CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
VERSION 03 - IN EFFECT AS OF: 28 JULY 2006

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

Annex 5: Stakeholder Consultation Meeting Participant List

Annex 6: Exemption Certificate for Oşkan and Berkman HEPPs

SECTION A. General description of project activity

A.1. Title of the project activity:

Ceyhan 61.7 MW Hydropower Project.
Date: 02 February 2011
Version: 3

A.2. Description of the project activity:

>>
The Ceyhan HEPP project (hereafter referred to as "the project" developed by ENOVA Energy Production Co , hereafter referred to as "the project owner") includes Oşkan and Berkman diversion weirs and HEPPs which are run-of-river hydro electrical power plants with a total installed capacity of 63.468MWm/61.704 MWe. The Oşkan and Berkman diversion weirs of Ceyhan Project are located on Ceyhan River, in the city of Osmaniye, in South Anatolian Region, Turkey.
Ceyhan HEPP project includes two diversion weirs and HEPPs. Oşkan Diversion weir and HEPP, upstream, has an installed capacity of 23.889 MW and generates 100.248[1] GWh electricity per year.
Berkman HEPP, downstream, has an installed capacity of 37.815 MW and generates 139.698[2] GWh electricity per year.

Oşkan HEPP has 3 Pit Kaplan type turbines each with an installed capacity of 7.963 MW.
Berkman HEPP is also equipped with 3 Pit Kaplan type turbines each with an installed capacity of 12.605 MW.

Apart from the project on Ceyhan River there are several other dams and HEPPs either on the same river or on its tributaries. The facilities on Ceyhan River upstream to downstream are: Menzelet Dam and HEPP, Kılavuzlu Dam and HEPP, Sır Dam and HEPP, Berke Dam and HEPP, Aslanlı Dam and HEPP, all these hydroelectric power plants are owned and operated by DSI (General Directorate of State Hydraulic Works).

The primary objective of the project is to generate electricity from hydropower station to meet the ever-increasing demand in South Anatolian Region and to contribute to the sustainability of electricity generation of the Turkish National Grid. Another benefit following the construction of the project is to utilize the 25m head between the Aslantaş Dam at the upstream of Ceyhan River and the Cevdetiye Irrigation Structure at the downstream by two diversion weirs; Oşkan and Berkman HEPPs.
The risks to deliver of the emission reductions are mainly related to climatic conditions as HEPPs depend on water and adequate water flow. Therefore unexpected and unpredicted climatic conditions might affect the emission reduction of the project.

As a hydro power project, the proposed project will produce clean electricity using water resources and will generate GHG emission reductions by avoiding CO2 emissions from electricity generation of fossil fuel fired power. Operation of this project does not lead to GHG emissions therefore the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

[1] Electricity generation projection has been made for every 5 years according to historical flow data of the river and future flows of upstream dams. Thus this figure reflects the average generation projection between the years 2010-2030.

[2] Electricity generation projection has been made for every 5 years according to historical flow data of the river and future flows of upstream dams. Thus this figure reflects the average generation projection between the years 2010-2030.

The project has not applied or created another form of renewable energy certificate. Therefore the project has not been rejected under any GHG programs.
The Project category is included in the sectoral scope 1 "Energy Industry – Renewable Sources" according to the UNFCCC definition.

Based on the Preliminary Design, the installed capacity of the proposed project is 63.468MW_m/61.704 MW_e, which yields an output of 239.946[3] GWh per year to the Turkish National Grid in long-term average. Thus, the project will lead to estimated annual emission reduction of approximately 147,566 tons of CO_2e.

The project activity is owned by Enova Enerji Üretim A.Ş. which is controlled by Nurol-Özaltın, a prominent energy firm in Turkey and had achieved all the necessary licenses to implement the project. The purpose of the project activity is to generate electricity from renewable sources and sell it to the National Grid.

Key Features of the project activity are;

- Run-of-river hydro power project with no water storage.
- Strong sustainable development aspects.
- One of the large scale hydro projects implemented by the private sector in Turkey.

The project activity's contributions to sustainable development are;

- Supply of reliable, zero emitting renewable energy to the Turkish National Grid.
- Contribution to the balance of payments of Turkey by using national resources.
- Contribution to social, educational and economic improvement of local people by implementing social responsibility projects.
- Increase of local income and job opportunities.

These social, economic and environmental benefits underscore the important sustainable benefits of this proposed project activity to the country and the region.

Table A.1: Milestones of the Project Timeline[4]

June 2003	First Feasibility Report
21 August 2003	EIA not required
04 May 2006	Water Use Agreement
21 December 2006	Production License by Energy Market Regulatory Authority. (EMRA)

[3] This figure is the average total electricity generation estimation between 2010 and 2020.

[4] Relevant documents will be provided to the DOE upon request

05 January 2007	VER consideration through a board meeting regarding the application of carbon finance to the project
22 November 2007	Electromechanical Contract&Starting date of the project
January 2008	Start of Construction
March 2008	Revised Feasibility Report
01 May 2009	EIA Report
22 June 2009	Suen was appointed as Carbon projects consultant by Enova Energy.
20 January 2010	Upload of PDD v1 to VCS web page
February 2010	Contract with DOE for validation
19-20 May 2010	Site visit by the DOE for validation
03/06/2010	Oşkan HEPP started operation officially
20/08/2010	Berkman HEPP started operation officially

The first feasibility report was prepared on June 2003.
On 21 August 2003 EIA exemption certificate was issued.
On 04 May 2006 Water Use Right Agreement was signed with DSI.
On 21 December 2006 Production License for Ceyhan HEPP was issued by EMRA.
VER consideration by a board meeting on 05 January 2007.

Ceyhan 61.7 HEPP project started officially by the electro mechanical contract with the turbine supplier on 22 November 2007.

On January 2008, construction of the project started.

The feasibility report was revised in March 2008 because;

- the installed power of Berkman diversion weir was updated as a result of water level of Cevdetiye Diversion weir[5]
- Output generation of Berkman diversion weir was re-calculated taking into consideration that 3m3/s of water will be taken for Afşin Elbistan C and D thermal power plants[6]
- River regulation was commenced at 56.50 m level and was connected to Cevdetiye diversion weir at 53.80 m level.[7]
- Plant cost was re-evaluated considering 2007 prices.[8]

On 1 May 2009 EIA report was prepared.[9]

Later on Suen Ltd. was assigned as carbon projects consultant by Enova Energy on 22 June 2009
Construction of the project started in January 2008.

The PDD v1 was uploaded to VCS webpage on 20 January 2010.
The validation contract with DOE was signed in February 2010.
The DOE performed the site visit for validation on 19-20 May 2010.
Oşkan HEPP started operation as of 03/06/2010[10]
Berkman HEPP started operation as of 20/08/2010

A.3. Project participants:

>>

Name of Party involved (host) indicates a host Party)	Private and/or public entity(ies) Project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Turkey (host)	Enova Enerji Üretim A.Ş. (project owner) Suen Ltd. (Carbon consultant)	No

Suen Ltd. is the carbon consultant for this project.

Project Owner:
Enova Enerji Üretim A.Ş. (Enova Energy Production CO)
is the sole investor, constructor, operator and owner of the proposed Project Activity.

Host Country:
The host country is The Republic of Turkey. The Government of The Republic of Turkey announced its approval of the Kyoto Protocol in February 2009.

[5] Revised Feasibility report

[6] Revised Feasibility report

[7] Revised Feasibility report

[8] Revised Feasibility report

[9] The project is exempt from EIA. However, the project owners prepared a report even though it was not required.

[10] Relevant documentation has been sent to DOE among clarification documents.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>> Ceyhan HEPP is located on Ceyhan River, in the city of Osmaniye, in South Anatolian Region. Oşkan Diversion Weir and HEPP, upstream, and Berkman Diversion Weir and HEPP, downstream, are 6.4 km apart from Berkman each other. Geographical coordinates of both HEPPs are given at A.4.1.4 of the PDD.

A.4.1.1. Host Party(ies):

>>
The Republic of Turkey.

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

>>
South Anatolian Region, in the borders of Osmaniye Province.

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

>>
14km. Northwest of Osmaniye City.

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

The project activity takes place on Ceyhan River which is in the borders of Osmaniye city in South Anatolian Region. . The geographical coordinates of the project sites are;
37°13'28.06" North, 36°15'8.77" East for Oşkan HEPP and 37°10'7.20" North, 36°14'1. 47” East for Berkman HEPP.

Figure 1. The physical location of Osmaniye City.

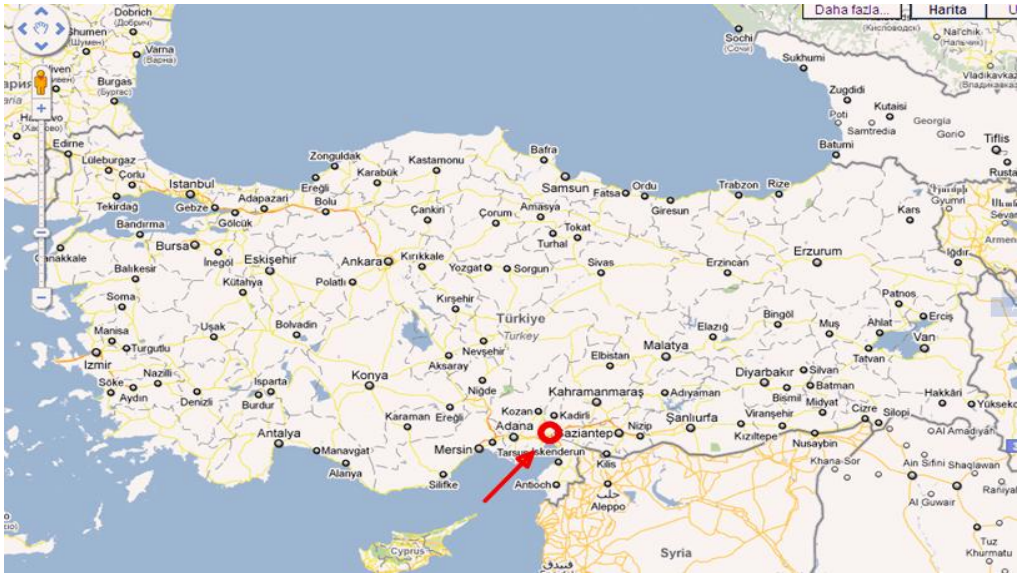


Figure 2. Osmaniye City

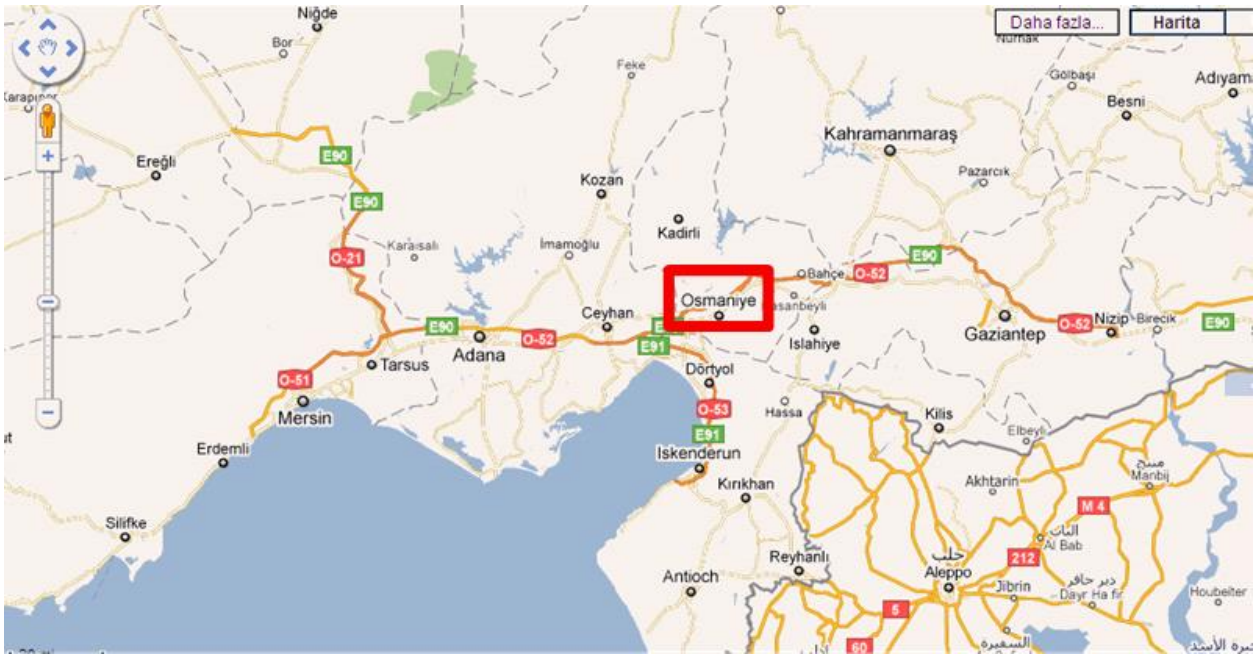
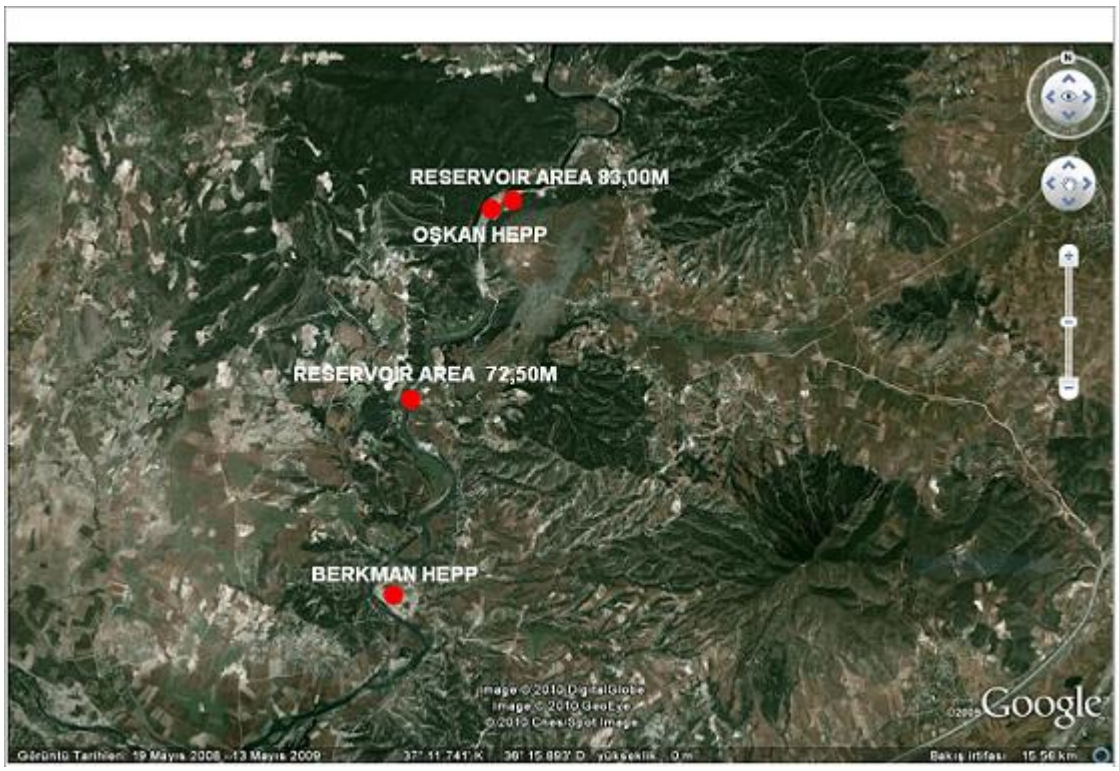


Figure 3. The locations of Oşkan and Berkman HEPPs.



A.4.2. Category (ies) of project activity:

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The Project category is included in the sectoral scope 1 "Energy Industry – Renewable Sources" according to the UNFCCC definition.

A.4.3.Technology to be employed by the project activity:

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The Ceyhan project is a run-of-river hydroelectric power plant with a total installed capacity of 61.704 MW. The project, being a run-of-river type Hydro-Power project, would generate power by utilizing the water diverted from the flow of Ceyhan River. The diversion weirs of the project are located on Ceyhan River to make use of the 25m. head between Aslantaş Dam and Cevdetiye Irrigation System at the downstream. This head is projected to be utilized by Oşkan HEPP, upstream, and Berkman HEPP, downstream. Oşkan HEPP of the Ceyhan project is planned to be built with 23.889 MW total installed capacity and equipped with 3 Pit Kaplan Type turbine-generator units (each turbine with 7.963 MW capacity). Depending on the water flow of the upstream projects, 100.248 GWh electricity will be produced annually in Oşkan HEPP.

Electromechanical equipment and training of the equipments for both projects have been supplied from France an Annex I county, from Alstom. Electro mechanic equipments of the project have 20 year lifetime.

Berkman HEPP, which is planned to be built with 37.815 MW total installed power and equipped with 3 Pit Kaplan Type turbine-generator units (each turbine with 12.605 MW capacity). Depending on the water flow of the upstream projects, 139.698 GWh electricity will be produced annually in Berkman HEPP.

The technical data of the Oşkan HEPP and the Berkman HEPP are as follows;

Table A.2. Oşkan Diversion Weir and HEPP

Parameter	Specifications
Drainage Basin	14.775 km^2
Reservoir Water Level	83.00 m
Diversion Weir Type	Homogenous Filling
Crest Elevation	85.50 m
Crest Length	167.50 m
Height From Thalweg	14.50 m
Upstream Cofferdam Crest Elevation	77.50 m
Downstream Cofferdam Crest Elevation	76.50 m
Type of Weir	Radial Penstock
Approach Channel Elevation	73.00 m
Sill Elevation	74.50 m
Design Flow	1600 m^3/s
Penstock Dimensions	10.00 m x 9.19 m
Installed Power	23.889 MW (7.963 MW * 3)
Powerhouse Dimensions	54.50 x 67.00
Tailwater Level	72.50 m
Gross Head	10.50 m
Project Flow	267 m^3/s

Number of Unit	3
Unit Type	Pit Kaplan
Output Voltage	154 kV
Power Factor	0.90
Annual Firm Energy Generation	58.73 GWh/year[11]
Annual Secondary Energy Generation	48.69 GWh/year[12]
Annual Total Net Energy Generation	104.828 GWh/year[13]
Annual Total Gross Energy Generation	107.42 GWh/year[14]
Load Factor	0.49

Oşkan Diversion Weir and HEPP is a facility with no water storage and therefore its water inlet flows are the water outlet flows of the Aslantaş Dam located at the upstream.

The main facilities of Oşkan Diversion Weir and HEPP are; the embankment, spillway structure, Powerhouse and the switchyard. Depending on the diversion process of the water, the Oşkan Diversion Weir and HEPP is planned to be constructed in two stages. At the first stage, spillway structure and the power plant structure will be constructed on the left bank. In order to prevent water leakages to the construction site, a thin wall will be built in the silt, underneath the diversion cofferdam which has a 76.50m elevation, while the river is flowing on its natural bed in dry season. The crest width of the diversion cofferdam is 10.00 m and its slope on both sides is 2.5 (horizontal) / 1(vertical).

The second stage will start after the construction of the spillway structure and the power plant structure. The river will be diverted to the spillway structure by the upstream cofferdam at 77.50 m crest elevation, after the approach and exit channels of the power plant and the spillway structures are opened.
The crest width of the upstream cofferdam is 8.00 m and water and air surface slopes are 2.5/1 and 2.5/1respectively. The crest elevation of the downstream cofferdam is 76.50 m and the crest width is 8.00 m. The construction of the upstream cofferdam will start after the river is diverted to the spillway structure. The crest width of the upstream cofferdam at 80.00 m crest elevation is planned to be 10.00 m as a thin wall will be constructed.
In order to prevent any leakage, a thin wall is proposed to be built underneath the upstream cofferdam with a maximum depth of 20.00 m. After completing the construction of the upstream cofferdam, a homogenous, earth filling type Embankment will be built to connect all the concrete structures on the left bank to the right hill.

As the Oşkan Diversion Weir is a facility with no water storage, it will give direct access to the upstream floods. Therefore, the spillway operation will be in parallel with the upstream Aslantaş Dam. The dimensions of the spillway structure of the Oşkan Diversion Weir is planned to give access to 1600 m^3/s of water which is the maximum flow of Aslantaş Dam during the repeated floods in 100 years.

Table A.3. Berkman Diversion Weir and HEPP

Parameter	Specifications
Drainage Basin	14.842 km^2
Reservoir Water Level	72.50 m
Diversion Weir Type	Homogenous Filling

[11] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[12] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[13] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[14] This figure is based on the projections of 2010, not the 20 year electricity generation average.

Crest Elevation	75.00 m
Crest Length	231.00 m
Height From Thalweg	13.50 m
Upstream Cofferdam Crest Elevation	67.500 m
Downstream Cofferdam Crest Elevation	66.00 m
Type of Weir	Radial Penstock
Approach Channel Elevation	62.50 m
Sill Elevation	64.00 m
Design Flow	1600 m^3/s
Penstock Dimensions	10.00 m x 9.19 m
Installed Power	37.815 MW (12.605 * 3)
Powerhouse Dimensions	53.00 m x 69.00 m
Tailwater Level	58.00 m
Gross Head	14.50 m
Project Flow	267 m^3/s
Number of Unit	3
Unit Type	Pit Kaplan
Output Voltage	154 kV
Power Factor	0.90
Annual Firm Energy Generation	78.89 GWh/year[15]
Annual Secondary Energy Generation	69.83 GWh/year[16]
Annual Total Energy Generation	146.128 GWh/year[17]
Annual Total Gross Energy Generation	148.72 GWh/year[18]
Load Factor	0.45

Berkman HEPP is also a facility with no water storage and uses the water outlet flows of the upstream Aslantaş Dam. The main facilities of Berkman HEPP are; the Embankment, the spillway structure, the Powerhouse and the switchyard.

The construction of the Berkman HEPP will be completed in two stages depending on the water diversion process. At the first stage, the spillway structure and the power plant will be constructed on the left bank. In order to prevent water leakage to the construction site, a thin wall will be built in the silt, underneath the diversion cofferdam which has a 71.00m elevation, while the river is flowing on its natural bed in dry season. The crest width of the cofferdam is 10.00 m and water and air surface slopes are 2.5 (horizontal) and 1 (vertical).

The second stage will start after the construction of the spillway structure and the power plant structure. The river will be diverted to the spillway structure by the upstream cofferdam at 66.50 m crest elevation after the approach and exit channels of the power plant and the spillway structures are opened. The crest width of the upstream cofferdam is 8.00 m and water and air face slopes are 2.5/1 and 2.5/1 respectively. The crest elevation of the downstream cofferdam is 66.00 m and the crest width is 8.00 m.
The construction of the upstream cofferdam will start after the river is diverted to the spillway structure. The crest width of the upstream cofferdam with 71.00 m crest elevation is planned to be 10 m as a thin wall will be constructed. In order to prevent any leakages, a thin wall is proposed to be built underneath

[15] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[16] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[17] This figure is based on the projections of 2010, not the 20 year electricity generation average.

[18] This figure is based on the projections of 2010, not the 20 year electricity generation average.

the upstream cofferdam with a maximum depth of 20.00 m. After completing the construction of the upstream cofferdam, the embankment will be constructed.

The concrete structures on the left bank will be connected to the right hill by a homogenous earth filling type Embankment. The crest width of this Embankment will be 10.00 m, the crest elevation will be 75.00 m and its length will be 231.00 m. The water surface slope is planned as 3 (horizontal) / 1 (vertical) and the air surface slope is planned as 2.5 (horizontal) / 1 (vertical).

As the Berkman Diversion Weir is a facility with no water storage, it will give direct access to the upstream floods. Therefore, the spillway operation will be in parallel with the Aslantaş Dam and the Oşkan HEPP which are located at the upstream. The dimensions of the spillway structure of the Berkman Diversion Weir is planned to give access to 1600 m^3/s of water which is the maximum flow of Aslantaş Dam during the repeated floods in 100 years

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

Table A.4. – Estimated amount of emission reductions of total Ceyhan Project over the first crediting period.

CEYHAN HEPP

Years	Annual estimation of emission reductions in tonnes of CO_2
June 2010-January 2011	73,783
2011-2012	147,566
2012-2013	147,566
2013-2014	147,566
2014-2015	147,566
2015-2016	147,566
2016-2017	147,566
2017-2018	147,566
2018-2019	147,566
2019-2020	147,566
- June 2020	73,783
Total estimated reduction (tonnes of CO_2)	1,475,660
Total number of crediting years	10
Annual average over the crediting period of estimated reductions(tonnes of CO_2 e)	147,566

A.4.5. Public funding of the project activity:

>>

No public funding or ODA Declaration used for the Ceyhan Project.

SECTION B. Application of a baseline and monitoring methodology

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

1. Title of the baseline and monitoring methodology: ACM0002: "Consolidated baseline methodology for grid connected electricity generation from renewable source" version 12.1.0[19], EB 58 valid from September 2010 onwards.
ACM0002 refers to;
"The tool for demonstration and assessment of additionality", version 05.2, EB 39[20] valid from 26 August 2008.

"Tool to calculate the emission factor for an electricity system Version 2, EB 50[21]

More information about the methodology can be obtained from:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The proposed project is a grid-connected renewable power generation project activity which meets all the applicability criteria stated in the methodology, such as:

- The Project Activity is a grid connected renewable electricity generation project,
- The project does not involve an on-site switch from fossil fuels to a renewable energy source,
- The geographic and system boundaries for the relevant electricity grid, The Turkish National Grid, can be clearly identified and information on the characteristics of the grid is available.[22]
- The project activity results in new reservoirs and the power density of both power plants, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.[23]

[19] http://cdm.unfccc.int/UserManagement/FileStorage/VA17EM2PNDJWBTFY34KGRLZO68S9UQ

[20] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

[21] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf

[22] **http://www.teias.gov.tr/Faaliyet2008/2008%20faaliyet%20raporu%20ingilizce.pdf (pages: 10/11)**

[23] The calculated power density of the submerged area for both plants is 18.65 W/m^2 which is more than 4 W/m^2. Submerged area and the diagram were submitted to DOE during site visit. Power density has been calculated according to the methodology ACM0002 Version 12.1.0.

B.3. Description of the sources and gases included in the project boundary:

According to methodology the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. Thus Project boundary is Turkish National Grid and the projects itself and all power plants connected to the grid. Import data obtained from the relevant government agencies (EUAS – Turkish Electricity Generation Corp., TEIAS – Turkish Electricity Transmission Corp., Ministry of Energy and Natural Resources) have been included in the calculations of the combined margin emissions.

Emission sources: According to methodology ACM0002 v12.1.0, the only emission sources are the emissions associated with the electricity that is displaced from the grid. These are calculated as the electricity supplied to the grid multiplied by an emission factor for the grid.

There are two diesel generators at each plant. These generators work only during maintenance, which is performed every year and which takes about 7-8 hours. Therefore, emission amounts of each generator are available and these are negligible amounts and are less than %1 of estimated emission reduction of the project.[24]

The activities and emission sources considered within the project boundaries are listed in Table B.1.

Table B.1. – Main gases included in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Fuel-fired Power Plant	CO_2	Yes	Included by the methodology
		CH_4	No	Excluded by the methodology
		N_{2O}	No	Excluded by the methodology
Project Activity	Run-of-river Hydropower Plant	CO_2	No	Excluded by the methodology
		CH_4	No	As the calculated power density of the submerged area of Oşkan and Berkman HEPPs is 18.86[25] W/m^2 which is more than 10 W/m^2, the methane emission is assumed to be zero. (refer to B.6.1)
		N_{2O}	No	Excluded by the methodology

[24] Technical information about diesel generations shall be submitted to DOE.

[25] Power density has been calculated according to the methodology ACM0002 Version 12.1.0

Figure 4: Flow Diagram of Turkish Electricity System

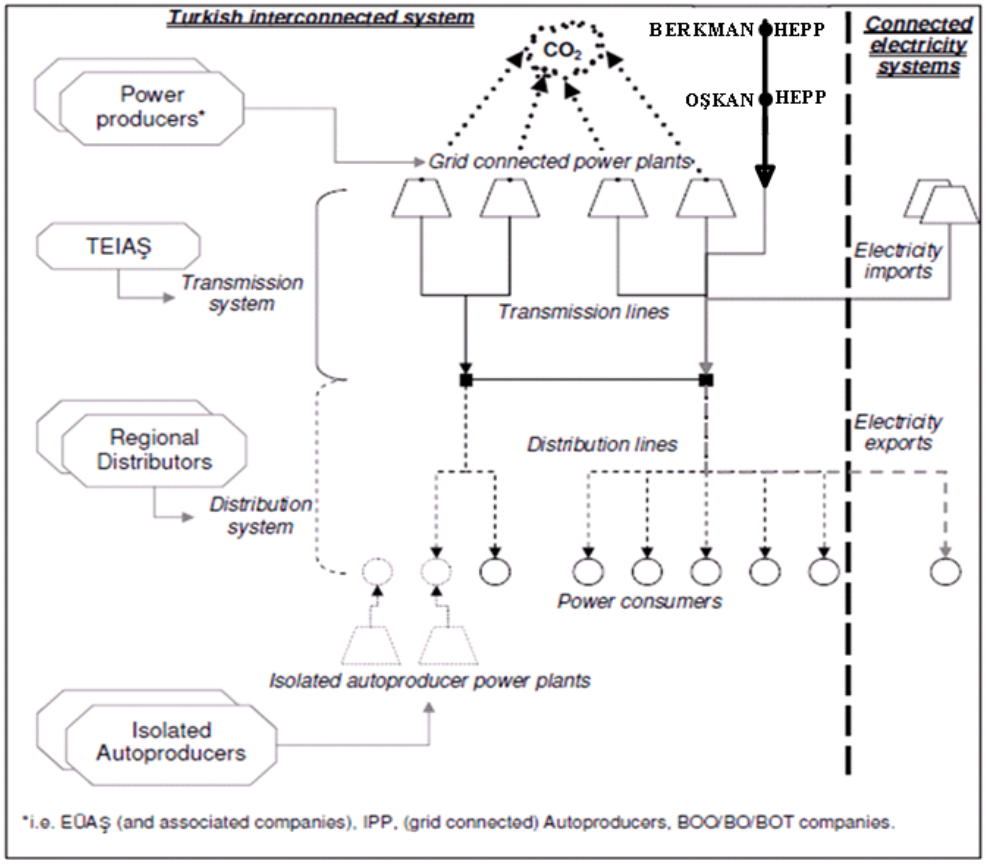
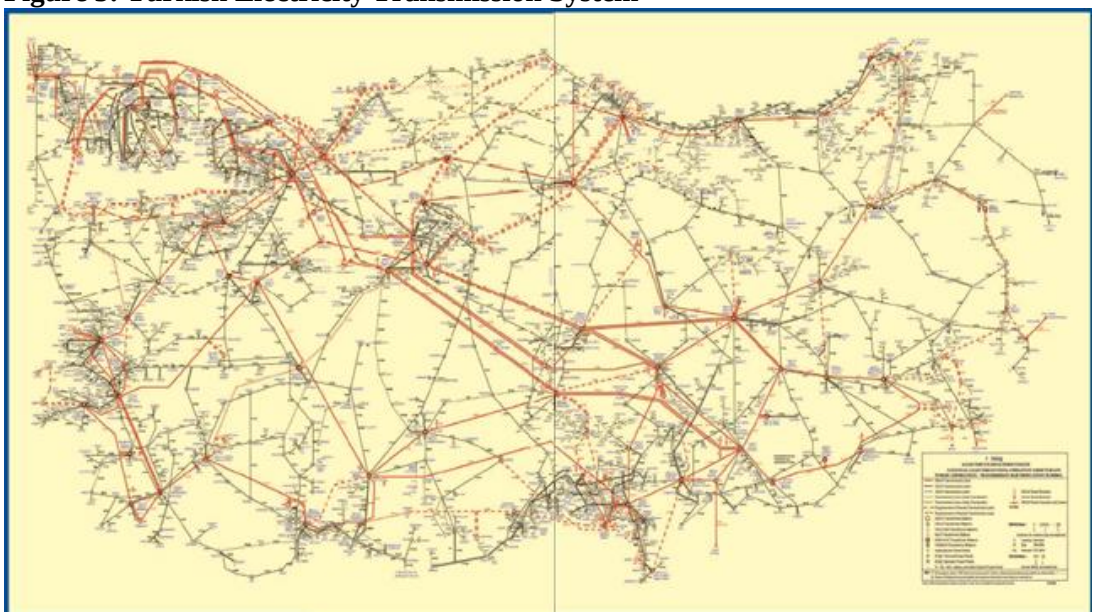


Figure 5: Turkish Electricity Transmission System[26]



[26] http://www.teias.gov.tr/Faaliyet2008/2008%20faaliyet%20raporu%20ingilizce.pdf **(pages: 10/11)**

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

Identification of the Baseline Scenario:

According to the methodology ACM0002 v12.1.0, the baseline scenario for the project is defined as *"Electricity delivered to the grid with the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations as shown in the "Tools to calculate the emission factor for an electricity system."*

Turkish electricity generation has been predominantly from thermal power plants and the role of renewable resources, As Turkey is an advanced developed country energy demand is on a rapid surge which is expected to continue in the foreseeable future.

In order to meet the ever growing energy demand in Turkey there has been a tendency to build thermal power plants and this is likely to be so in the future because of the neglect of the alternative energy resources. Turkey as an advanced developing country has concentrated on developing and constructing high capacity coal and natural gas power plants as alternatives to its future energy security. The development of thermal power plants has been also encouraged by the availability of large natural resources, especially the abundance of economically accessible lignite. Until 2008, the electricity of the Turkish National Grid had been generated mainly from fuel-fired power plants dominating 67.7% of electricity generation while renewable energy power plants were 32.3%. The installed capacity of fuel-fired power plants accounted for 66% while the installed power of the hydro power plants occupied 32.9%. The "Ninth Five-Year Development Plan" also focuses on fuel-fired power and nuclear power. Thus, the fuel-fired power plants are likely to remain dominant in the Turkish National Grid in the near future

In the absence of the proposed activity, the energy replaced by the project would have been supplied by the current power plants or by increasing number thermal powers, ultimately exacerbating current GHG emissions.

Figure 6: Peak Load and consumption projection for Turkish electricity system between 2005-2020[27]

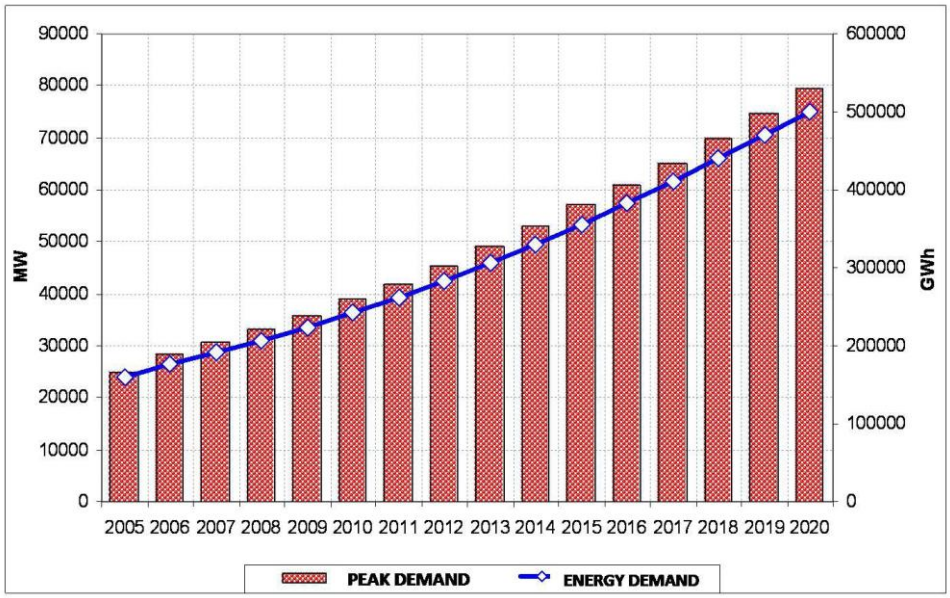
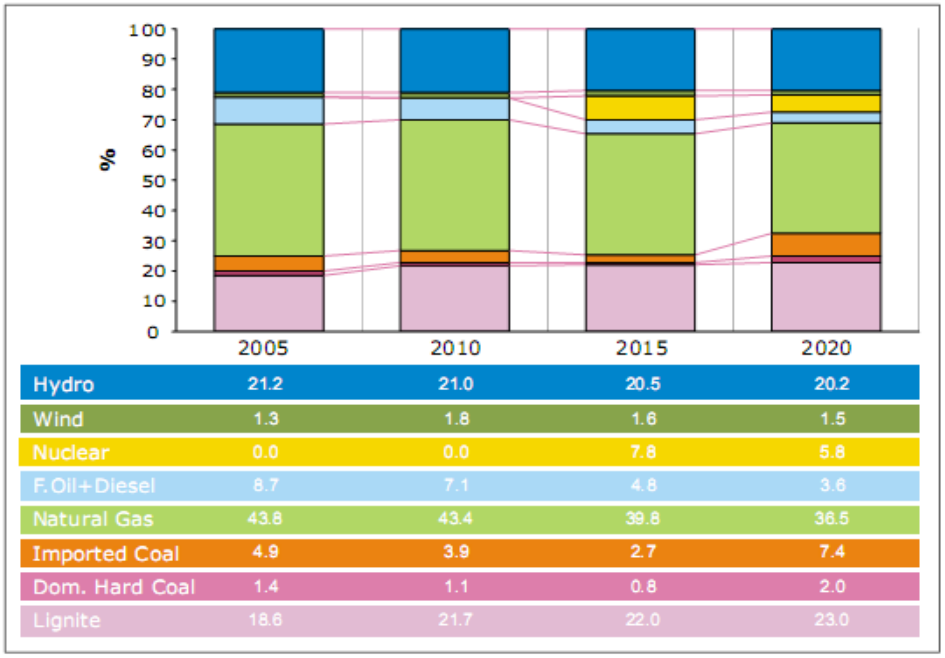


Figure 7: The proportion of fossil fuels in Turkish electricity mix[28]



	2005	2010	2015	2020
Hydro	21.2	21.0	20.5	20.2
Wind	1.3	1.8	1.6	1.5
Nuclear	0.0	0.0	7.8	5.8
F.Oil+Diesel	8.7	7.1	4.8	3.6
Natural Gas	43.8	43.4	39.8	36.5
Imported Coal	4.9	3.9	2.7	7.4
Dom. Hard Coal	1.4	1.1	0.8	2.0
Lignite	18.6	21.7	22.0	23.0

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

[28] http://unfccc.int/resource/docs/natc/turnc1.pdf (p 124)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered VER project activity (assessment and demonstration of additionality):

According to the applied methodology (ACM0002, version 12.1.0) the baseline scenario for the project has been identified as "generation of equal amount of electricity by the power plants connected to the grid". Emission factor for the baseline scenario has been calculated according to the combined margin approach as defined by the selected methodology. Within this framework the projects is expected to generate about 239.946 GWh electricity and about 147,566 tons of CO_2 emissions through replacing the electricity that would have been supplied by the national grid in the absence of the project activity. Additionality of the proposed project has been assessed according to the applied tool for demonstration of additionality as shown in following steps. Although the renewable energy projects are not very common and are very costly in Turkey, most of all the energy investment projects need financial support other than equity capital and only by this way, the investment return period can be shortened.
After the completion of the Feasibility Studies and according to the cost analysis the project owner received a bank loan to start the project implementation. But between the First Feasibility Study Report date 2003 and electromechanical contract with ALSTOM in 2007, the prices of electromechanical equipments and iron used for the construction increased unexpectedly high.

Because of these unexpected cost increases, and because the project implementation was in a point of no return the project owner had to receive a second bank loan. At this stage, the project owner was suggested to search for financial support from the VER revenues because otherwise with all these paybacks, the whole investment would be a total loss. Therefore, the VER revenues have been considered seriously in the decision to proceed with the ongoing project and were one of the most important decision-making factors for the project owner.

The following steps are used to demonstrate the additionality of Ceyhan Project according to the "Tool for the demonstration and assessment of additionality Version 05.2":

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 three realistic and credible alternatives for the project activity are:

1. Proposed activity not undertaken as a VER project activity
2. Continuation of the current situation – with electricity provided by the existing Grid.
3. Construction of a thermal power plant with the same installed capacity or the same annual power output.

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

The last alternative is the most plausible alternative to the project activity as the growth of thermal power plants has increased and is expected to continue to increase disproportionately in the future as the demand for electricity is predicted to double from the current level of approximately 40,000 MW to 79,000 MW by 2020.

Outcome of step 1a

Continuation of the current situation is not considered plausible alternative because of an increasing demand therefore the first and the third alternatives are more viable.

Sub-step 1b Consistency with mandatory laws and regulation

The following applicable mandatory laws and regulations have been identified.

1. Electricity Market Law[29]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[30]
3. Energy Efficiency Law[31]
4. Forest Law[32]
5. Environmental Law[33]
6. Regulation on procedures and principles of signing the agreement of utilisation of water resources for the purpose of electricity production in the electricity market[34]
7. Regulation on Environmental Impact Assessment[35]

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 project finance. CEYHAN HEPP project has been financed through loans from commercial banks and the company's resources.
The '*Tool for the Demonstration and Assessment of Additionality',* version 05.2, from EB39, lists three possible analysis methods:

Sub-step 2a. Determine appropriate analysis method

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

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

[30] Law number 5346, enactment date 18/05/2005 http://www.eie.gov.tr/duyurular/YEK/YEK_kanunu.html

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

[32] http://www.resmi-gazete.org/6831/ Law number 6831, Available upon the request of DOE

[33] http://www2.cevreorman.gov.tr/yasa/k/2872.doc Law number 2872

[34] National Gazette number 25150, 06/06/2003

[35] National Gazette number 26939, 17/07/2008

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

The simple cost analysis method is not appropriate because the project generates economic benefits not only from CDM but also from sales of electricity. The investment comparison analysis is also not applicable for the proposed project, as the project owner has no investment options to compare with. The baseline scenario of the proposed project is the Turkish National Grid rather than a similar investment project alternative to the proposed project, so investment comparison analysis method is not appropriate. Hence, it has been decided to use benchmark analysis for evaluation of the project investment.

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

According to the "Tool for the demonstration and assessment of additionality", version 05.2, from EB39, a relevant benchmark for a Project's IRR can be derived from government bond rates that have been increased by a suitable risk premium (to reflect private investment and/or project type).

Government bond rate in US dollar in Turkey (also known as risk free rate) was 6.96 %, according to a Turkish state bank statics of 2007[36].
On the other hand risk premiums mirror the conditions in the country where the investment takes place and reflects the credibility of that country.
Turkey's risk premium in 2007 is 5.4%[37] according to the statics published by a respected American university.

Energy sector in Turkey has gained a momentum only during the last couple of years and therefore a reliable risk Premium related to hydro projects could not be identified because of limited data on this sector. Energy investments in Turkey inherit more risks than other sectors of economy. Hydro projects on the other hand are more vulnerable to performance risks as they are bound to climatic conditions. Furthermore the initial capital cost of hydro power in all over the world is more than conventional thermal power technology and there is a significant low rate of return as the load factor for hydro plants is much less than conventional thermal power plants. Therefore a 5.4% risk premium can be considered as conservative as a realistic risk premium for hydro projects would be higher.

Therefore, a realistic equity benchmark IRR for this type of project should be greater than the base investment threshold (Turkey government bonds) *plus* a risk premium, which, given the actual figures referenced, is greater than 6.96 + 0.85[38] * 5.4 = 11.55

[36] http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx
[37] http://pages.stern.nyu.edu/~adamodar/pc/archives/ (ctryprem05.xls)

[38] Market beta: 0.85. As there is no published market beta analysis for energy investments in Turkey this beta is calculated by the data of last 9 years of 4 biggest energy firms in Turkey. This calculation can be submitted upon the request by the DOE.

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

1- The main parameters used for evaluation of the investment are as follows:

Table B.2: Financial parameters used in investment analysis

Installed Capacity[39]	61.704 MW
Grid Connected Output[40]	239.946 GW/h
Total Investment[41]	103,101,436 €
Loan[42]	67,372,969 €
Income Tax[43]	20%
Expected VER Price[44]	6 Euro t/CO2e

2- Results of the financial analysis:

Table B.3 includes the results of the financial analysis for the Project, at the time that the decision to go ahead was made, both with and without VER financing. The IRR of the Project without VER financing was lower than the applicable benchmark rate of return. This therefore indicates that in comparison to alternative investments, the Project was financially unattractive in the absence of VER financing.

Table B.3: Summary of Project investment analysis without and with VER financing.

	Without VER	With VER
Equity IRR (%)	6.52	7.91

3- Comparison of IRR for the proposed project to the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the project IRR, are lower than the benchmark, the proposed project is not considered financially attractive.

Table B.3 highlights the project IRR with and without carbon revenues. Without the additional income to the project developer resulting from VER sales, the Equity IRR is 6.52%, which is lower than the financial benchmark. Thus, the proposed project is not financially attractive.

Taking VER revenues into consideration, the Equity IRR increases to 7.91%. While the IRR with VERs remains lower than the financial benchmark of 11.55, the Project Developer will also benefit from the following intangible benefits that VERs provide:

[39] Electricity License issued by EPDK (Electricity Market Regulatory Authority)

[40] Average annual generation projection of 20 years.

[41] Financial Studies with the bank

[42] Financial Studies with the bank

[43] http://www.worldwide-tax.com/turkey/turkey_tax.asp

[44] Ecosystem Marketplace State of the Voluntary Carbon Markets 2009 (pg. 42 figure20)

- Development of international partnerships through the turbines provider, which positively affect investors confidence

- Enhanced corporate green image of the project developer through its contribution to the a clean source of electricity and the diversification of electricity sources in Turkey, which broadens stakeholder confidence

Sub-step 2d. Sensitivity analysis

According to "Tool for the demonstration and assessment of additionality" Version 05.2 only variables (including initial investment cost) that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For the proposed project, five parameters have been identified:

- **Investment Cost**
- **Operating Cost**
- **El. Sale Revenue**
- **Construction Cost**
- **Electromechanical Cost**

For a range of ±10% fluctuations in parameters above, the below has been obtained.

	%Fluctuation						
	-10	**-5**	**-2.5**	**0**	**2.5**	**5**	**10**
Investment cost	7.35	6.95	6.74	6.52	6.30	6.07	5.59
Operation and Maintenance cost	6.68	6.60	6.56	6.52	6.48	6.44	6.37
El. Sale Revenue	4.30	5.44	5.98	6.52	7.05	7.56	8.57
Construction cost	6.90	6.72	6.62	6.52	6.42	6.32	6.12
El. mechanical cost	6.86	6.69	6.61	6.52	6.44	6.35	6.17

These variations do not reflect a realistic range of assumptions for the input parameters of the financial analysis as detailed:

- **Investment cost**

After a %10 decrease on investment cost the project IRR does not reach the benchmark IRR and the project IRR becomes %7.35 after a such decrease. On the other hand it is much more likely hydro power projects will experience cost increases rather than cost decreases during construction. During the period between the Initial Feasibility Report (2003) and the Revised Feasibility Report (2008), concrete and iron prices soared due to the economic fluctuations in Turkey. The unexpected price increase on iron simultaneously triggered increase on the price of related items. The increase on the price of iron within the first five months of 2008 is % 89.67. Moreover between February 2006 and May 2008 the overall increase rate of iron price is % 186.06.[45] The other construction barriers that the project faced were the

[45] http://www.kardemir.com/turkce/fiyatlar/index.html

miscalculation of the slope level and the unexpected clay formation in the location of the Berkman HEPP which made the spillway installation harder. These additional construction barriers required significant amount of extra finance and the project owner had to resort to a bank loan in order to be able to complete the project's construction.
Therefore a decrease much more than %10 on investment cost seems highly unrealistic and the IRR is not likely to reach the benchmark IRR of 11.55.

- **Operation and Maintenance cost:**

As observed from the analysis a %10 decrease on operation and maintenance costs rises project IRR to 6.68 which is far below the benchmark IRR. Therefore as the two plants will be in full operation until the end of their lifetime there will always be maintenance and operation costs. Therefore it is unrealistic to assume a decrease more than %10 on O&M cost.

- **Electricity Sale Revenue:**

The expected electricity of the proposed project is calculated based on the decades of hydrological flow statics of the river. Thus it is highly unlikely to reach benchmark IRR with an increase on electricity generation as the generation potential of both plants have been made with the help of historical data and calculations.

Moreover, the current law "Law on Utilisation of Renewable Energy Resources for the Purpose of Generating Electricity Energy 18/05/2005"[46] guarantees the purchase of electricity generated from renewable resources for a fixed 7 year period. The law states that the tariff should be average wholesale price determined by the Electricity Market Regulatory Authority.
Energy Efficiency Law[47], on the other hand, extends purchase guarantee from renewable energy plants from 7 to 10 years commenced operation before 2012 at a price of €.05 - .055/kWh. However the same article enables renewable energy producers sell the electricity above the threshold if such possibility exists in the market.

According to annual report of EMRA in 2007 average wholesale electricity price was determined as 5.4 Euro cents /kW/h (9.67 Turkish Kurus = 5.4 Euro cents according to exchange rate on 17/12/2007[48])

"As per the provisions of the Law on Use of Renewable Resources for Electricity Generation Purposes, the average wholesale electricity price was determined to be 9,67 YKr/kWh for 2007 by the Board Decision dated 17.12.2007 and numbered 1424/38, and announced to the public."[49]

Therefore purchase guarantee and electricity tariff are not sufficient incentives for hydro projects to be able to competitive with thermal power plants without the revenues of VERs or other incentives. As run-of-river hydro power plants do not have control over their output generation as much as thermal power plants which can match their generation to meet the market demand and to receive a higher tariff at peak demand. Hence it is very unlikely that the tariff will increase to enable this project reach the benchmark IRR of 11.55.

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[46] http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf

[47] http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc

[48] http://www.tcmb.gov.tr/yeni/eng/

[49] ENERGY MARKET REGULATORY AUTHORITY ANNUAL REPORT 2007

http://www.epdk.gov.tr/english/Announcments/announcments.htm

- **Construction and electromechanical cost**

As stated at construction barrier section there has been a price increase rather than a decrease on construction materials such as the % 186.06[50] price surge on iron prices between February 2006 and May 2008.
A %10 decrease on electromechanical costs increases project IRR to 6.90. Therefore as the project uses state of the art technology it is highly unlikely to expect a more than %10 decrease on these equipments to reach benchmark IRR of 11.55.

Step 3. Barrier Analysis

This step is used to determine whether the proposed project activity faces barriers that:
a) Prevent the implementation of this type of proposed project activity; and
b) Do not prevent the implementation of at least one of the alternatives.

The following sub-steps are pursued:

Sub-step 3a. Identify barriers that would prevent the implementation of the type of the proposed VER project activity

(a***) Investment barriers*:**

There is a lack of incentives for renewable energy projects in Turkey. The benefit of carbon market is that it helps such projects to be viable and allows the investor to overcome investment barrier. Following are the barriers apply to hydro projects in Turkey.

- ***High level of financing and long payback period***

In general, HEPP unit capital investment costs are much higher than those of alternative (in terms of power output) thermal power plants. According to US Energy Information Administration in the electric power sector capital costs are generally lower for generating plants that use fossil fuels than for plants that use nuclear or renewable fuels.[51] This high initial investment cost leads to a long payback period and a higher investment risk on project financing which makes it difficult to source loans from banks and other lenders.

On the other hand capital cost for a conventional hydropower in 2007 in the USA was 1500$/kW whereas it is 603$/kW for a conventional gas/oil combined cycle.[52] Ceyhan HEPP project is a capital intensive project around 2,436$ per kW (150,352,823$[53] / 61.7 MW)

Another important issue is that even though hydropower plants use cheap and renewable fuel source they have low capacity factor compared to Gas Turbine Combined-Cycle plants (44% vs. 80-90% respectively)[54] thus making the cost hydro energy more expensive.

[50] http://www.kardemir.com/turkce/fiyatlar/index.html

[51] www.eia.doe.gov/oiaf/aeo/pdf/0383(2008).pdf pg.40

[52] www.jcmiras.net/surge/p130.htm

[53] Total investment amount for both projects. (103,101,436 € investment amount has been converted to US dollar for comparison)

[54] www.jcmiras.net/surge/p130.htm

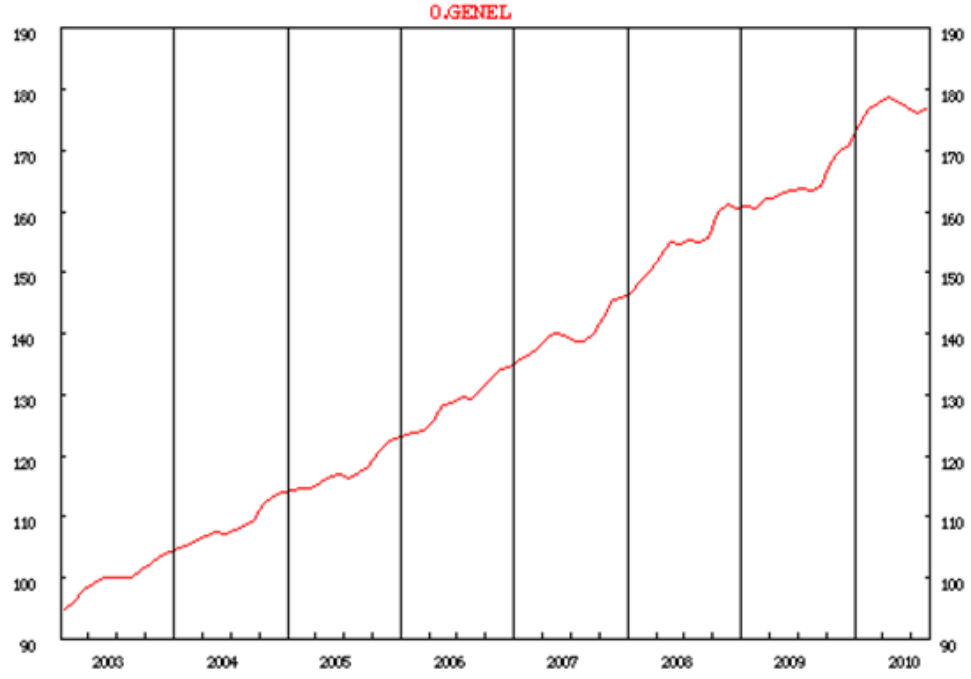
- ***Low project IRR***

The IRR of the project without VER revenues is too low in financial aspects.

- ***Country Risk***

Despite the evident macroeconomic progress that Turkey has been experiencing, the country's inflation rate[55] and financial markets remain unstable, rendering Turkey less attractive for long-term investments such as hydro power. As seen on Figure 8 consumer price index there is not yet a stable indicator for Turkish economy.

Figure 8: consumer price index of Turkey between 2003 - 2010[56]



[55] http://www.tcmb.gov.tr/research/parapoli/inflation2009IV.pdf

[56] http://evds.tcmb.gov.tr/cbt.html

Figure 9: The inflation rate in Turkey between the years 1997 and 2009.[57]

Year	Inflation (%)
1997	85.7
1998	84.6
1999	64.9
2000	54.9
2001	54.4
2002	45.0
2003	25.6
2004	11.1
2005	2.7
2006	11.6
2007	5.9
2008	8.1
2009	6.5 (est)

- ***High Fluctuation in the Exchange Rate***

65.3% of the total investment cost of the project is provided by bank loans in US Dollar. High fluctuation rate between US dollar and Turkish Lira creates another important risk for the project.
Below the fluctuation rate can be observed within the years between 2001 and 2008[58].

Table B.4: Yearly US Dollar – Turkish Lira fluctuation rate between 2001 and 2009.[59]

Year	**January**	***December***	***Yearly fluctuation %***	***Average Fluctuation Rate %***
2001	**0.671**	**1.455**	***+116.8***	
2002	**1.375**	**1.549**	***+12.6***	
2003	**1.663**	**1.435**	***-13.7***	
2004	**1.348**	**1.389**	***+3***	***23.1***
2005	**1.348**	**1.345**	***-0.2***	
2006	**1.327**	**1.426**	***+7.4***	
2007	**1.419**	**1.173**	***-17.3***	
2008	**1.171**	**1.541**	***+31.5***	
2009	**1.595**	**1.500**	***-5.9***	

Exchange rate January – December comparison. 1 US dollar = x Turkish Lira

[57] http://www.worldwide-tax.com/turkey/tur_inflation.asp

[58] http://evds.tcmb.gov.tr/yeni/cbt-uk.html

[59] http://stats.oecd.org/Index.aspx

- ***Grid Usage Fee***

Grid usage fee is defined by TEIAS and this amount is determined by the installed capacity of the plant, not the actual generation of the plant[60]. When compared with thermal power plants that use much of their installed capacity i.e. (68-90%)[61], hydropower plants use only average 44% of their installed capacity which turns out to be a real disadvantage for hydro power investors.

- ***Construction barriers***:

In addition to the investment barrier mentioned above, a specific barrier faced by the project is the construction barrier. During the period between the Initial Feasibility Report (2003) and the Revised Feasibility Report (2008), concrete and iron prices soared due to the economic fluctuations in Turkey. The unexpected price increase on iron simultaneously triggered increase on the price of related items. The increase on the price of iron within the first five months of 2008 is % 89.67. Moreover between February 2006 and May 2008 the overall increase rate of iron price is % 186.06.[62] The other construction barriers that the project faced were the miscalculation of the slope level and the unexpected clay formation in the location of the Berkman HEPP which made the spillway installation harder. These additional construction barriers required significant amount of extra finance and the project owner had to resort to a bank loan in order to be able to complete the project's construction. (Table B.5)

Table B.5: Initial and revised construction cost estimates of Berkman and Oşkan HEPPs[63]

OŞKAN & BERKMAN HEPP BUDGET					
		(A) INITIAL PROJECT AMOUNT (TL) (February 2006)		(C) REVIZED AMOUNT (TL) (March 2008)	RATE OF INCREASE C/A %
1)	OŞKAN HEPP CONSTRUCTION COST	19,582,495.00		41,578,531.55	112.32
2)	BERKMAN HEPP CONSTRUCTION COST	22,819,872.00		49,661,431.03	117.62
3)	PROJECT EXPENSES	2,450,934.00		2,250,000.00	-8.20
4)	TRANSMISSION LINE COST	2,913,750.00		2,100,000.00	-27.93

[60] http://www.epdk.gov.tr/english/Tariffs/Transmission.html

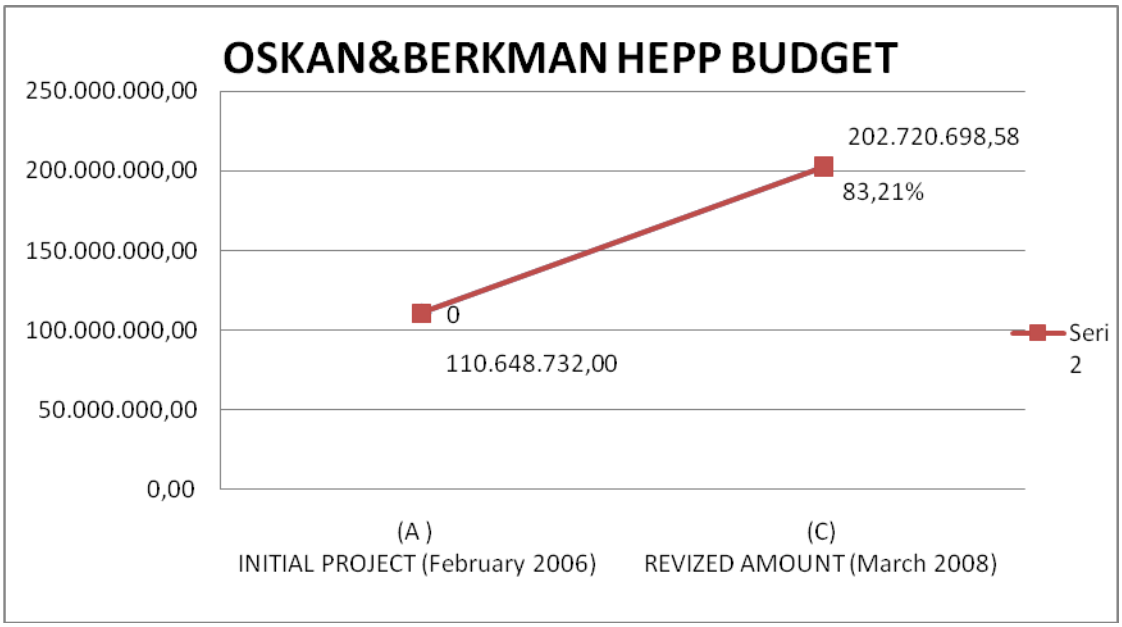
[61] www.jcmiras.net/surge/p130.htm

[62] http://www.kardemir.com/turkce/fiyatlar/index.html

[63] Available upon DOE request.

5)	NATIONALISATION	4,500,000.00		6,500,000.00	44.44
6)	SITE OF CONSTRUCTION	451,310.00		2,500,000.00	453.94
7)	WATER USE RİGHT AGREEMENTS	22,000,000.00		22,835,000.00	3.80
8)	ELECTROMECHANIC EQUIPMENT 37.647.868€ * 2 YTL/€	32,040,000.00		75,295,736.00	135.01
9)	OTHER COST	3,890,371.00			-100.00
	TOTAL	110,648,732.00		202,720,698.58	83.21

Figure 10: The difference between the initial and revised feasibility reports of Ceyhan Project in Turkish Lira (TL)[64]



[64] Feasibility Study

Technical Barriers

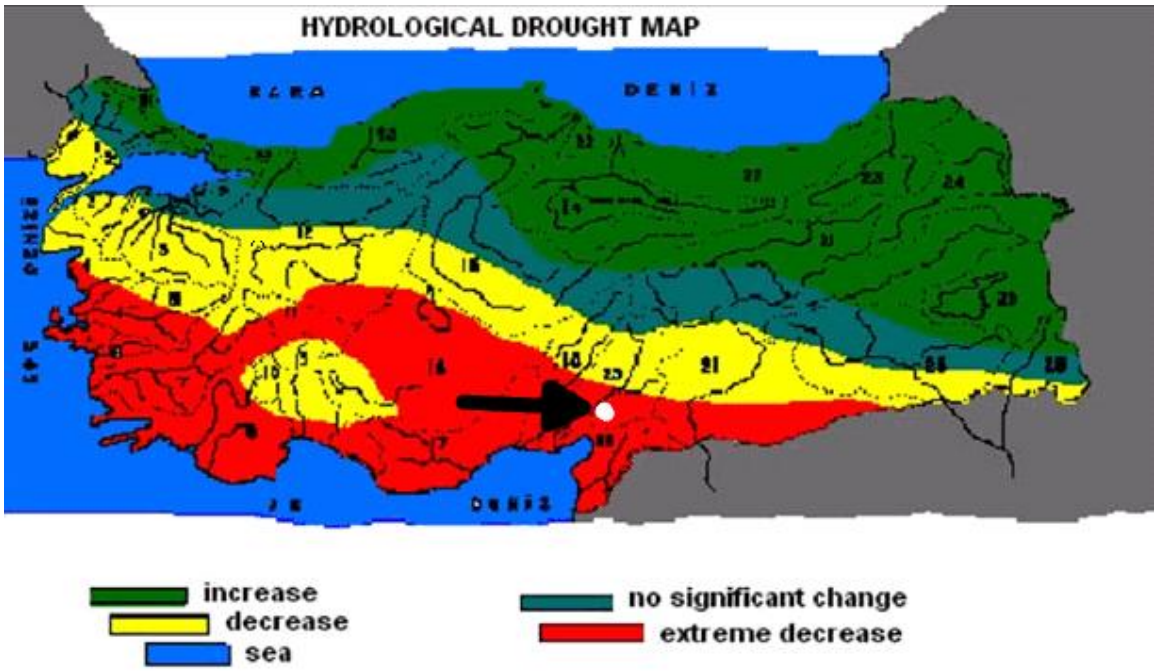
- **Climatic conditions**

Since Turkey is located in the Mediterranean macroclimate region in the sub-tropical zone, great rainfall variations can be seen between the years. This causes regional and widespread droughts in various intensities. Thus, drought is one of the main problems for Turkey[65] As hydroelectrical power plants are solely dependent on water and thus changes in rainfall and also uncertainty of the effects of Global Warming makes the implementation such project more unfeasible in the future. Such climatic obstacles such as decrease in rainfall and drought put in danger the future and the profitability of these projects.

Drought map below illustrates the drought potential of the project location. It has been seen that river flows are decreasing according to the long-term average over most parts of Turkey. Moreover, in 1915, the 1930s and between 1970 and 1974, Turkey experienced serious drought hazards. Also, 1988 and 1989 were the hardest drought years for the south-eastern Anatolia Region. The flow of the Euphrates River decreased to 50 m^3/s in these drought years.[66]

On the other hand %11.8 population growth rate[67] in 2007 means water resources of Turkey will be more vulnerable as more water is needed and this puts Turkey among the countries experiencing a noticeable growth in water demand.

Figure 10: Hydrological Drought Map of Turkey

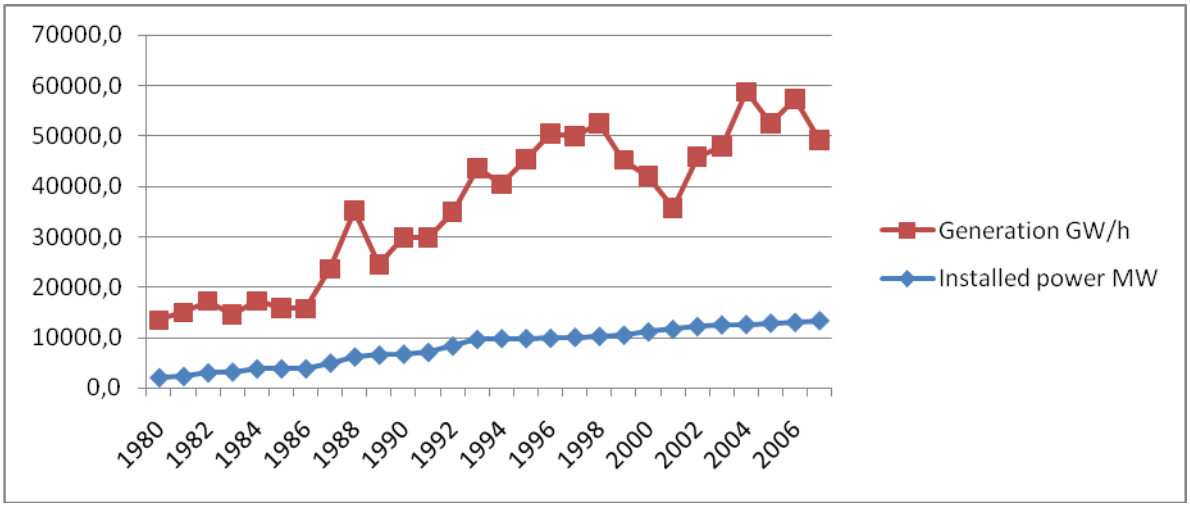


[65] http://www.wmo.int/pages/publications/meteoworld/archive/june09/turkey_en.html

[66] http://www.wmo.int/pages/publications/meteoworld/archive/june09/turkey_en.html

[67] http://www.turkstat.gov.tr/PreIstatistikTablo.do?istab_id=243

Figure 11: Volatility of electricity generation from hydro power in Turkey - installed capacity vs. generation.[68]



Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

The barriers mentioned above are all related to hydro power plants. They have minimal relevance or effect on the alternatives mentioned in the baseline methodology of ACM0002 v12.1.0, electricity generation by existing thermal power plants. Therefore the project is more vulnerable to barriers and faces considerable investment and technical barriers that would affect the implementation of such projects without VER revenues.

Barrier evaluated	**Alternative 1** Proposed activity not undertaken as a VER project activity	**Alternative 2** Continuation of the current situation – with electricity provided by the existing Grid.
Investment barriers	Applicable	The Grid is not subject to investment barriers as there is no investment is needed to continue the current situation.
Technical barriers (Climatic conditions)	Applicable	Grid is or thermal power plants are not climate dependent and therefore less affected by climatic conditions.
	The project is deemed to be additional.	Baseline scenario

[68] http://www.teias.gov.tr/istatistik2008/13.xls The graph has been prepared based on the data of TEIAS

Step 4. Common practice analysis

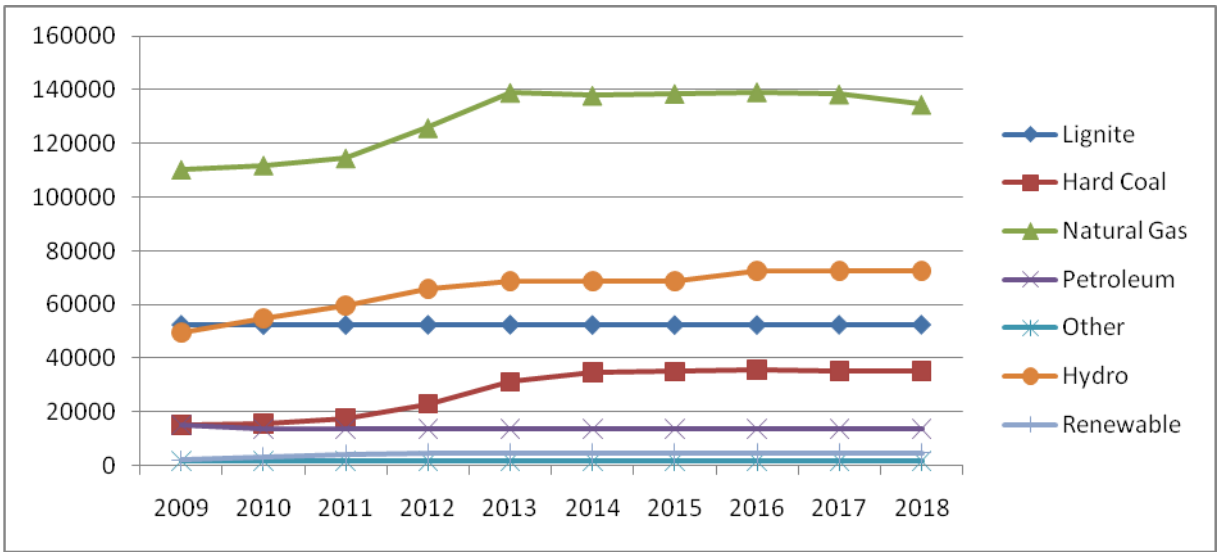
Sub-step 4a. Analyse other activities similar to the project activity

Many of the hydro projects that are operational in Turkey are either operated by EUAS[69] (Electricity Generation CO. INC) or DSI[70] (General Directorate of State Hydraulic Works), which are government bodies, or had been contracted as build-operate-transfer (BOT) or build-operate (BO) projects which have a government guarantee to be eventually purchased. On the other hand according to the reports of TEIAS (Turkish Electricity Transmission Company) the foreseeable supply of the grid will be via power plants which are mainly fossil fuel powered (covering more than 70% of overall electricity supply).[71] Therefore hydro power investment is likely to continue in a rather slow pace.

A state body, Turkish Electricity Transmission Company (TEİAŞ) made two ten year energy production capacity projections giving an insight on the future of alternative energy sources. It can been seen in the graphs that the electricity production is fossil fuel based and it is projected to remain so in the near future. Natural gas is the dominant energy source and will be so in the next ten years with a slight rise within a couple of years then keeping rather a stagnant pace.

According to two projections the use of emission intensive hard coal is expected to rise, almost doubling. Petroleum based energy generation is projected to be the same in the next ten years.
The share of other renewable sources i.e; wind, geothermal and biomass in the next ten year projection is negligible.

Figure 12: Total Energy Production Capacity between 2009 and 2018 Scenario 1 by Teiaş.[72]



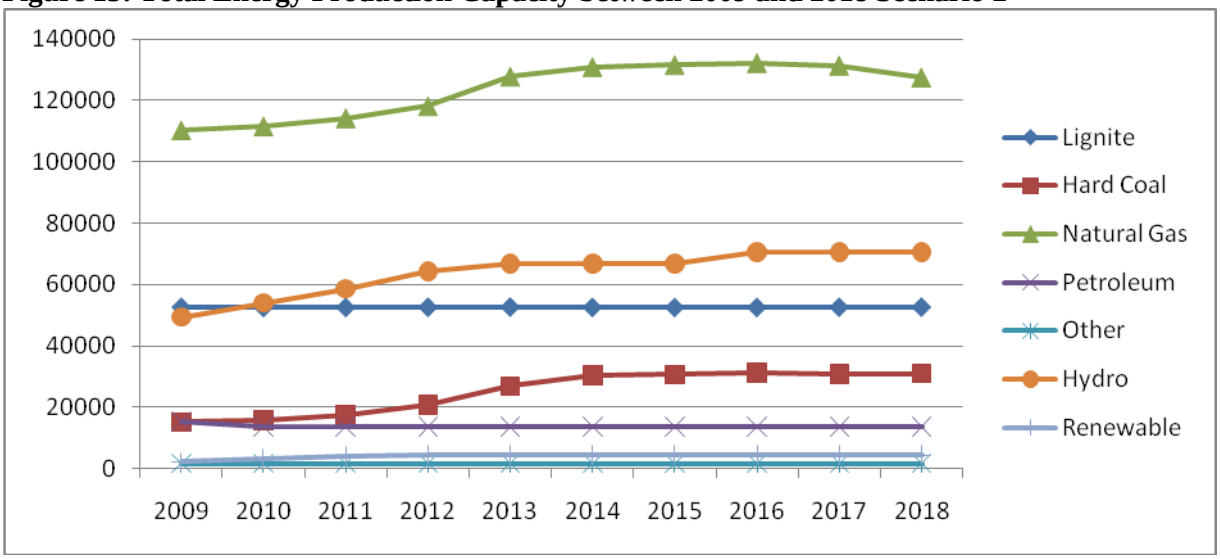
[69] http://www.euas.gov.tr/_EUAS/Images/Birimler/apk/YILLIK%20RAPORLAR/2008_yillikrapor.pdf

[70] http://www.dsi.gov.tr/english/topraksue.htm

[71] http://www.teias.gov.tr/istatistik2008/1.xls

[72] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page: 32, 38) the graph has been generated from the data of TEIAS.

Figure 13: Total Energy Production Capacity between 2009 and 2018 Scenario 2[73]



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

The share of hydroelectric power is stagnant and not inclined to have a rapid rise in the future due to the changes in government's economic policies which encourages private companies to make investments in energy generation in order to ease the load of the state on electricity via privatization or built operate and transfer system. Therefore, new investments have mainly preferred thermal power plants which start operation in comparatively short time and require lower investment cost and use conventional technology. Installed capacity of thermal power plants has increased from 13,021.3 MW in 1998 to 27,595 in 2008 whereas the capacity of hydroelectric has only increased from 10,306.5 MW to 13,828.7 in the same time span, which is an illustration of energy production tendency in Turkey.[74]

Additionally private companies have mainly preferred to invest in thermal power plants which can be commissioned in shorter time periods, require lower initial investment and uses conventional technologies. Installed capacity of thermal power plants owned by generation companies has increased from 123.4 MW to 9576.0 MW[75] between 1996 and 2005[76] whereas privately owned hydro plants' installed capacity rose from 75.3 to 1203.5 MW in the same period which shows that private companies find it more attractive to invest in thermal power plants. According to the latest data obtained from TEIAS thermal capacity of private companies is 11208.9 in the year 2008 and the capacity of private renewable plants, including wind, geothermal and hydro is 2,185.5 MW[77]. For private companies, project profitability, financial return on equity, funding costs and other commercial risk factors are considered as being the most important decision making aspects. The figure below highlights the proportion of private owned electricity generation from hydro power plants and given the past and continuing weight and presence of the Government influence, as mentioned and illustrated from the above facts, the proposed type of project is not considered as a common practice.

[73] http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page: 32, 38) the graph has been generated from the data of TEIAS.

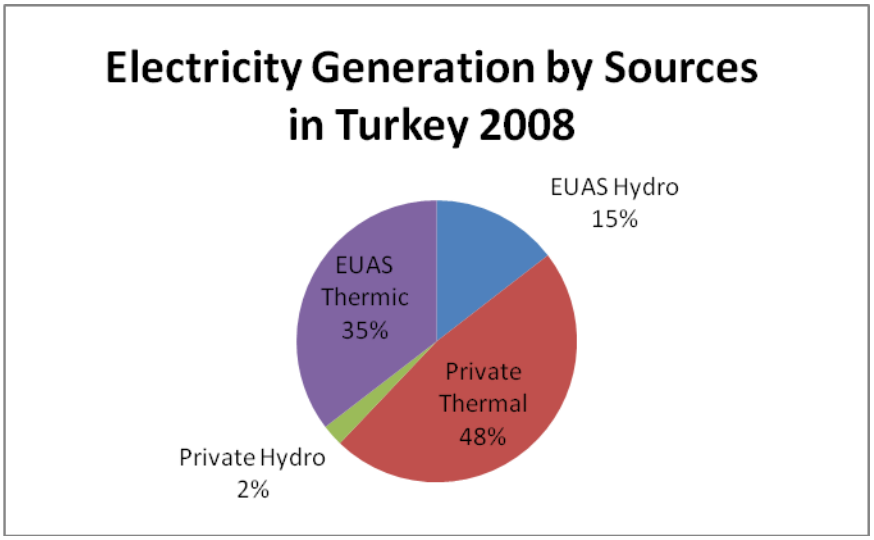
[74] http:// http://www.teias.gov.tr/istatistik2008/1.xls

[75] http://www.teias.gov.tr/istatistik2008/5(1984-05).xls

[76] There is no unique data for hydro plants the years 2006, 2007 and 2008 in this respect.

[77] There is no unique data for hydro plants the years 2006, 2007 and 2008 in this respect

Figure 14: the distribution of electricity generation by primary energy sources and electric utilities in Turkey in 2008[78]



Similar Projects in the Selected Area:

According to feasibility report of Ceyhan HEPP the table below shows the list of Dams and HEPPs on Ceyhan River and on its tributaries. All mentioned Dams and HEPPs belong to the State Hydraulics Works and none is a run-of-river HEPP. Detailed data on these facilities are available at the link.[79] The list and details of these facilities are as follows:

Table B.6: Hydrological Facilities on Ceyhan River

Facility	Purpose	Type	Height (m)	Installed Power (MW)
Adatepe Dam	Irrigation	Rock	95.00	-
Menzelet Dam and HEPP	Irrigation and Energy	Rock	156.50	124.00
Kılavuzlu Dam and HEPP	Irrigation and Energy	Earth	59.00	54.00
Kartalkaya Dam	Irrigation and drinking water	Earth	57.00	-
Sır Dam and HEPP	Energy	Concrete abutment	116.00	284.00
Berke Dam and HEPP	Energy	Thin abutment	201.00	510.00
Aslantaş Dam and HEPP	Irrigation + flood prevention + Energy	Earth	95.00	138.00

[78] http://www.teias.gov.tr/istatistik2008/41.xls The graph has been generated from the data on TEIAS web page.

[79] http://www.dsi.gov.tr/baraj/baraj_arama.cfm

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the methodology ACM 0002 v12.1.0, the baseline emission factor is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) emission factor by utilizing an ex-ante 3 years data vintage for the National Turkish Grid, then the baseline emission (BE_y in tCO_2) is the product of baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied to the grid by the project activity (EG_y in MWh).

In accordance with the methodology, the Combined Margin is deemed to represent the tCO_2/MWh that would have been emitted in the absence of the project activity According to the "Tool to Calculate the Emission Factor for an Electricity System", Version 2, the following four methods are applicable to calculate the operating margin:
Step 1 – Calculation of the Operating Margin Emission Factor (OM)
Step 2 – Calculation of the Build Margin Emission Factor (BM)
Step 3 – Calculation of the Baseline Emission Factor (CM)
Step 4 – Calculation of the Baseline Emission (BE_y)

Step 1. Calculate the Operating Margin Emission Factor ($EF_{OM,y}$)

Based on the "Tool to calculate the emission factor" there are four potential methods that can be selected:

A-Simple OM, or
B-Simple adjusted OM, or
C-Dispatch Data Analysis OM, or
D-Average OM

Any of the four methods may be used. However, due to insufficient availability of data, methods (b), (c) and (d) could not be applied. Thus (a) simple OM method is used in calculations. The simple OM method can be used if the low cost/must run resources comprise less than 50% of the total generation capacity of the Turkish Grid. Low cost/ must run resources comprise resources such as hydro, geothermal, wind, low cost biomass, nuclear and solar generation. It can be seen from the table below that the share of generation by low cost/must run resources is under 50%. Statistics for the most recent available year[80] has been used.

Table B.7 - Electricity Generation Breakdown of the Turkish Grid for the Last 3 Years[81]

	2006	2007	2008
THERMAL (GWh)	131,835.1	155,196.2	164,139.3
LOW COST/MUST RUN (GWh)	44,464.7	36,361.9	34,278.7
TOTAL (GWh)	176,299.8	191,558.1	198,418.0
LOW COST/MUST RUN PROPORTION (%)	25	19	17

Under the Simple OM method, there are two choices for calculating the emissions factor

[80] The most recent available official data is that of 2008 as of October 2010. www.teias.gov.tr

[81] http://www.teias.gov.tr/istatistik2008/32(75-08).xls

- **Ex ante option** which required using a 3-year generated-weighted average CO_2 emissions data per unit net electricity generation (tCO2/MWh) available at the date of submission of the document (not including low cost/must run power units). , based on the most recent data available; or
- **Ex post option** which uses data from the year in which the project activity displaces grid electricity.

Fuel consumption data and net electricity generation data is available for Turkish generating plants and so the ex ante has been selected. For the purpose of these calculations the most recent data for the years 2006-2008 can be found in Annex 3 Baseline information.

According to the methodology, the simple OM emission factor ($EF_{OM,simple,y}$) is calculated as 2006-2008 generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding low- operating cost and must- run power plants. The formula of $EF_{OM,simple,y}$ calculation is;

$$EF_{grid,\ OM\ simple,\ y} = \sum FC_{i,y} \times NCV_{i,y} \times EF_{co2,i,y} / \sum EG_y \qquad (1)$$

Where:

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

$FC_{i,y}$ = Amount of fossil fuel type *i* consumed in the project electricity in year *y* (mass or volume unit)

$NCV_{i,y}$ = Net calorific value(energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)

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

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

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

y = Either three most recent years for which data is available at the time of submission of the VER-DD to the DOE far validation (ex-ante option) or the applicable year during monitoring (ex-post option).

Data about the fuel consumption for electricity generation, electricity generation by fuel type, import and export were obtained from the Turkish Electricity Distribution Company (TEİAŞ) web site[82]. Operating and Build Margin calculations have been based on data for 2006-2008. Other data required for calculation of CO_2 emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories[83]. Details of the data used for the calculations are given in Annex 3. Using the available data and ACM0002

[82] http://www.teias.gov.tr/istatistikler.htm

[83] http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories,

methodology, overall CO_2 production by electricity generation is calculated using IPCC values given in Table B.8 and Table B.9 below.

Table B.8 - Calculation of Emission factors for fuels[84]

	COEF(NCV*EF) (tCO2/kt)	Total Fuel Consumption 2006-2008(tons or 1000m3)	Total Emission 2006-2008 (tCO 2)
Hard Coal+ Imported Coal	2,069	17,917,014	37,070,302
Lignite	625	178,181,751	111,402,359
Fuel Oil	3,014	6,170,427	18,599,320
Diesel Oil	3,101	242,940	753,422
LPG	0	0	0
Naphtha	3,042	35,500	107,977
Natural Gas	1,998	59,099,976	118,104,106
Total Emissions			**286,037,485**

Net electricity generated and supplied to the grid by thermal power plants has been calculated using the data obtained from the TEİAŞ web page[85]. 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. Summing up this with the imported electricity, total supply excluding low-cost / must-run sources are determined as given in table below.

Table B.9 - Net Electricity Generation from thermal power plants (units in GWh)[86]

Year	Gross generation	Net generation	NET/Gross	Gross Gen. Thermal	Net Gen Thermal	Import	Total
2006	176299.8	169543.1	0.96	131835.1	126782.5	573.20	127.356
2007	191558.1	183339.7	0.96	155196.2	148537.8	864.30	149.402
2008	198418.1	189761.9	0.96	164139.3	156978.6	789.40	157.768
				Total Net Thermal Gen.	**432,299.0**	**2226.9**	**434525.8**

Finally, using the data in the previous two tables, OM emission factor considering years 2006 – 2008 has been calculated dividing the total CO_2 emission by total electricity supply to the grid which is (from equation 1) shown above;

$$\mathbf{EF}_{\text{grid, OMsimple, y}} = 286{,}037{,}485\ \mathbf{tCO_2} \ / \ 434{,}525.8\ \mathbf{GWh}$$

$$= 0.658\ \mathbf{tCO_2/MWh}$$

[84] 2006 IPPC Guidelines for National Greenhouse Gas Inventories

[85] http://www.teias.gov.tr/ist2007/31(40-07).xls

[86] http://www.teias.gov.tr/ist2007/31(40-07).xls

Step 2. Calculation of the Build Margin Emission Factor (BM)

The Build Margin emission factor has been calculated ex-ante using the most recent data available.

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

According to the "Tool to calculate the emission factor for an electricity system", Version 02, the sample group of power units *m* used to calculate the built margin consists of either;

- The five power plants that have been built most recently, or
- The set of power capacity additions in electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. If 20% falls on part capacity of a unit, that unit is fully included in the calculations.

From these two options the sample group that comprises of the larger annual generation has been used. List of most recent capacity additions to the grid and their average and firm generation capacities are available at the TEİAŞ web page[87]. For determination of plants that comprise 20% of the system generation, generation in year 2008 which is 198,418 GWh has been taken as reference and its 20% has been determined as about 39,683.6 GWh. Summing up all the plants built in 2008, 2007, 2006 and 2005 together we add up to 37,551.9 GWh for the selected plants.

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

$$EF_{\text{grid, BM, y}} = \sum EG_{\text{m, y}} \times EF_{\text{EL, m, y}} \; / \; \sum EG_{\text{m, y}} \qquad (2)$$

Where:

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

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

$EF_{\text{EL, m, y}}$ = 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.

Data for generation efficiency has been calculated using average values obtained from Environmental Map of Turkey[88] (p197). For LPG and Naphtha whose weights are not very significant, best available techniques (EF_{BAT}) data from European Integrated Pollution Prevention and Control Bureau[89] has been

[87] http://www.teias.gov.tr/istatistik2008/30(84-08).xls

[88] http://www.cedgm.gov.tr/dosya/cevreatlasi/atlasin_metni.pdf (p197)

[89] EIPPCB, Reference Document on Best Available Techniques for Large Combustion Plants, (http://eippcb.jrc.es/pages/FActivities.htm).

used (p405). For EF values of fuels consumed, IPCC default values at lower limit of 95% confidence interval have been used.

Table B.10 – Calculation of emission factor from most recent plants[90].

	EF CO2 (tCO2/Tj	Generation Efficiency %	EFBAT tCO2/MWh
Coal	94.6	33.6%	1.014
Lignite	90.9	32.8%	0.999
Fuel Oil	75.5	35.1%	0.775
Diesel	72.6	27.5%	0.949
LPG	61.6	45.0%	0.493
Naphtha	69.3	45.0%	0.554
Natural Gas	54.3	46.0%	0.425

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

Table B.11 – Distribution of most recent capacity additions by fuel source.[91]

Fuel Source	Generation (MWh)	Percent in overall generation	EF	Weighted EF
Coal	1,125	3.0%	1.014	0.03
Lignite	11,480	30.6%	0.999	0.31
Fuel Oil	99	0.3%	0.775	0.00
Diesel oil	2	0.0%	0.949	0.00
LPG	50	0.1%	0.493	0.00
Naphtha	0	0.0%	0.554	0.00
Natural Gas	20,639	55.0%	0.425	0.23
Renewables and wastes	85	0.2%	0	0.00
Solid	5	0.0%	0	0.00
Total Renewables	4,067	10.8%	0	0.00
TOTAL Capacity additions	37,551.9			**0.572**

[90] Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

[91] Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

Finally, by summing up the weighted EF_{BAT} values, overall Build Margin emission factor has been calculated as:

$$EF_{grid,\ BM,\ y} = 0.572$$

Step 3. Calculate the combined margin emission factor

Based on ACM0002 v12.1.0, weighted average baseline emission factor is calculated as follows:

$$EF_{grid,\ CM,\ y} = W_{OM} \times EF_{grid,\ OMsimple,\ y} + W_{BM} \times EF_{grid,\ BM,y} \qquad (3)$$

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 emission factor (%)

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

The default values of the weights, W_{OM} and W_{BM} , for hydro projects as recommended by the selected methodology are 0.50 and 0.50 respectively. These default values have been used in calculating CM emission factor together without rounding the values of EF_{OM} and EF_{BM}.

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

$$EF_{grid,\ CM,\ y} = 0.50 \times 0.658 + 0.50 \times 0.572 = 0.615$$

Step 4. Calculation of the Baseline Emission (BE_y)

The baseline emissions (BE_y in tCO_2) are the product of the baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid (EG_y in MWh).

$$BE_y = EF_y \text{ x } EG_y \qquad (4)$$
$$= 0.615 \text{ x } 239{,}946 \text{ MW/h}$$
$$= 147{,}566\ tCO_2$$

Project Emission

According to the methodology, as a run-of-river hydropower project, there are no expected project emissions related to the electricity generation. Although the project has a submerged area of 1,621,425.95 m^2 for Oşkan HEPP and 1,648,560.79 m^2 for Berkman HEPP and 3,269,986.74 m^2 in total as the Ceyhan Project (including the flooded land and the river surface area) and the installed capacity is 61.704 MW.

The calculated power density of Oşkan and Berkman is 18.86[92]W/m^2. As the methodology ACM0002 version 12.1.0 says, if the power density of the project is greater than 10 W/m^2, then the PE_y could be neglected.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(1)}$$

Where:

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

Therefore, $PE_y = 0$.

Leakage Emission

According to the methodology, the leakage of the project is not considered. No leakage is expected.

Therefore, $L_y = 0$.

Emission Reduction

Emission reductions will be estimated based on the total CO_2 emissions mitigated by the project. In accordance with the methodology, the project activity reduces carbon dioxide through displacement of grid electricity generation with fuel-fired power plants by renewable-hydro electricity.

The emission reduction (ER_y) due to Ceyhan Project activity during a given year y is calculated as the difference between baseline emissions (BE_y), project emission (PE_y) and emissions due to leakage (L_y). To sum up, the Emission Reductions (ER_y) for the project activity could be calculated as follows:

$$ER_y = BE_y - PE_y - L_y \quad (5)$$

[92] Power density has been calculated according to the methodology ACM0002 Version 12.1.0

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**$F_{i, j, y}$**
Data unit:	m^3 or tons
Description:	Amount of fossil fuel type *i* consumed by the relevant power source *j* in year *y*
Source of data used:	TEİAŞ web page (www.teias.gov.tr)
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is published by the transmission company (TEİAŞ) annually. Data will be used only once for the crediting period.
Any comment:	

Data / Parameter:	**$NCV_{i, y}$**
Data unit:	Tj/kt
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	Calculated using data in TEİAŞ web page using fuel consumption and heating values data.
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local values
Any comment:	Applied in the calculation of the simple OM, where fuel consumption data is available for all power plants.

Data / Parameter:	**$EF_{CO2, i, y}$**
Data unit:	tCO_2/Tj
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is collected from the IPCC
Any comment:	Applied in the calculation of the simple OM, where fuel consumption data is available for all power plants.

Data / Parameter:	Installed Capacity
Data unit:	MW
Description:	Installed capacities of hydro power and fuel-fired power of the National Turkish Grid 2002-2008[93]
Source of data used:	Turkish Electricity Transmission Company (TEİAŞ)[94]
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is collected from the official statistics.
Any comment:	

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the power plant in year *y*
Source of data used:	Metering devices measuring the electricity generation of the plant and invoices prepared for billing the transmission company.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data will be monitored continuously by redundant metering devices, which will provide the data for the monthly invoicing to TEİAŞ.
Any comment:	

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

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Ex-ante emissions are calculated as given below;

$\boldsymbol{BE_y} = EG_y \times EF_{grid,CM,y}$

$\boldsymbol{EG_y}$ = 239,946 MWh/year

$\boldsymbol{EF_{grid,CM,y}}$ = 0.615 tCO_2e/MWh

Baseline Emissions = 239,946 x 0.615 = 147,566 tCO_2e/year

Project Emissions = 0 tCO_2e/year

Emission Reductions = 147,566 – 0 = 147,566 tCO_2e/year

[93] http://www.teias.gov.tr/istatistik2008/1.xls

[94] www.teias.gov.tr

B.6.4 Summary of the ex-ante estimation of emission reductions:

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Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
June 2010-January 2011	0	73,783	0	73,783
2011-2012	0	147,566	0	147,566
2012-2013	0	147,566	0	147,566
2013-2014	0	147,566	0	147,566
2014-2015	0	147,566	0	147,566
2015-2016	0	147,566	0	147,566
2016-2017	0	147,566	0	147,566
2017-2018	0	147,566	0	147,566
2018-2019	0	147,566	0	147,566
2019-2020	0	147,566	0	147,566
- June 2020	0	73,783	0	73,783
Total (tones of Co_2)	**0**	1,475,660	**0**	1,475,660

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)	
Data / Parameter:	**Electricity Supply**
Data unit:	MWh
Description:	Electricity supplied to the grid by the project activity.
Source of data to be used:	Measured by meters.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	239,566 MW/h
Description of measurement methods and procedures to be applied:	Measured by meters. Hourly measurement and monthly recording; 100% data will be monitored and archived.
QA/QC procedures to be applied:	The amount of electricity generated by the Ceyhan project and fed into the grid will be recorded by 4 Main electronic meters and 4 substitute meters. Monthly readings of these meters will be calculated by personnel from Teiaş and a representative from the plant and an invoice will be submitted to the Enova Energy. This invoice is also the sales receipt of the electricity fed into the grid between Teiaş and the project developer.

	Electricity that is generated at Berkman HEPP will be transmitted to Oşkan HEPP and the amount of electricity generated by Berkman HEPP will be calculated and monitored by a meter (also by a substitute meter) which is located at Oşkan HEPP. The electricity that is generated by Oşkan HEPP will be calculated and monitored by 3 meters (each meter has also has a substitute meter). Each meter has also a substitute meter which also performs recording simultaneously. Both meters are sealed and under the control of TEİAŞ. The substitute meter is also checked together with the primary meter every month for billing by TEİAŞ staff. The substitute meter also serves to detect calibration faults between two meters. In case of such a discrepancy TEİAŞ is responsible for calibration and maintenance. The electricity of both plants will be connected to Berke-Kadirli Energy Transmission Line. At the end of each month Teiaş will perform the reading of each meter and the project owner will be billed only one receipt. The metering devices are under the control of Teiaş and since they are sealed[95] no one but only Teiaş can intervene with these meters. Calibration and maintenance is also under responsibility of Teiaş.
Any comment:	

Data / Parameter:	Surface area of full reservoir level
Data unit:	m^2
Description:	The surface area of full reservoir area of the project.
Source of data to be used:	Project sites
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3,269,986.74 m^2
Description of measurement methods and procedures to be applied:	Will be measured yearly from topographical surveys, maps, satellite pictures, etc
QA/QC procedures to be applied:	The measurement will be performed by a qualified institute and the results will be kept during the crediting period.
Any comment:	

[95] http://www.teias.gov.tr/yonetmelikler/meters.doc

Data / Parameter:	Number of temporary and permanent employees.
Data unit:	
Description:	
Source of data to be used:	Employee records including the start and end days. Payrolls.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually during verification.
QA/QC procedures to be applied:	Information about each employee working at the plant has been recorded so far. The amount of salary these employees received has been recorded as well. After construction the number of employees will be less (47 people will be working during operation) and information about these permanent employees will be recorded and kept.
Any comment:	

Data / Parameter:	Livelihood of the poor.
Data unit:	
Description:	
Source of data to be used:	Employee pay rolls.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Annually during verification.
QA/QC procedures to be applied:	The project employs staff from the region. During construction there have been locals working at the construction. The number of employees and information about them have been recorded and kept. On the other hand during operation number of staff will be less and more qualified staff will be required. Necessary personnel will be recruited from the region if qualified. Information on number of staff from the region and their monthly payrolls are available and this will be recorded during the operation of the plant.
Any comment:	

Data / Parameter:	Environmental Indicators (during construction)
Data unit:	
Description:	Status of air quality, water quality, solid waste, biodiversity and noise pollution.
Source of data to be used:	Monitoring report and licenses submitted to Government.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	All liquid and solid wastes with potential impacts on the environment have been handled in accordance with the relevant national and international legal framework. Wastewaters generated during the construction phase have been collected in non-leaking septic tanks pursuant to the national "Regulation on pit holes to be made for the sites where sewer construction is not possible" (Date: 19/03/1971, No: 13783). Accumulated waste water has been limed and disinfectants have been added periodically in order to prevent spreading of odor and endemic diseases. Wastewaters collected in the septic tanks have been withdrawn by the Municipality via sewage vacuum truck and discharged to the sewerage system. The construction activities have included excavation works and these excavations have been used as fill material on site and remaining has been stored to be further used in making roads. The project activity is not on forest land. There are agricultural lands around the project area; however, since the project is constructed on water and includes only the plant, no reservoir, no negative impacts are expected on agricultural lands. The calculated mass flows from heavy construction equipment are very low and these do not have negative effects on the baseline air quality for both plant sites. Dust has been expected to be formed during the construction activities. During project activities, transportation, excretion and loading of both excavations and excavation wastes have been pursuant to the Article 7 of the Regulation on Evaluation and Management Air Quality (Date: 06.06.2008, No:26898) According to the national Regulation air quality modeling is not required for the project activities. However following measures have been taken: -Transportation vehicles have been covered with canvas -The vehicles have not exceeded 40km/h speed -Roads have been watered periodically The workers at the quarries were required to wear dust masks pursuant to the Regulation on Occupational Health and Safety (Date: 9.12.2003, No: 25311). All activities at construction phase were in accordance with the Regulation of Air Quality, Regulation on Environmental Noise Assessment and Control (Date: 07.03.2008 No: 26809) and Regulation on Occupational Health and Safety ensuring the prevention of any problems associated with human health and environmental conditions.

	Exhaust gas emissions were generated from the operation of equipment used during construction phase. All emissions were below the limit values given in the Regulation on Protection of Air Quality and the fuel systems of vehicles were monitored constantly. In order to mitigate the noise and vibration from operation of heavy construction equipment and occasional operation of crusher the operation equipment did not work continuously but for short intervals. The operation of equipment has been in compliance with the Turkish Standards and World Bank Guidelines. All equipment operated at the project site has been new and advanced in order to minimize the noise. The closest of residential area in the case of Berkman HEPP is the Kumarlı Village at a distance of 2.5 km to the plant site and in the case of Oşkan HEPP it is the Karagedikli Village at a distance of 1.5 km to plant site. Oil wastes, grease and fuels which resulted from the maintenance of vehicles will be handled pursuant to the Regulation on Control of Oil Wastes. (Date: 31.05.2005, No: 25831) The project land is already considered to be deteriorated land with weak vegetation and does not host any endemic species. The construction activities are not expected to have a further negative impact on the present florae and fauna. The air, dust and noise emissions from the construction activities are expected to have minor and temporary impacts on the flora and fauna. The waste water generated during the construction activities has not been discharged to any receiving environment that would negatively affect flora or the fauna. The project has not caused any displacement of individuals whose livelihood depends on the land that will be occupied by the Project.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	Environmental Indicators (during operation)
Data unit:	
Description:	Status of air quality, water quality, solid waste, biodiversity and noise pollution.
Source of data to be used:	Monitoring report and licenses submitted to Government.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	The project is not expected to have a negative impact on the downstream of the plants in terms of water quality and hydrology downstream since both plants do

	not have water storage and all water turbined will be left back to the river stream. The operation of the plants is not expected to affect the surface flow or the feed discharge relationship between the surface waters and ground waters. There will be waste water generation from the daily water consumption of the personnel to be employed during the operation phase which will be supplied from villages nearby via tankers. Waste waters generated during the operation phase will be collected in toilets to be built inside the plants buildings and will be withdrawn by the municipality sewage vacuum truck and discharged to the sewage system. The operation of the plants is not expected to have negative impacts on the top soil cover beyond the baseline conditions. The operation of run of river type HEPPs does not involve water storage as in dams that would cause loss of top soil vegetation during storing water in the dam reservoir. The project activity is not expected to cause soil pollution due to solid waste generation in the plants during operation. The generated domestic solid waste will be collected in standard closed trash bags and properly disposed of in sanitary landfills shown by the municipality as required by the national Solid Waste Control Regulation (05.04.2005, No:25831) Wastes resulting from leakages from oil storage tanks and oil pipes and oil wastes, grease and fuels which might result from the maintenance of vehicles will be handled pursuant to the Regulation on Control of Oil Wastes (Date: 31.05.2005, No: 25831) There will be no gas emissions from the project activity or from the personnel employed during the operation phase. Heating will be done by catalytic stoves/heaters. There are two diesel generators[96] at the plants, one at Oşkan HEPP one at Berkman HEPP. These generators will be used once in a year, during maintenance works. For each plant the maintenance work is estimated to take 7 or 8 hours. Therefore the emissions from the generators are not expected to cause major emission. The project activities in the operation phase are not expected to have any major negative impacts on the biodiversity and/or cause any loss of habitat for aquatic or other type of flora/fauna. The project activity is not expected to cause any detectable changes in water quality (temperature, dissolved oxygen, minerals, turbidity, salinity, etc.) that would affect the aquatic environment. A total of 47 of people will be employed during operation phase of the project. The project activities will not be causing any physical damages such as destroying of land of economical value that would negatively affect the socio economic environment in the project region. The number of people and the wages they earn shall be monitored by their monthly paychecks.

[96] Technical data on diesel generators shall be submitted to DOE.

QA/QC procedures to be applied:	
Any comment:	

B.7.2. Description of the monitoring plan:

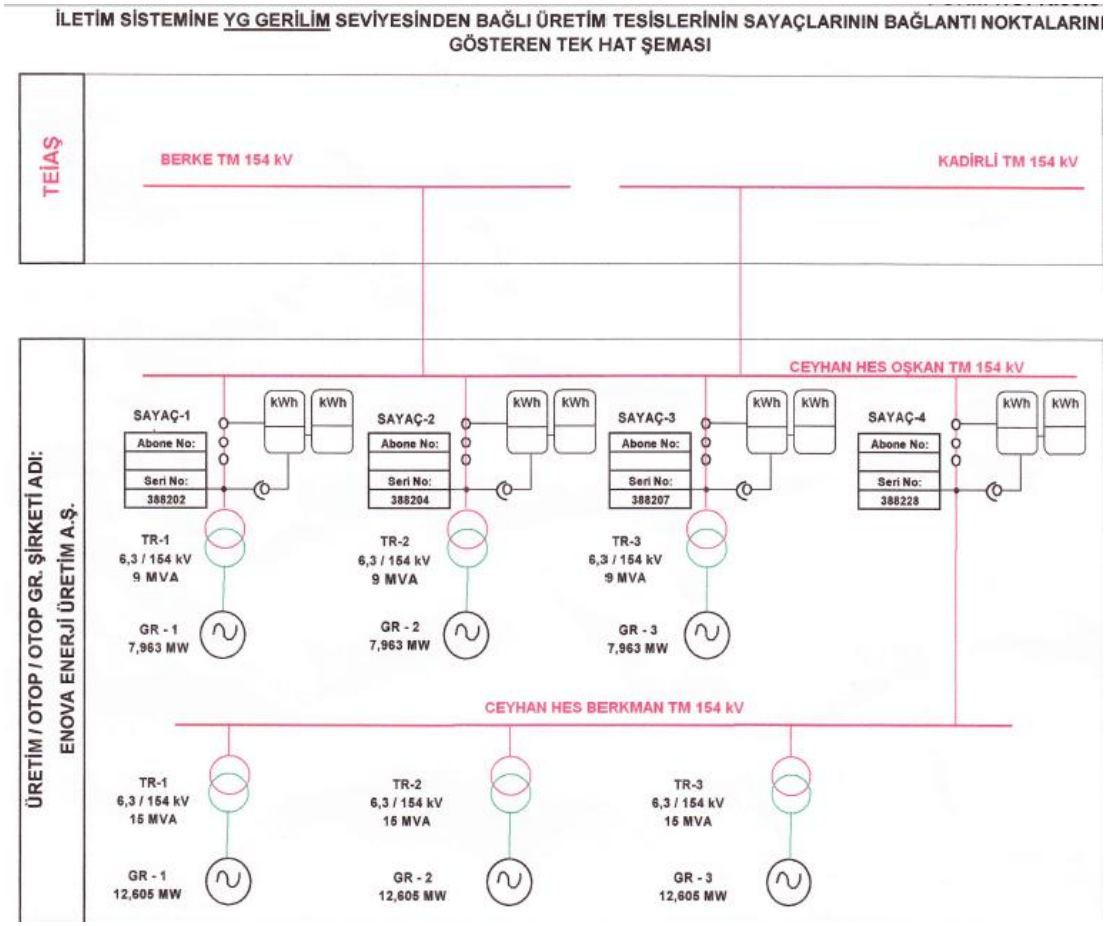
The Monitoring Plan (MP) used for determining the emission reduction by the project is based on the approved methodology ACM0002 V12.1.0. Since the project activity involves electricity generation from renewable sources and there is no significant leakage source or environmental impacts, MP will mainly include monitoring electricity generation by the project activity and key sustainable development indicators.
The amount of electricity generated by the Ceyhan project and fed into the grid will be recorded by 4 Main electronic meters and 4 substitute meters. Monthly readings of these meters will be calculated by personnel from Teiaş and a representative from the plant and an invoice will be submitted to the Enova Energy. This invoice is also the sales receipt of the electricity fed into the grid between Teiaş and the project developer.
Electricity that is generated at Berkman HEPP will be transmitted to Oşkan HEPP and the amount of electricity generated by Berkman HEPP will be calculated and monitored by a meter (also by a substitute meter) which is located at Oşkan HEPP.
The electricity that is generated by Oşkan HEPP will be calculated and monitored by 3 meters (each meter has also has a substitute meter).

Each meter has also a substitute meter which also performs recording simultaneously. Both meters are sealed and they are under the control of TEİAŞ. The substitute meter is also checked together with the primary meter every month for billing by TEİAŞ staff. The substitute meter also serves to detect calibration faults between two meters. In case of such a discrepancy TEİAŞ is responsible for calibration and maintenance.
The electricity of both plants will be connected to Berke-Kadirli 154 kV Energy Transmission Line.
At the end of each month Teiaş will perform the reading of each meter and the project owner will be billed only one receipt.

The metering devices are under the control of Teiaş and since they are sealed[97] no one but only Teiaş can intervene with these meters. Calibration and maintenance is also under responsibility of Teiaş.

[97] http://www.teias.gov.tr/yonetmelikler/meters.doc

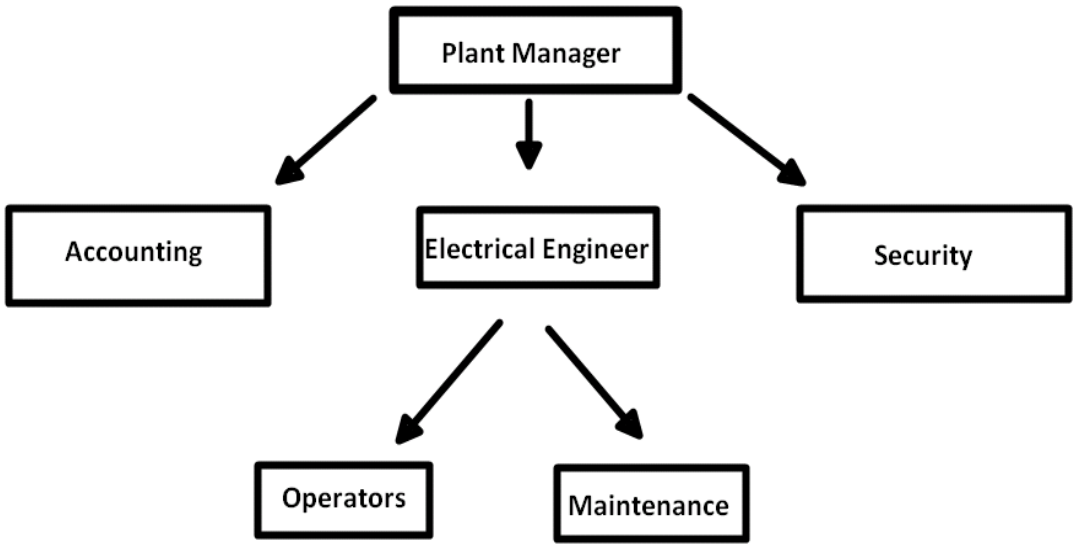
Figure 14: Single Line Diagram of Ceyhan HEPP.



MP will be implemented by ENOVA Energy Production Co. During all stages of the project activity, the plant manager or the electrical engineer will be responsible for monitoring the generation in the plant. Four meters issued in the plant will be used as primary source of generation data. This will also be monitored by the headquarters of the ENOVA Energy Production Co. located in Ankara. Generation can be checked with the invoices and the software used for turbines which shows the actual generation by each turbine. Plant manager and the engineers will be informed about the VER concepts and mechanisms and how to monitor and collect data that will be used for emission reduction calculations. Generated data during the crediting period will be submitted to Suen Ltd. who is responsible for calculating emission reductions. These data will be used to prepare monitoring reports and all these data will be submitted to DOE at each verification period.

VER monitoring team members:

Plant manager: Will be responsible for the general aspects of the plant and VER monitoring plan.
Electrical Engineer: Will be responsible for the electrical matters and from the recording and monitoring of relevant data.
Account manager: Will be responsible for data keeping on electricity sales, invoicing and purchasing.
Suen Ltd.: Responsible for emission reduction calculations, monitoring repots verification process.



Sustainable Development Indicators

Public consultations did not raise any significant issues which should be included in the monitoring plan. Some points have been emphasized by the stakeholders such as the employment of local people for the project (both quality and number of jobs) and contribution to human and institutional capacity. Number of people employed in the plant can be easily determined during operation of the plants. Since plant operation requires skilled technicians trained for working in high voltage environment, local people will be mainly recruited as support staff (security, logistics, etc) which will still be a better opportunity for local people.

The environmental indicators will be monitored and reported to the Governorship of Osmaniye in accordance with the item 18 of EIA Regulation, numbered 26939[98], during construction and operational phase on an annual basis. The legal permissions and licenses to be acquired will also be reported to the governorship as well.

Training of Monitoring Personnel

For the training of the personnel a weeklong course will be organized by the turbine manufacturer ALSTOM. All technical staff in the plant will be trained to be eligible to work in high voltage environment, as required by TEİAŞ.

Emission Reductions

A spreadsheet prepared in excel will be used in order to calculate the emission reductions. The project owner will collect data for EG_y, net electricity supplied to the grid by the Ceyhan project. Generation will be measured and recorded monthly through four high precision measuring devices sealed and controlled by TEİAŞ according to the regulations issued by the TEİAŞ (there are also 4 substitute meters). Data can also be checked from electricity sales invoices and records kept by ENOVA for cross-checking.

[98] http://www.mugla-cevreorman.gov.tr/uploads/%C3%87ED_Y%C3%96NETMEL%C4%B0%C4%9E%C4%B0(17_TEM_2008)(1).doc

Data Management System

Under the monitoring system, a data management system should be set up for keeping data and information, and tracking information from the primary source to data calculation, in paper format. It is the responsibility of the owner to provide additional necessary data, information and document for validation and verification requirements of respective DOE.

Paper documentation such as maps, diagrams and environmental assessment will be collected in a central place, together with this monitoring plan. All paper-based information will be stored by the owner and kept at least one copy. Whatever occurs later, the monitored data for verification and issuance should be kept for two years by the end of the crediting period or the last issuance of VERs for the project activity.

Verification

A DOE will be selected and engaged for the verification. The owner will make the arrangements for the verification to the best of its abilities. The owner will facilitate the verification by providing the DOE all required necessary information before, during and after the verification.

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

Date of completion PDD v2: 12/10/2010
Date of completion PDD v3: 01/02/2011

Name of persons determining the baseline study and monitoring methodology:

1) Mrs. Aynur SEZER. VER Project Coordinator SUEN LTD
E-mail: aynur@suenltd.com, Tel: +90 242 229 80 23

Neither SUEN LTD. nor its employees are project participants.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
Starting date of the project is 22 November 2007 on which electromechanical contract with turbine manufacturer was signed.

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

>>
49 years.[99]

[99] The project is licensed for 49 years by EMRA.

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

C.2.1. Renewable crediting period:

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

>> Oşkan HEPP of Ceyhan HEPP project started generating electricity and supplying electricity to the grid officially on 03/June/2010. Therefore the first crediting period will be as of this date.

C.2.1.2. Length of the first crediting period:

>>
10 years.

C.2.2. Fixed crediting period:

Not applicable.

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

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

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The purpose of the environmental effects assessment is to evaluate whether the project could have a potentially adverse impact on the environment.

Under the Turkish EIA system, projects are classified as either Annex I or Annex II and by default, "No Annex". If a project is identified under Annex I of the Turkish regulation, an EIA Report is automatically required. Turkish requirements for carrying out an EIA Report, including public consultation, expert review and revisions to the EIA Report are outlined in the regulations.

For hydroelectric power projects a summary of Annex I and Annex II projects according to current Turkish EIA Regulation and for comparison under earlier Turkish EIA regulations (Date: 16.12.2003, No: 25318; Date: 06.06.2002, No: 24777; Date: 17.07.2008, No: 26939) utilized for the earlier renewable energy loan are presented below:

Table D.1 – HEPP project classifications for MoEF (Ministry of Environment and Forestry) EIA

Hydroelectric Power Projects	Limits	
	Former	Revised
Annex I	More than 50 MW More than 100 million m^3 More than 15 km^2	More than 25 MW More than 10 million m^3
Annex II	10-50 MW	More than 0.5 MW

For the projects identified under Annex II of the Turkish regulations the project proponent is required to prepare and submit a "Project Introduction File" (or PIF) to the MoEF to clarify whether an EIA Report is required.

The Ceyhan project is not listed in Annex II of the Turkish Environmental Impact Assessment (EIA) Regulation, thus, is not subject to preparation of a Project Introduction File (PIF). Preliminary EIA studies for the Oşkan and Berkman HEPP were prepared and submitted to the Osmaniye Provincial Directorate of Environment and Forestry (PDoEF) previously. Upon examining the Preliminary EIA study reports, the Osmaniye PDoEF issued "EIA Not Required" certificates for Oşkan and Berkman HEPP in August 2003 pursuant to the then applicable national EIA Regulation.

On the other hand, while ENOVA was planning to obtain a loan for the project from the Spanish Export Credit Agency, they decided to prepare an Environmental Impact Assessment Report to meet the requirements of the lender.

In the assessment, the project was evaluated with respect to potential impact on water quality, air quality, noise, water lose and soil erosion, biodiversity and socio-economical environment. The results of the EIA were positive. The summary of this evaluation is as follows;

AIR QUALITY

Construction Phase: Catalytic stoves and electrical energy were used for heating purposes for the personnel to be employed during the construction phase, and there was no fuel use for heating purposes. Emissions from the operation of heavy construction equipment were a matter concern in the project field. Diesel oil was used as fuel for construction equipment. As the calculated mass flow from heavy construction equipment was very low these did not have negative effects on the baseline air quality for both plant sites. The oil system of the vehicles was checked periodically and the requirements of the Regulation on Control of Exhaust Gases[100] (Date: 04.04.2009, No: 27190) were met.

Dust was expected to be formed during the construction activities. During project activities, transportation, excretion and loading of both excavations and excavation wastes were pursuant to the Article 7 of the Regulation on Evaluation and Management of Air Quality[101] (Date:06.06.2008, No: 26898) together with the issues addressed in Article 5.

It was expected that approximately 30,000 m^3 (45,000 tons) of excavation waste would be generated during the site preparation activities for each of the plants. These excavations were used as fill material on site and the remaining was stored to be further used in building roads.

Activities such as transportation, loading and unloading were taken into account in the calculation of dust emissions for the cases mentioned above. The dust emission calculations were made assuming the worst case where the total amount of excavation waste is processed.

All other stages of the project's implementation and all project activities at the construction phase were in accordance with the Regulation on Protection of Air Quality, Regulation on Environmental Noise Assessment and Control[102] (Date: 07.03.2008, No: 26809) and Regulation on Occupational Health and Safety,[103] ensuring the prevention of any problems associated with human health and environmental conditions.

[100] http://rega.basbakanlik.gov.tr/eskiler/2009/04/20090404-5.htm (article 2)

[101] http://rega.basbakanlik.gov.tr/eskiler/2008/06/20080606-6.htm

[102] http://rega.basbakanlik.gov.tr/eskiler/2008/03/20080307-6.htm

[103] http://rega.basbakanlik.gov.tr/eskiler/2003/12/20031209.htm#17

Operation Phase: The project activity replaces the fossil fuel electricity generation dominating the national grid hence it reduces the nitrogen oxides (NO_x), sulphur oxides (SO_x) and particulate emissions as well as the greenhouse gas emissions and it will contribute to the improvement of the air quality.

Negative impacts on air quality are mostly concerned for large-scale dams which may affect the microclimate (evaporation, fog/haze, wind speed) and/or cause greenhouse gas emissions from organic degradation of vegetation left under the water. The project does not involve storage of water in dams and such impacts will not be a concern.

There will be no gas emissions from the project activity and/or from the personnel employed during the operation phase. There will be no emissions from the use of fossil fuels and heating will be done by catalytic stoves.

NOISE

The operation of heavy construction equipment and occasional operation of the crusher will be causing vibration and noise during the construction phase. The operation of equipment will not be continuous but with short intervals. The operation of equipment will comply with the Turkish Standards and World Bank Guidelines.

The closest residential area in the case of Berkman HEPP is the Kumarlı Village at a distance of 2.5 km to the plant site and in the case of Oşkan HEPP it is the Karagedikli Village at a distance of 1.5 km to the plant site. Hence, it is expected that the noise level will be lower than the limits given in the National Regulation and the World Bank Guidelines at the closest residential receptor.

WATER QUALITY

Construction Phase: Project activities that will require water consumption during the construction phase will be:

1. Preparation of concrete,
2. Prevention of dust,
3. Drinking and process water use for the workers employed.

It is expected that the preparation of concrete will require a total of approximately 100,000 m^3 of water use and prevention of dust will require 300,000 m^3 of water use yielding a total of 400,000 m^3 of water use for each of the project plants. Water required for the construction phase will be supplied from the Ceyhan River. Water use for the preparation of concrete and prevention of dust is not expected to generate a considerable amount of wastewater. A great portion of the water used will be lost through infiltration and the remaining will be lost through evaporation.

Apart from these, water will be required in order to meet the daily drinking and process water demand of the personnel employed for the preparation of the project site and construction of the plant. For each of the project plants, the number of personnel employed will be 100 persons. Assuming a daily water use of 150 l/day, the total water requirement is as follows;

Number of workers:	200 persons
Water use:	150 l/cap-day = 0.15 m^3/cap-day
Total water requirement:	0.15 m^3/cap-day x 200 persons = 30 m^3/day

Water to be used as drinking and processing water will be supplied from villages nearby via tankers.

Wastewater generated during the construction phase will be collected in non-leaking septic tanks pursuant to the national "Regulation on pit holes to be made for the sites where sewer construction is not possible"[104] (Date: 19.03.1971, No: 13783). Accumulating wastewater will be limed and disinfectants will be added periodically in order to prevent spreading of odor and endemic diseases. Wastewater collected in the septic tanks will be discharged by the Municipality via sewage vacuum trucks to the sewerage system.

Operation Phase: The project is not expected to have a negative impact on the downstream of the plants in terms of water quality and hydrology downstream since both plants do not have any water storage and all turbine water will be released to the river system.

There will be wastewater generation from the daily water consumption of the personnel to be employed during the operation phase which will be supplied from villages nearby via tankers. Wastewater generated during the operation phase will be collected in toilets to be built inside the plant's buildings and ultimately dumped to the sewerage system by the Municipality sewage vacuum truck.

SOIL EROSION

Construction Phase: The project activity will not take place in forest land. There are cultivated areas around the project area; however, since the project plant will be constructed in water and includes only the hydroelectric plant, i.e. no reservoir, no negative impacts are expected on those lands.

The construction activities will be implemented according to the detailed engineering geology and the flood measures. The loading capacity of alluvium and the permeability of alluvium and gravel stone have been considered in the project's preparation studies.

Operation Phase: The operation of the project plants is not expected to have negative impacts on top soil cover beyond the baseline conditions. The operation of run-of-river type HEPPs do not involve water storage as in dams that would cause loss of top soil vegetation during water storage in the dam reservoir therefore soil productivity and agricultural activities will not be affected or damaged.

No major negative impacts are expected regarding erosion in the downstream riverbed since the water from the turbines is released back to the river will not cause deepening of the river bed and/or changing of water levels in the downstream.

BIODIVERSITY

Construction Phase: The project land is already considered to be deteriorated land with weak vegetation and does not host any endemic species due to anthropogenic activities. The construction activities are not expected to have further major negative impact on the present flora and fauna. The air, dust and noise emissions from the construction activities are expected to have minor and temporary impacts on flora and fauna. The wastewater generated during the construction activities will not be discharged to environment that would negatively affect the flora and the fauna. The project does not involve storage of water in a dam structure which would result in burying of biological species under water. The lake area will not be beyond the flooding beds.

[104] http:// www.bcm.org.tr/pdf/su_tek_us_teb.doc

The project region does not possess any feature of a habitat for threatened species or wildlife which would be negatively affected from the construction activities.

Operation Phase: The project activities in the operation phase are not expected to have major impacts on the biodiversity and/or cause any loss of habitat for aquatic or other type of flora/fauna. The baseline conditions of the biological environment in the project region show that there are no sensitive habitats and/or sensitive/endangered species within the project region.

The project region is rich in aquatic fauna however, the operation of the plants is not expected to destroy any feeding and/or breeding habitats and upset the eco-system. In fact, during the operation of the plants, water in the dam lakes shall be better controlled compared to the flowing streams and enable production of more and diverse zooplanktons and phytoplankton, which will ultimately help fish species grow and breed faster.

The project activity is not expected to cause any detectable changes in water quality (temperature, dissolved oxygen, minerals turbidity, salinity, etc.) that would affect the aquatic environment.

SOCIO-ECONOMIC ENVIRONMENT

Contributions to local community:

During the construction phase ENOVA Energy Production Company made the following contributions to the local community in the region. When the implementation of the project started the company intended to keep contributing to social and economic development in the region through educational, cultural and economic activities as a part of corporate social responsibility.

Construction Phase: The construction of the plant will have limited affects on the demographic conditions since the number of workers in the construction phase will be 200 people (100 for Berkman HEPP and 100 for Oşkan HEPP). There will be no permanent living quarters associated with this power plant. Hence there will be no increased demand on local infrastructure, such as utilities, housing, medical facilities, schools, water and food. The project will not cause any displacement of individuals whose livelihood depends on the land that will be occupied by the project.

The personnel to be employed during the construction phase will create employment for people in the project region which will contribute to the income and livelihood of the local population

Operation Phase: A total of 47 people will be employed during the operation phase of the project. Project activities will not be causing any physical damages such as destruction of land of economic value (agricultural land, fruit gardens, shopping area) and/or public land such as forest area, land of cultural value or land housing infrastructure that would negatively affect the socio-economic environment in the project region. There are no residential units within the project sites hence no re-settlement actions will be required for the project activity. The project will not cause any changes in the current transportation system in the region.
The project contributes to sustainable development in Turkey in the following ways;

- Production of renewable energy and thus reduction of the greenhouse gas emissions in Turkey where the grid has a large share of fossil fuel power generation;
- Contribution to the stimulation of the hydro power industry in Turkey;
- Diversification of energy sources;
- Reduction of energy deficit of Turkey;

- Reduction of the import dependency;
  Stabilization of electrical sub-transmission system of the project region

Social responsibility projects:
As part of sustainable national and regional development apart from above mentioned items ENOVA Energy has sought other ways of social progressive and sustainable utilities in the project area. Within the framework of corporate responsibility and with an intention to improve social life, ENOVA Energy has contributed to the well being of the region and its inhabitants by creating various facilities such as:[105]

- Karagedik Primary School with 5 classrooms in a 407 square meter area. Total Cost: 250,000 TL
- Two small mosques for Karagedik and Kumarlı villages. Total Cost: 40,000 TL
- Roof isolation of Kumarlı Primary School
- Pavement of a schoolyard in Osmaniye
- Creation of local employment during construction and operation phase[106]

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

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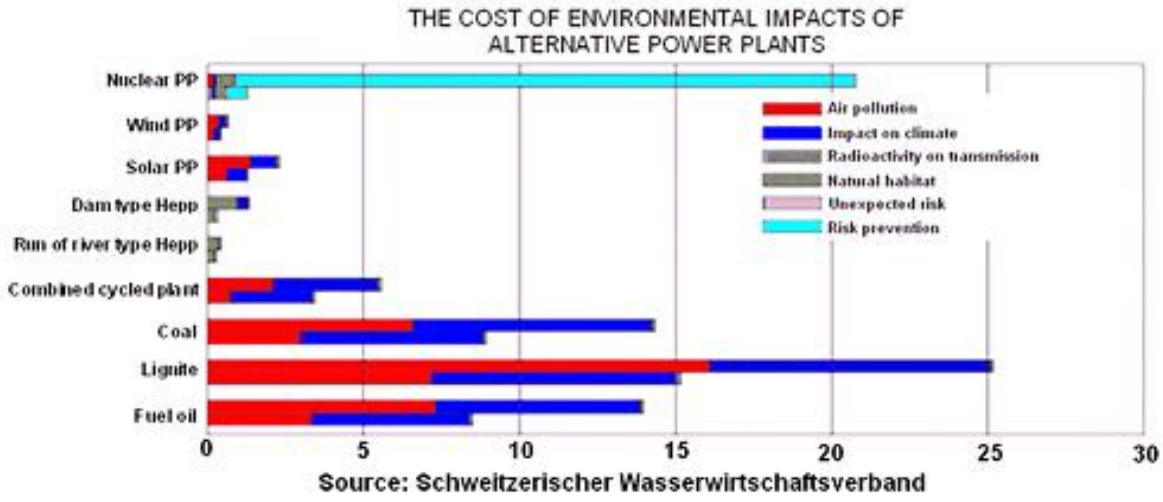
No significant environmental impact has been detected. As for the transportation to Oşkan HEPP and Berkman HEPP project sites, main roads are renovated; which will also serve to other residents in the region. Some trees will be cut at the construction area, but according to the afforestation requirements of the Ministry of Environment and Forestry the required amount of money had to be paid to the government in advance. This prepaid amount of money is used for afforestation activities of the lands that are found appropriate by the Ministry of Environment and Forestry. The project owner cannot interfere with the decision of the amount and location of the trees planted. Since the land in the project site is mainly formed of rocks, the project will not have any adverse affect on agricultural activity or land use.
As the project is a typical run of river hydropower plant its impacts on environment and habitat of flora and fauna is much less compared to other power plants

Grid connection will be provided through 7.5 km transmission line. According to the local regulations, transmission lines below 15 km do not need EIA assessment.

[105] Relevant information, documentation and photos are available upon DOE request.

[106] Names of the employed people and the types of employment are available upon DOE request.

Figure 14: The Cost of Environmental Impacts of Alternative Power Plants[107]



SECTION E. Stakeholders' comments

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

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The stakeholders meeting was organized as a part of the EIA that was required by Spanish Export Credit Agency and was organized by a third party called EN-ÇEV. As the carbon projects consultant SUEN LTD. did not contribute to this process.

The stakeholder meeting was held on 10th April 2009 in Karagedik Village in accordance with the World Bank Operational Manual requirements. The meeting was announced in local media and national (Bir Gün) newspapers and through Village Head of Karagedik. Also, national and local policy makers, local NGOs and the local people were invited. List and contact information of the NGOs have been determined using the database of "Civil Society Development Center"[108]. Residents in the village were informed about the event through the village heads of Karagedik, Karatepe and Nohuttepe. The participant list is given in Annex 5.

Before the meeting the non-technical project summary in Turkish were distributed to the attendants as hand-outs. The meeting started with the welcome speech of Mrs. Elvan Çalatlı (Environmental Engineer) from EN-ÇEV on behalf of the project owner ENOVA Energy Production Company. Eng. Çalatlı introduced herself and explained the purpose of the consultation. She then gave a presentation on the project owners, the technology and operation of run-of-river type hydroelectric power plant, project location and brief non-technical description and the estimated amount of electricity production to be achieved with the project. She concluded her presentation with the considered environmental and socio-economical impacts of the project.

[107] http://www.dsi.gov.tr/hizmet/enerji.htm

[108] http://www.stgm.org.tr/

The stakeholders were then invited to ask questions regarding the presentation and/or the project itself. Two representatives from EN-ÇEV and one representative (Arda Candemir) from the project owner company were present in the consultation meeting and they answered the questions of the participants. The meeting was recorded via handy cam and an official written record was signed by the village heads in the project region.

E.2. Summary of the comments received:

>>

The stakeholders in the meeting were mostly the representatives of local administrative units, mainly village heads from surrounding villages and. All the hearings were held in Turkish.

The environmental and social aspects were discussed by the stakeholders and clarifications were sought. The overall response to the project was positive.

Some points have been emphasized by the stakeholders such as the agricultural areas near the project regions and employment of local people for the project. The concerns regarding employment was explained in a way that the employment of personnel for the construction period from the region will be a priority , however, during the operation phase employment of more qualified personnel will be necessary since the plants will be operated with a single computerized system requiring certain skills.

The project team ensured that all relevant national legislations will be respected and compiled during the project activities.

The meeting was finalized with no adverse reactions, comments and/or further clarifications sought. The answers provided by the project team were accepted as satisfactory. In short all stakeholders agreed that no significant negative effects will result because of the project activity as far as they could assess according to their knowledge. No major concerns were raised during the entire consultation process requiring any changes in the project's implementation.

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

>>

Comments by the participants were taken down during the meeting. As no significant issues were raised, no revision in the project design was required. The only request from the stakeholders was to give priority to recruitment of the locals, which was positively responded by the ENOVA Energy Production Company.

Summary of the local public consultation meeting was made publicly available on the municipality announcement board within 15 days after the meeting.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	ENOVA Energy Production Co.
Street/P.O.Box:	Buğday Sk. / KAVAKLIDERE
Building:	No:9
City:	ANKARA
State/Region:	
Postcode/ZIP:	06700
Country:	TURKEY
Telephone:	+90 312 455 18 80 / +90 312 455 18 81
FAX:	+90 312 455 18 85
E-Mail:	info@nurol.com.tr
URL:	www.nurol.com.tr
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last name:	TAŞKINSU
Middle name:	
First name:	Serhat
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	serhat.taskinsu@nurol.com.tr

Organization:	Suen Ltd.
Street/P.O.Box:	Altınkum Mah. Atatürk Bulvarı
Building:	Nadir Apt. No: 239 K.1 D.4
City:	ANTALYA
State/Region:	
Postcode/ZIP:	
Country:	TURKEY
Telephone:	+90 242 229 80 23 - 24
FAX:	+90 242 229 80 25
E-Mail:	info@suenltd.com
URL:	www.suenltd.com
Represented by:	
Title:	Project Coordinator
Salutation:	Mrs.
Last name:	SEZER
Middle name:	
First name:	Aynur
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	aynur@suenltd.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding.

ENOVA
ENERJİ ÜRETİM A.Ş.

Project Proponent: Enova Enerji Üretim A.Ş
Date: 30/07/2009
To: Voluntary Carbon Standards
Declaration of Non-Use of Official Development Assistance by Project Proponent.

Enova Enerji Üretim A.Ş:
As legal Owner ("Project proponent") of the above referenced Project, acting on behalf of all Project participants, I now make the following representations:

R.Serhat Taşkınsu and Mustafa ÖZTÜRK
I hereby declare that I am duly and fully authorised by the legal owner ("Project Proponent") of the above referenced Project, acting on behalf of all Project participants to make the following representations on Project Proponent's behalf:

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

II. Financier Declarations
I hereby declare that I have submitted [#] declarations of Non-Use of ODA, representing declarations from all Project financiers. If additional financiers are added to the Project, I will promptly notify the Voluntary Carbon Standard and ensure that additional declarations are promptly submitted.

III. Financing Plan
I agree to complete and submit a sufficiently clear and transparent financing plan for the Project so that during validation the Validator can assess compliance with the Non-Use of ODA requirement.

IV. Duty To Notify Upon Discovery
If I learn or if I am given any reason to believe at any stage of Project design or implementation that ODA has been used to support the development or implementation of the Project, or that an entity providing ODA to the host country may at some point in the future benefit directly or indirectly from the credits generated from the Project as a condition of investment, I will make this known to the Voluntary Carbon Standard immediately.

Gelincik Sokak, No:2/2 Güvenevler – ANKARA
Tel: +90.312 428 1125 • Faks : +90.312 428 1128
E-mail : enova@enovaenerji.com.tr

ENOVA
ENERJİ ÜRETİM A.Ş.

V. Sanctions
I am fully aware that under Voluntary Carbon Standard Terms and Conditions sanctions and damages may be incurred fort he provision of false information related to Projects and/or Voluntary Carbon Standard credits.

Name:	**Mustafa ÖZTÜRK**	Name:	**R.Serhat TAŞKINSU,**
Title:	**Administrative Manager**	Title:	**General Manager**
On behalf of:	**Enova Enerji Üretim A.Ş**	On behalf of:	**Enova Enerji Üretim A.Ş**

Gelincik Sokak, No:2/2 Güvenevler – ANKARA
Tel: +90.312 428 1125 • Faks : +90.312 428 1128
E-mail : enova@enovaenerji.com.tr

Annex 3

BASELINE INFORMATION

Data Used in calculation of OM for Turkish Electricity Grid

Table 1 – Values used in calculation of OM[109]

	NCV (Tj/kt) (unit ton or 1000m3 for gas)	EF (tCO2/Tj)	COEF(tCO2/kt)
Hard Coal	*22.2*	94.6	2,069
Imported Coal	*22.2*	94.6	2,069
Lignite	*6.9*	90.9	625
Fuel Oil	*39.9*	75.5	3,014
Diesel Oil	*42.7*	72.6	3,101
LPG	*0.0*	61.6	0.0
Naphta	*43.9*	69.3	3,042
Natural Gas	*36.8*	54.3	1,998

Table 2– Amount of fuels used for electricity generation[110]

	2006	2007	2008	Total Fuel Consumption 2006-2008	Total Emission 2005-2007
Hard Coal	**5,617,863**	**6,029,143**	**6,270,008**	**17,917,014**	**37,070,302**
Imported Coal	**0**	**0**	**0**	**0**	**0**
Lignite	**50,583,810**	**61,223,821**	**66,374,120**	**178,181,751**	**111,402,359**
Fuel Oil	**1,746,370**	**2,250,686**	**2,173,371**	**6,170,427**	**18,599,320**
Diesel Oil	**61,501**	**50,233**	**131,206**	**242,940**	**753,422**
LPG	**33**	**0**	**0**	**33**	**0**
Naphta	**13,453**	**11,441**	**10,606**	**35,500**	**107,977**
Natural Gas	**17,034,548**	**20,457,793**	**21,607,635**	**59,099,976**	**118,104,106**

Table 3 – Net electricity supply to the grid by thermal plants and imports (GWh)[111]

Year	Gross generation	Net generation	NET/Gross	Gross Gen. Thermal	Net Gen Thermal	Import	Total
2006	**176299.8**	**169543.1**	**0.96**	**131835.1**	**126782.5**	**573.20**	**127,356**
2007	**191558.1**	**183339.7**	**0.96**	**155196.2**	**148537.8**	**864.30**	**149,402**
2008	**198418.0**	**189761.9**	**0.96**	**164139.3**	**156978.6**	**789.40**	**157,768**

[109] Vol.2.Energy.2006IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

[110] http://www.teias.gov.tr/istatistik2008/44.xls

[111] http://www.teias.gov.tr/istatistik2008/32(75-08).xls

Table 4 – Data used in calculation of BM for Turkish Electricity Grid[112].

	A	B	D	E (=3.6/D/1000*B*C)
	NCV	EF CO2 (tCO2/Tj)	Generation Efficiency %	EF tCO2/MWh
Coal	*22.18*	94.6	33.6%	1.014
Lignite	*6.88*	90.9	32.8%	0.999
Fuel Oil	*39.92*	75.5	35.1%	0.775
Diesel	*42.72*	72.6	27.5%	0.949
LPG	*0.0*	61.6	45.0%	0.493

Table 5 – Most recent capacity additions corresponding to 20%[113][114][115]

Fuel Source	Electricity Generated (MWh)	EF	Share in total generation
Coal	**1,125**	**1.014**	**3.0%**
Lignite	**11,480**	**0.999**	**30.6%**
Fuel Oil	**99**	**0.775**	**0.3%**
Diesel oil	**1.8**	**0.949**	**0.0%**
LPG	**50**	**0.493**	**0.1%**
Naphtha	**0**	**0.554**	**0.0%**
Natural Gas	**20,639**	**0.425**	**55.0%**
Renewables and wastes	**85**	**0.000**	**0.2%**
Solid	**5**	**0.000**	**0.0%**
Total Renewables	**4,067**	**0.000**	**10.8%**
TURKEY'S TOTAL	**37,551.9**		**100%**

[112] Vol.2.Energy.2006IPCC Guidelines for National Greenhouse Gas Inventories, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

[113] http://www.cedgm.gov.tr/dosya/cevreatlasi/atlasin_metni.pdf (p197)

[114] EIPPCB, Reference Document on Best Available Techniques for Large Combustion Plants, http://eippcb.jrc.es/pages/FActivities.htm

[115] Vol.2. Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

Annex 4

MONITORING INFORMATION

The Net Electricity of the project will be calculated as follows;

Net Electricity = Electricity Supply – Achieved Electricity

As the same as the data of Electricity Supply and Achieved Electricity, the Net Electricity Data will be calculated, recorded and kept in accordance with the regulations and procedures defined in the Monitoring Plan of the project.

Annex 5

Stakeholder Consultation Meeting Participant List

Participant Name	Organization/Company	Position
Yusuf Kaya	Karatepe Village	Muhtar (village head)
Mustafa Denktaş	Karatepe Village	Muhtar (village head)
Hüseyin Ak	Nohuttepe Village	Muhtar (village head)
Ahmet Doğan	Kadılar Village	Muhtar (village head)
Seyit Ahmet Babaoğlan	Kazmacı Village	Muhtar (village head)
Abdullah Denktaş	Karagedik Village	Karagedik resident
Ramazan Keskin	Nohuttepe Village	Nohuttepe resident
Ömer Demir	Karagedik Village, Ocak District	Karagedik resident
Ökgeş Demir	Karagedik Village, Ocak District	Karagedik resident
Süleyman Ala	Karagedik Village, Ocak District	Karagedik resident
Mehmet Atacan	Karagedik Village, Ocak District	Karagedik resident
Bekir Çelik	Karagedik Village, Ocak District	Karagedik resident

Annex 6

EIA Exemption Certificate for Oşkan HEPP

T.C.
OSMANİYE VALİLİĞİ
İL ÇEVRE VE ORMAN MÜDÜRLÜĞÜ

Karar Tarihi: 21/04/2003
Karar No : 2003/14

ÇED GEREKLİ DEĞİLDİR BELGESİ

06 Haziran 2002 tarih ve 24777 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 18. maddesi gereğince; "Özaltın İnş.Tic. ve San. A.Ş.-Nurol İnş. ve Tic. A.Ş. Ortaklığı'nın "Oşkan Regülatör ve Hidroelektrik Santrali" projesi hakkında " ÇED Gerekli Değildir Kararı" verilmiştir.

Fevzi ÖZDOĞRU
Vali a.
Vali Yardımcısı

ASLI GİBİDİR

Proje Sahibi : Özaltın İnş.Tic. ve San. A.Ş.-Nurol İnş. ve Tic. A.Ş. Ortaklığı
Proje Yeri : Osmaniye İli Düziçi İlçesi, Ceyhan Nehri Üzeri

EIA Exemption Certificate for Berkman HEPP



T.C.
OSMANİYE VALİLİĞİ
İL ÇEVRE VE ORMAN MÜDÜRLÜĞÜ

Karar Tarihi: 21/08/2003
Karar No : 2003/3

ÇED GEREKLİ DEĞİLDİR BELGESİ

06 Haziran 2002 tarih ve 24777 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 15. maddesi gereğince; "Özaltın İnş.Tic. ve San. A.Ş.-Nurol İnş. ve Tic. A.Ş. Ortaklığı'nın "Berkman Regülatör ve Hidroelektrik Santrali" projesi hakkında " ÇED Gerekli Değildir Kararı"verilmiştir.

Fevzi ÖZDOĞRU
Vali a.
Vali Yardımcısı

ASLI GİBİDİR

Proje Sahibi : Özaltın İnş.Tic. ve San. A.Ş.-Nurol İnş. ve Tic. A.Ş. Ortaklığı
Proje Yeri : Osmaniye İli, Merkez İlçesi, Ceyhan Nehri Üzeri