year 2010 which is 211,207.7 GWh has been taken as reference and its 20% has been determined as about 42,242 GWh. Since 20% of the most recent year's generation falls partly on capacity of a plant, this plant was fully included in the calculations as requested by the methodological tool applied. Thus, total capacity included in BM calculation has increased to 48,096 GWh which reduces to 40,629 GWh after excluding plants benefitting from VER revenue.

(c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SETsample); Identify the date when the power units in SETsample started to supply electricity to the grid. If none of the power units in SETsample started to supply electricity to the

grid more than 10 years ago, then use SETsample to calculate the build margin. In this case ignore steps (d), (e) and (f).

SET≥20% is selected as (SETsample) because the set of power units that comprises the larger annual electricity generation. There is no power units in SETsample started to supply electricity to the grid more than 10 years ago. Therefore the steps (d), (e) and (f) are ignored.

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

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

Where:

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

"Tool to Calculate the Emission Factor for an Electricity System" has been used for plant efficiency data although this approach is very conservative. Since tool does not contain any specific data for plants with LPG, Naphtha etc. all of the plants consuming liquid fuels have been considered as open cycle plants. Plants using lignite and coal have been assumed as using subcritical technology, whereas natural gas plants have been assumed as combined cycle plants. The assumptions have been based on TEIAS statistics which gives heating values of fuels consumed in thermal power plants[47] and corresponding electricity generation which shows that values used are very conservative compared to actual situation.

	EF CO_2 (tCO2/Tj)	Generation Efficiency	EF (tCO_2/MWh)
Coal	89.50	39.0%	0.826
Lignite	90.90	39.0%	0.839
Fuel Oil	75.50	39.5%	0.688
Diesel	72.60	39.5%	0.662
LPG	61.60	39.5%	0.561
Naphtha	69.30	39.5%	0.632
Natural Gas	54.30	60.0%	0.326

Table 7 Calculation of emission factor from most recent power plants

The build margin emission factor has been determined for the most recent capacity additions as shown in table below. The Build margin emission factor in the last column has been determined by multiplying each EF value with the corresponding electricity generation value for that fuel and dividing it by the total generation by the most recent capacity additions.

[47] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/49.xls

Fuel Source	Generation (MWh)	Percent Generation	EF	Emission by Source
Coal	9,080	18,9%	0.826	7,501
Lignite	144	0.3%	0.839	121
Fuel Oil	0	0.0%	0.688	-
Diesel oil	0	0.0%	0.662	-
LPG	0	0.0%	0.561	-
Naphtha	0	0.0%	0.000	-
Natural Gas	31,557	65.6%	0.326	10,281
Renewable and wastes	0	0.0%	0.000	-
Solid	0	0.0%	0.000	-
Total Renewable	7,315	15.2%	0.000	-
TOTAL	**48,096.4**	**100.0%**		**17,904**
Capacity Built by VER Revenue	7,467			
Net Capacity Addition	40,629(Exc VERs)			

Table 8 Most recent capacity additions corresponding to 20% by fuel source

List of Plants built using VER revenue (those excluded in BM calculation) are given in Annex 8

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

$$EF_{grid,\ BM,\ y} = 17{,}904\ tCO_2 / (40{,}629\ GWh$$
$$= \mathbf{0.441\ tCO_2/GWh}$$

STEP 6 - Calculate the combined margin (CM) emission factor

As per the, weighted average baseline emission factor is calculated as follows;

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

Where:

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

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year "y" (tCO_2/MWh) as calculated from equation (1) above.

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

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

The default values of the weights, w_{OM} and $w_{BM,}$ as recommended by the selected methodology are 0.5 for both components. These default values have been used in calculating CM emission factor together without rounding the values of EF_{OM} and EF_{BM}.

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

$$\mathbf{EF}_{grid,\,CM,\,y} = 0.5 * 0.641 + 0.5 * 0.441 = \mathbf{0.541}$$

The combined margin emission factor is therefore **0.541 tCO_2/MWh.** Emission factor will remain same during the first crediting period as recommended by the methodology.

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

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

Where:

ERy = Emission reductions in year *y* (tCO_2)
BEy = Baseline emissions in year *y* (tCO_2)
PEy = Project Emissions in year *y* (tCO_2)
LEy = Leakage emissions in year *y* (tCO_2)

Baseline emissions

Baseline emission is calculated according to the formula

$$BE_y = EG_{facility,\,y} \times EF_y$$

Where:

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

EFy = Emission factor calculated according to selected methodology

Project emissions

The proposed project activity involves the generation of electricity by a hydroelectric power plant which has does not cause any significant new reservoir other than the existing river bed. Therefore, PD has not been calculated for the project activity. .

The power density of the project activity (PD) is not calculated since the project does not cause any new flooded area or reservoir formation.

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

$$LE_y = 0$$

As a result: Total Emission Reduction is;

$$ERy = BE\ y$$

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2015 (01/09/2015-31/12/2015)	13,335	0	0	13,335
2016	40,006	0	0	40,006
2017	40,006	0	0	40,006
2018	40,006	0	0	40,006
2019	40,006	0	0	40,006
2020	40,006	0	0	40,006
2021	40,006	0	0	40,006
2022 (01/01/2022-30/08/2022)	26,671	0	0	26,671
Total	280,045	0	0	280,045
Total number of crediting years	7			
Annual average over the crediting period	40,006	0	0	40,006

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Biçimlendirilmiş: Yazı tipi: Times New Roman
Biçimlendirilmiş: Yazı tipi: Times New Roman
Biçimlendirilmiş: Yazı tipi: Times New Roman
Biçimlendirilmiş: Yazı tipi: Times New Roman

Data / Parameter	$EG_{facility, y}$
Unit	GWh
Description	Net Electricity generated and delivered to the grid by Cemel Hydro bundle in year y
Source of data	Records from the metering devices used in the power plant will be used to calculate the annual generation of energy.. PMUM records will be used as a cross-check both for generation and internal consumption.
Value(s) applied	Estimated annual generation forming the basis for emission reduction calculation is 73.95 GWh
Measurement methods and procedures	Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Generation will be recorded via remote reading system. This record will form the basis for monthly invoicing.
Monitoring frequency	Continuous measuring and monthly recording
QA/QC procedures	Two calibrated ammeters will backup each other. Maintenance and calibration of the metering devices will be made by TEIAS. If there is a noticeable difference between the readings of two devices, maintenance and tests of the metering devices and the associated equipment will be done before waiting for the periodical maintenance. The meters should comply with EPDK regulations which define the accuracy class of the meters as 0.2 or 0.5 depending on the capacity of the circuit as given in document in link (http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44)
Purpose of data	Emission Reduction calculations
Additional comment	-

Data / Parameter	Cap_{PJ}
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site, equipment agreements
Value(s) applied	20.4 MWe
Measurement methods and procedures	Checking project documents and equipment labels
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Ensuring validity of project documentation
Additional comment	-

Data / Parameter	A_{PJ}
Unit	m_2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Project site
Value(s) applied	0
Measurement methods and procedures	Measured from topographical surveys or maps
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Maximum area is already calculated in feasibility report and considered in calculations. Annual measurements are not expected to be higher than this value.
Additional comment	

B.7.2. Sampling plan
No sampling plan will be necessary

B.7.3. Other elements of monitoring plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established.

Net electricity generation will be measured and recorded by both TEIAS and project owners for billing purposes therefore no new additional protocol will be needed for monitoring emission reduction. Power Plant Manager, will be responsible for the electricity generated, gathering all relevant data and keeping the records.

Generation data collected during crediting period will be submitted to Global Tan Energy who will be responsible for calculating the emission reduction subject to verification: Generation data will be used to prepare monitoring reports which will be used to determine the vintage from the project activity. These reports will be submitted to the duly authorized and appointed Designated Operational Entity 'DOE' before each verification period.

VER Team Members is expected to include the following staff of the HEPP:
Plant Manager: Responsibility for running the HEPP plant and compliance with VER monitoring plan
Accounting Manager: Responsible for keeping data about generation and consumption.
and
Global Tan Energy: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of meter and data monitoring will be carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) will be used for monitoring the electricity generated by the power plant. Readings will be done using main metering devices and spare metering device will be used for comparison only. Data from metering devices will be recorded by TEIAS monthly(through remote reading). In addition to the two metering devices, generation of the HEPP can be cross checked from TEIAS – PMUM web site (http://pmum.teias.gov.tr) which is accessible using a password provided to electricity generation companies. ISVM (Electricity fed to the grid)and UECM(Electricity consumed

from the grid) data given in PMUM records will be used for cross checking of emission reduction calculations.

All data will be kept for at least two years after the crediting period for QA/QC purposes.

Calibration of the metering devices will be made by TEIAS and sealed before the commissioning of the power plant. The meters will be calibrated by TEIAS when there is an inconsistency between two devices.

SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
Start date of project activity is determined as 13/07/2011, date of construction subcontractor agreement

C.1.2. Expected operational lifetime of project activity

The expected operational lifetime of the project is about 44 years as per the license issued. According to the lifetime of turbines which is estimated as 150,000 hours, lifetime of turbines will be about 41 years if operated at full time. Turbines will be renovated or replaced later. Project will be delivered to government authority at no cost at the end of license period.

C.2. Crediting period of project activity
C.2.1. Type of crediting period

Project will use renewable crediting period.

C.2.2. Start date of crediting period

The first crediting period is expected to ~~will~~ start in ~~01/07/2013~~01/09/2015 in parallel with commissioning date of Cemel-III.

C.2.3. Length of crediting period

First crediting period will be valid for seven years.

SECTION D. Environmental impacts
D.1. Analysis of environmental impacts

A Project Identification File has been prepared for Cemel HEPP project by Gökoğuzlar Mühendislik on November 2009 considering final project design. In order to assess the Environmental Impacts of the project, including its location, its characteristics, capacity, interaction with other plants in the vicinity, utilization of natural resources, waste management, social and economic impacts, any natural and historical protected areas within the project boundaries, assessment of geological and seismic aspects of the project site has been considered.

This Report has been evaluated by Province Directorate of Environment and Forestry. After evaluation of the project and comments of the local agencies, on 26/05/2010 , Directorate has decided that no detailed EIA is required for the project activities. The EIA not required certificate is given in Annex 5

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

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

D.2. Environmental impact assessment

No significant negative permanent effect of the project has been identified during evaluation of related authorities and stakeholder meeting. The feasibility report covers some aspects of EIA in including social impacts, technology and materials used current land use in the region, waste deposition, dust and noise control geological assessment of the project site and any communities affected by the project.

SECTION E. Local stakeholder consultation
E.1. Solicitation of comments from local stakeholders
Stakeholder feedback round for proposed project was held on 16/07/2012 at Avanos Municipality Meeting Hall in Avanos District of Nevsehir province.

AGENDA:

15:00-15:05	OPENING & INTRODUCTION
15:05-15:20	INTRODUCTION OF THE PROJECT
15:20-15:30	CLIMATE CHANGE & CERTIFICATION PROCESS
15:30-15:45	QUESTIONS & ANSWERS
15:45-16:00	INTRODUCTION OF GRIEVANCE MECHANISM SD ASSESMENT
	CLOSURE OF MEETING

E.2. Summary of comments received
The meeting was organized Municipality Meeting Hall on 16/07/2012. Because of the low attendance, Project owner and GTE team, went to village and tried to meet locals. However, most of locals worked on field, and project owner and GTE team could talk with people listed below.

- Mustafa Çete (Mukhtar of Yenimahalle)
- Murat Ateş (Yeşilöz Village- deputy of Mukhtar)
- Şenel Güneş (Yeşilöz Village)
- Ali Ay (Yeşilöz Village)
- İsmail Ay (Yeşilöz Village)
- Ibrahim AY (Yeşilöz Village)

Moreover, to reach all locals and to take their opinion about project, project owner visited the village and met the locals after the meeting day. They gave brief information about the project. Locals filled the evaluation forms and these forms are attached in the GS Passport.

After opening of the meeting and definition of the purpose of the meeting, Mr. Metin DEMİR, site manager, made a presentation about the project. Moreover, He explained the benefits of the project to the District and the national Economy. After Mr. Metin Demir, GTE representative delivered a presentation climate change and carbon certification. Also Kemal Demirkol explained the grievance rule of the Gold Standard stressing that the meeting was just the beginning of a process for at least 7 years and impacts of the project will be monitored. It was highlighted that the GS was also considering the social and environmental impacts of the projects and required continuous feedback from the stakeholders, especially of locals. Then, it was explained that a grievance notebook would be placed at a secure and easily accessible place, such as the muhktar's office, where they could fill in whenever there was a complaint or request which would be regularly checked by the project manager.

The participants in general stated their support for the project. There were a few questions Questions from participants and responses are as below;

Local: Have the Kyoto Protocol been still in force?
M. Kemal Demirkol: At the end of this year, Kyoto Protocol will abolished but some counties will continue decreasing their GHG emissions voluntarily.

Local: Does this project cause the climate change in this region?
Metin Demir: Project is an impoundment type HEPP and does not cause any new flooded area. Therefore, new reservoir is not created. Water will be rised in the existing stream bed. As a result, there is no micro climate change

Local: Can we utilize the generated electricity from this project?
Metin Demir: You cannot use it directly. Energy voltage is not suitable for daily usage.. The generated energy will be transferred to the transmission line, then transformer station and then to the energy pool for to be transferred all over Turkey.. Think that as a energy pool. Generated electricity will be transmitted to the grid.

After the official meeting GTE team and project representatives went to villages. They met the locals, and asked their opinion about the project. Locals generally stated their support to the project, and they asked some questions .
Murat Ateş mentioned the concerns of the local which are high number of expropriation and submerging of village, Metin Demir explained that there were only 2 area in this village which were expropriated and the compensation payments has been made to the Şenel Güneş and Ali Ay. No other expropriation would be made. Submerging of the village were not possible. As he mentioned before, there were only two area would submerge, and these areas has already expropriated and compensation payments were made. Moreover, İsmail Ay, İbrahim Ay, and Ali Ay asked the employment opportunities for the locals.Metin Demir explained that they wanted to employ locals however, all locals work on fields, no one prefered to work in the project, and he said that if anyone wants to work in this project , they can contact with him directly.

E.3. Report on consideration of comments received

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)

Have the Kyoto Protocol been still in force?	Yes	At the end of this year, Kyoto Protocol will abolished but some counties will continue decreasing their GHG emissions voluntarily.
Does this project cause the climate change in this region?	Yes	Project is a impoundment type hepp and does not cause any new flooded area. Therefore, new reservoir is not created. Water will be rised in the existing stream bed. As a result, there is no climate change
Can we utilize the generated electricity from this project?	Yes	You cannot use directly. Energy voltage is not suitable for daily usage.. The generated energy will be transferred to the transmission line, then transformer station and then to the energy pool for to be transferred all over Turkey.. Think that as a energy pool. Generated electricity will be transmitted to the grid.

SECTION F. Approval and authorization

Project is developed as a VER project. Since Turkey does not have a cap and trade system or issue approval letter, no authorization or approval is needed.

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Appendix 1: Contact information of project participants

Organization:	ZEYNEP ENERJİ ÜRETİM SANAYİ VE TİCARET ANONİM ŞİRKETİ
Street/P.O.Box:	Turan Güneş Bulvarı
Building:	75/4
City:	Çankaya Ankara
State/Region:	N/A
Postfix/ZIP:	06550
Country:	Turkey
Telephone:	90.312 490 98 38
Fax:	90.312 490 48 40
E-Mail:	murat@derinenerji.com
URL:	-
Represented by:	
Title:	Manager
Salutation:	Mr
Last name:	Dirsek
Middle name:	-
First name:	Murat
Department:	Management
Direct fax:	90.312 490 48 40
Direct tel:	90.312 490 98 38
Personal e-mail:	murat@derinenerji.com

Organization:	Global Tan Energy Limited
Street/P.O.Box:	Ehlibeyt Mah 1259. Sokak
Building:	7/2
City:	Ankara
State/Region:	-
Postfix/ZIP:	06520
Country:	Turkey
Telephone:	(0090) 312 472 35 00
Fax:	(0090) 312 472 33 66
E-Mail:	email@gte.uk.com
URL:	www.gte.uk.com
Represented by:	
Title:	Director
Salutation:	Mr.
Last name:	Demirkol
Middle name:	Kemal
First name:	Mehmet
Department:	Management
Direct fax:	(0090) 312 472 35 00

Direct tel:	(0090) 312 472 33 66
Personal e-mail:	kemal@gte.uk.com

Appendix 2: Affirmation regarding public funding

No Public funding is used for the project activity.

Appendix 3: Applicability of selected methodology

Information on applicability of project activity is given in Section B.2

Appendix 4: Further background information on ex ante calculation of emission reductions

Data Used in calculation of OM for Turkish Electricity Grid

	NCV (Tj/kt) (1000m^3 for gas)	EF (tCO_2/Tj)	COEF (tCO2/kt)
Coal	*22.26*	89.5	1,992
Lignite	*6.78*	90.9	617
Fuel Oil	*39.84*	75.5	3,008
Diesel Oil	*42.42*	72.6	3,079
LPG	*46.47*	61.6	2,863
Naphtha	*39.78*	69.3	2,756
Natural Gas	*37.06*	54.3	2,012

Table 9Values used in calculation of OM [48]

	2008	2009	2010	Total Fuel Consumption 2008-2010	Total Emission 2008-2010
Hard Coal	6,270,008	6,621,177	7,419,703	20,310,888	40,464,455
Lignite	66,374,120	63,620,518	56,689,392	186,684,030	115,098,675
Fuel Oil	2,173,371	1,594,321	891,782	4,659,474	14,014,770
Diesel Oil	131,206	180,857	20,354	332,417	1,023,654
LPG	0	111	0	111	318
Naphtha	10,606	8,077	13,140	31,823	87,719
Natural Gas	**21,607,635**	**20,978,040**	**21,783,414**	**64,369,089**	**129,542,466**

[48] 2006 IPCC Guidelines for National Greenhouse Inventories

Table 10.Amount of fuels used for electricity generation[49]

Data Used in calculation of BM for Turkish Electricity Grid

	A NCV (Tj/kt or m^3 for gas)	B EF_{CO2} (tCO_2/Tj)	D η Generation Efficiency	E (=3.6/D/1000*B) EF [50] tCO_2/MWh
Coal	22.26	89.50	39.0%	0.826
Lignite	6.78	90.90	39.0%	0.839
Fuel Oil	39.84	75.50	39.5%	0.688
Diesel	42.42	72.60	39.5%	0.662
LPG	46.47	61.60	39.5%	0.561
Naphtha	0.00	69.30	39.5%	0.632
Natural Gas	0.00	54.30	60.0%	0.326

Table 11.
Net calorific values, generation efficiency and emission factor data used in calculations

Fuel Source	Electricity Generated (MWh)	EF	Share in Total Generation
Coal	9,080	0.826	18.9%
Lignite	144	0.839	0.3%
Fuel Oil	0	0.688	0.0%
Diesel oil	0	0.662	0.0%
LPG	0	0.561	0.0%
Naphtha	0	0.000	0.0%
Natural Gas	31,557	0.326	65.6%
Renewable and wastes	0	0.000	0.0%
Solid	0	0.000	0.0%
Total Renewable	7,315	0.000	15.2%
TURKEY'S TOTAL	48.096		100%

Table 12Most recent capacity additions corresponding to 20%.[51,52]

Appendix 5: Further background information on monitoring plan

[49] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls
[50] IPPC Reference Document on Best Available Techniques for Large Combustion Plants
[51] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/kguc(1-12)/8.xls
[52] http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2009/8.xls

Information about monitoring plan is given in section B.7

Appendix 6: Summary of post registration changes

N/A

Appendix 7: EIA Letter

T.C.
NEVŞEHİR VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

SAYI :B.18.4.İÇO.4.50.03/ 251 /758 26/05/2010
KONU :Ek-2 Belgesi.

MOLU ENERJİ ÜRETİM ANONİM ŞİRKETİ

İLGİ : Çevre ve Orman Bakanlığı'nın 11.05.2010 tarih ve B18.0.DMP0.01.03/493-1320-4012 Sayılı yazısı.

Çevre ve Orman Bakanlığı, Doğa Koruma ve Milli Parklar Genel Müdürlüğü'nün İlgi yazısında İlimiz Avanos İlçesi, Cemel Köyü, sınırları içerisinde işletilmesi planlanan "Cemel HES I-II-III Hazır Beton Tesisi" Tesisinden bahsedilerek, söz konusu tesisler için ; peyzaj bütünlüğünün korunması, ruhsat sahibi tarafından verilen taahhütnameye uyulması ve çalışanların tamamlanmasını müteakip Valiliğimize (İl Çevre ve Orman Müdürlüğüne) bilgi verilmesi şartıyla ek'te gönderilen EK-2 belgesinin verilmesi uygun görülmüştür. Yazımız ekinde iletilen EK-2 belgesi 2 (iki) yıl geçerli olup, süre bitiminde yenilenmesi gerekmektedir. Belirtilen şartlara uyulmaması halinde Çevre ve Orman Bakanlığı bu belgeyi feshetme hakkına sahiptir.

Bilgilerinize rica ederim

Gülseren ERGÖZOĞLU
Çevre ve Orman İl Müdürü V.

Ek:
1-İzin Belgesi (3 Sayfa)

Nevşehir Valiliği- İl Çevre ve Orman Müdürlüğü/Hükümet Binası D/Blok Kat/4 NEVŞEHİR TEL: (384)212 99 19 FAX: (384)212 99 20 E-Mail:nevsehir@cevreorman.gov.tr

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Appendix 8: List of Operational HEPPs

Projects in green are known to benefit from carbon revenue. Unmarked ones are either not at comparable scale or built with a different investment model .Yellow ones are either has not benefitted from carbon revenue or no information is available. Yellow projects constitutes 12% (7 out of 58) of projects. Since there is no information whether they are developed as carbon project or benefitted from other investment schemes etc. no comparison could be made for those projects. CDM projects which are at different scale (i.e ≤15 MWe) are not referenced since including them as CDM projects is conservative. Each project can be accessed via public database of the associated scheme.

Biçimlendirilmiş: İki Yana Yasla

Hydroenergy Plant	Installed Capacity	License Type	Reference
ALMUS	27.0	EUAS	Different Investment Model , TEIAS Capacity Projection Report 2011[53]
TORTUM	26.2	EUAS	Different Investment Model , TEIAS Capacity Projection Report 2011
HAZAR I-II	30.1	Transfer of Operational Rights	Different Investment Model , TEIAS Capacity Projection Report 2011
AKSU (ÇAYKÖY)	16,0	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
FETHİYE	16,5	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
GAZİLER (Iğdır)	11,2	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
GİRLEVİK-II / MERCAN	11,0	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
GÖNEN	10,6	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
TOHMA MEDİK (ALARKO)	12,5	BOT	Different Investment Model , TEIAS Capacity Projection Report 2011
AKÇAY	28.8	GENERATION COMPANY	Different Investment Model , Built as Autoproducer[54]
ANADOLU ÇAKIRLAR	16,2	GENERATION COMPANY	GS Listed [55]
BAYBURT HES	14,6	GENERATION COMPANY	Different Scale
CEYKAR BAĞIŞLI	29.6	GENERATION COMPANY	VCS Issued [56]
BEREKET (GÖKYAR)	11,6	GENERATION COMPANY	Different Scale

Biçimlendirilmiş Tablo

[53] http://www.teias.gov.tr/KAPASITEPROJEKSIYONU2011.pdf
[54] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 26
[55] http://mer.markit.com/br-reg/public/index.jsp?q=cakirlar&s=cp
[56] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=657&lat=37.713611&lon=44.054721&bp=1

BURÇBENDİ (AKKUR EN)	27.3	GENERATION COMPANY	VCS Registered [57]
CEYHAN HES (BERKMAN HES-ENOVA)	25,2	GENERATION COMPANY	VCS Issued [58]
CEYHAN HES (OŞKAN HES-ENOVA)	23,9	GENERATION COMPANY	
CİNDERE (DENİZLİ)	28.2	GENERATION COMPANY	Different Investment Model , Built by DSI [59]
ÇAKIT HES	20,2	GENERATION COMPANY	VCS Issued [60]
DAMLAPINAR(CENAY ELEK.)	16,4	GENERATION COMPANY	VCS Issued [61]
EGEMEN 1 HES (ENERSİS ELEK.)	19,9	GENERATION COMPANY	GS Validated [62]
ENERJİ-SA-AKSU-ŞAHMALLAR	14,0	GENERATION COMPANY	Different Scale
ENERJİ SA-SUGÖZÜ-KIZILDÜZ	15,4	GENERATION COMPANY	Different Investment Model , Built as BOT [63]
ERENKÖY REG.(TÜRKERLER)	21,5	GENERATION COMPANY	No information available
FIRTINA ELEK.(SÜMER HES)	21,6	GENERATION COMPANY	No information available
FİLYOS YALNIZCA HES	14,4	GENERATION COMPANY	GS Validated
HAMZALI HES (TURKON MNG ELEK.)	16,7	GENERATION COMPANY	GS Issued [64]
HİDRO KONTROL YUKARI MANAHOZ	22,4	GENERATION COMPANY	No information available
İÇTAŞ YUKARI MERCAN	14,2	GENERATION COMPANY	Different Scale
KALKANDERE-YOKUŞLU HES(AKIM EN.)	14,5	GENERATION COMPANY	VCS Issued [65]
KAR-EN KARADENİZ ELEK.(ARALIK HES)	12,4	GENERATION COMPANY	GS Registered
KAYABÜKÜ HES (ELİTE ELEK.)	14,6	GENERATION COMPANY	GS Validated
KAYEN ALFA EN.KALETEPE HES (tortum)	10,2	GENERATION COMPANY	Different Scale
KULP IV HES (YILDIZLAR EN.)	12,3	GENERATION COMPANY	Different Scale

Biçimlendirilmiş: Ortadan
Biçimlendirilmiş: Ortadan
Biçimlendirilmiş: Ortadan
Biçimlendirilmiş: Ortadan

[57] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=419&lat=37.458333&lon=38.172222&bp=1
[58] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=810&lat=37.224463&lon=36.233742&bp=1
[59] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 28
[60] https://vcsprojectdatabase2.apx.com/myModule/Interactive.asp?Tab=Projects&a=2&i=685&lat=37.275555&lon=34.999444&bp=1
[61] http://mer.markit.com/br-reg/public/index.jsp?q=damlapinar&s=cp
[62] http://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002173
[63] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 19
[64] http://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002294
[65] http://mer.markit.com/br-reg/public/project.jsp?project_id=100000000001296

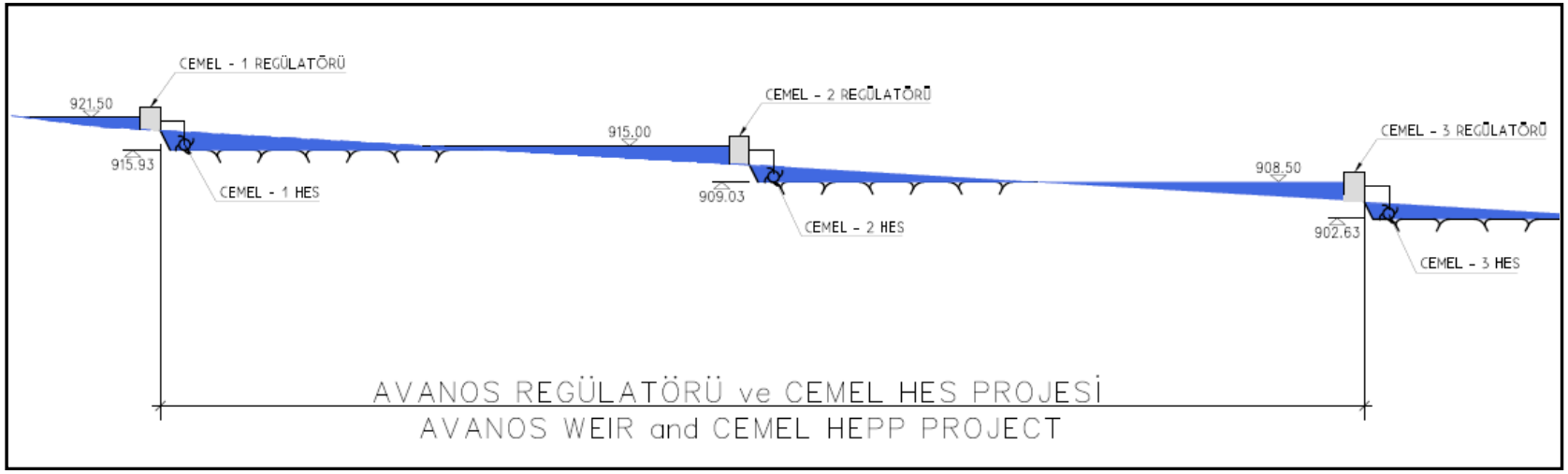
MURGUL BAKIR	24,2	GENERATION COMPANY	Different Investment Model , Built as AUTOP [66]
ÖZGÜR ELEKTR.K.Maraş Tahta HES	12,5	GENERATION COMPANY	Different Scale
ÖZGÜR ELEKTR.AZMAK I	11,8	GENERATION COMPANY	VCS Registered
PAMUK (Toroslar)	23,3	GENERATION COMPANY	Different Investment Model , Built as BOT [67]
REŞADİYE I HES(TURKON MNG EL.	15,7	GENERATION COMPANY	GS Registered [68]
REŞADİYE II HES(TURKON MNG EL.	26,1	GENERATION COMPANY	GS Validated [69]
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,0	GENERATION COMPANY	No info available
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,6	GENERATION COMPANY	No info available
SELEN EL.(KEPEZKAYA HES)	28,0	GENERATION COMPANY	VCS Issued [70]
TEKTUĞ-KARGILIK	23,9	GENERATION COMPANY	VCS Issued [71]
TEKTUĞ-KALEALTI HES	15,0	GENERATION COMPANY	VCS Issued
TEKTUĞ-ERKENEK	13,0	GENERATION COMPANY	VCS Issued
UMUT III HES(NİSAN EL.)	12,0	GENERATION COMPANY	VCS Issued
REŞADİYE III HES(TURKON MNG EL.	22,3	GENERATION COMPANY	GS Listed
YEŞİLBAŞ	14,0	GENERATION COMPANY	VCS Issued
YAPISAN HACILAR DARENDE	13,3	GENERATION COMPANY	Different Scale
YAVUZ HES (MASAT EN.)	22,5	GENERATION COMPANY	No information available
TÜM EN. PINAR	30.1	GENERATION COMPANY	No information available
BEYKÖY ZORLU	16,8	GENERATION COMPANY	Different Investment Model , Built by DSI [72]
KUZGUN ZORLU	20,9	GENERATION COMPANY	Different Investment Model , Built by DSI[73]

[66] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 134
[67] http://www.limak.com.tr/sektorler/insaat/projeler/barajlar/pamuk-hidroelektrik-santrali
[68] http://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002284
[69] http://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002283
[70] http://mer.markit.com/br-reg/public/project.jsp?project_id=100000000001299
[71] http://mer.markit.com/br-reg/public/project.jsp?project_id=100000000000284
[72] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 5
[73] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 54

TERCAN ZORLU	15,0	GENERATION COMPANY	Different Investment Model , Built by DSI[74]
ÇILDIR ZORLU	15,4	GENERATION COMPANY	Different Investment Model , Built by DSI[75]
İKİZDERE ZORLU	18,6	GENERATION COMPANY	Different Investment Model , Built by İLB [76]
MERCAN ZORLU	20,4	GENERATION COMPANY	Different Investment Model , Built by DSI [77]

[74] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 55
[75] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 137
[76] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 131
[77] http://www2.dsi.gov.tr/skatablo/Tablo1.htm Line 66

Appendix 9: Project Layout



History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
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