



SANIBEY DAM AND HYDROELECTRIC POWER PLANT

Project Title	SANIBEY DAM AND HYDROELECTRIC POWER PLANT
Version	08
Date of Issue	03/05/2012
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Table of Contents

1	Project Details	3
1.1	Summary Description of the Project.....	3
1.2	Sectoral Scope and Project Type.....	3
1.3	Project Proponent.....	4
1.4	Other Entities Involved in the Project	6
1.5	Project Start Date	6
1.6	Project Crediting Period	6
1.7	Project Scale and Estimated GHG Emission Reductions or Removals	6
1.8	Description of the Project Activity	7
1.9	Project Location.....	9
1.10	Conditions Prior to Project Initiation	12
1.11	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	12
1.12	Ownership and Other Programs.....	13
1.13	Additional Information Relevant to the Project	14
2	Application of Methodology	16
2.1	Title and Reference of Methodology	16
2.2	Applicability of Methodology.....	16
2.3	Project Boundary.....	18
2.4	Baseline Scenario.....	19
2.5	Additionality	28
2.6	Methodology Deviations	39
3	Quantification of GHG Emission Reductions and Removals.....	39
3.1	Baseline Emissions	39
3.2	Project Emissions	39
3.3	Leakage.....	41
3.4	Summary of GHG Emission Reductions and Removals	41
4	Monitoring	43
4.1	Data and Parameters Available at Validation.....	43
4.2	Data and Parameters Monitored	47
4.3	Description of the Monitoring Plan	49
5	Environmental Impact.....	51
6	Stakeholder Comments	57
	ANNEX 1	60
	ANNEX 2	61
	ANNEX 3	62
	ANNEX 4	63
	ANNEX 5	64
	ANNEX 6	65
	ANNEX 7	65
	ANNEX 8	86
	ANNEX 9	103
	ANNEX 10	107
	ANNEX 11	108
	ANNEX 12.....	128
	ANNEX 13.....	129



1 Project Details

1.1 Summary Description of the Project

Sanibey Baraji Elektrik Uretim ve Ticaret A.S., a subsidiary of Sanko Enerji A.S. plans to install a hydro power plant in Adana, Turkey. The objective of the Sanibey Dam and Hydroelectric Power Plant (Sanibey Dam & HEPP) is to generate electricity and supply it into the public grid. It shall be registered as a VCS project in order to facilitate the project implementation by means of financial inflows coming from the credits sale. Due to its significant contribution to climate change mitigation and sustainable development in the region, this project is expected to fulfil the requirements of VCS rigorously.

The project activity was originally developed under the name of “Yedigoze Dam & HEPP” by Yedigoze Elektrik Uretim ve Ticaret A.S. In parallel with the demand of executive board members, both the company name and consequently the name of the project have recently been changed to “Sanibey Baraji Elektrik Uretim ve Ticaret A.S.” and “Sanibey Dam & HEPP” respectively. The board decision was taken on 08/06/2011 with the decision number 13. The Board decision was later published in the Turkish Trade Registry Gazette on 16/08/2011 (No: 7881). Please see the Turkish Trade Registry Gazette provided.¹ Letters of applications to EMRA and the Ministry of Environment and Urban Planning for the change of project title have been provided. Please see Annex 12 and Annex 13.

Sanibey Dam & HEPP, which is planned to be constructed with the intention of generating clean energy is comprised of the construction of a dam and a green field 310.66 MWe hydroelectric power plant located in the Seyhan river basin, in Turkey’s Eastern Mediterranean Region. In order to generate energy, a dam, having a body of concrete faced rock fill and a HEPP have been constructed. Generally describing; a spillway is located on the left bank of the river bed; also energy structures consisting of two penstocks and a power plant building including two units having outputs of 155.33MWe each are located on the downstream of the dam body. Besides, diversion structures containing two tunnels one of which will be used as a sluiceway outlet and the second one is containing valve house are located on the left bank. Once the project is accomplished, a separate project will also be carried out by the State Hydraulic Works (DSI) which envisages the provision of irrigation of 75,000ha of land in Imamoglu region.

The project has been commissioned in two phases. The first phase started on 2nd December 2010 while the second phase started on 26th January 2011. It is estimated that the electricity production of the proposed project is going to be 966.53 GWh/year for the first fifteen years. When the full development scenario takes place after fifteen years, which means the time when the dam water will also be used for irrigation of 75.000 ha area of land, the annual electricity production will drop to approximately 768.66 GWh to supply the national grid using a renewable resource and tapping the significant hydropower potential in the region.

The project activity reduces greenhouse gases (GHGs) emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources. The average annual emission reductions of the proposed Project for the crediting period are estimated to be 524,729 tonnes of CO₂e (tCO₂e).

1.2 Sectoral Scope and Project Type

This is a voluntary project, but it follows the CDM rules.

¹ The Turkish Trade Registry Gazette has been provided to the DOE separately.



The approved baseline and monitoring methodology ACM0002-Version 12 1.0: “*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*” (“ACM0002”) is applied.

According to Annex A of the Kyoto Protocol, the Project fits in:

Sectoral Scope Number: 1

Sectoral Scope: Energy Industries -Renewable Energy

The project is not a grouped project.

1.3 Project Proponent

The project developer:

In accordance with the Electric Market Law No. 4628, Sanibey Baraji Elektrik Uretim ve Ticaret A.S.. was founded to construct, commission, operate and transfer a hydroelectric power plant in order to generate and market electric power.

Its mission is to be one of the energy companies that effectively utilize domestic and renewable resources by transforming advanced technology and knowledge into efficiency and making maximum contribution to national economy without neglecting international quality standards.

The following table show the project proponent’s contact information:



Organization:	SANIBEY ELEKTRIK URETIM SANAYI VE TICARET A.S.
Street/P.O.Box:	SANKO HOLDING-ISKO SUBESI ORG.SAN.BOL.3.CADDE
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State/Region:	
Postfix/ZIP:	16400
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Personal E-Mail:	vdogan@sankoenerji.com.tr
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Middle Name:	
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Sanibey Baraji Elektrik Uretim ve Ticaret A.S. has the vision and ambition to be a reputable and a leading company that takes a pioneering role in the world of today's standards by utilizing energy resources within the country in the most efficient and environmentally friendly way.

The Sanibey Dam & HEPP shall be registered as a Voluntary Carbon Standard (VCS-VER) project to enable the project implementation by means of financial inflows coming from the carbon credits sale. All elements mentioned in this document show that the proposed project activity is expected to fulfil the requirements of the Voluntary Carbon Standard.

As stated before the contacts persons are Mr. Volkan Dogan and Mr. Taner Sengonul. Their responsibilities regarding the carbon credits process are to analyze the related documents, the coordination between internal departments and to setup meetings with companies.

The following table shows the Carbon Asset Development Consultants' contact information:



Organization:	GAIA CARBON FINANCE
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Postfix/ZIP:	34371
Country:	TURKEY
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E-Mail:	
URL:	http://www.gaiacf.com
Represented by (1):	
Position:	MANAGING PARTNER
Last Name:	BAYRAKTAR
Middle Name:	
First Name:	GURKAN
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Direct tel:	+90 212 224 50-51
Personal E-Mail:	gbayraktar@gaiacf.com

Responsibilities of GAIA Carbon Finance regarding the carbon credits process are the preparation of the PDD and assisting Sanibey Baraji Elektrik Uretim ve Ticaret A.S. during the validation process.

1.4 Other Entities Involved in the Project

1.5 Project Start Date

Project start date: 2nd December 2010 (Date on which the project commenced electricity production)

1.6 Project Crediting Period

The crediting period of the project begins with the commissioning of the plant. The exact commencement date for the plant is the day of first documented supply to the grid. It is estimated that the Project will reduce 524,729 tCO₂e annually, generating an expected total of 5,209,598 tCO₂e for the duration of the initial 10-year crediting period.² VCS project crediting period will be renewed once which will make the total crediting period as 20 years. The project started to generate electricity on December 2nd, 2010. The end date of the first crediting period is 1st of December 2020. The Project's estimated annual ERs over the 10-year crediting period are as follows:

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	X
Mega-project	

² Please see the calculation details of emission reductions under "Section 3: GHG emission Reductions".



Years	Estimated GHG emission reductions or removals (tCO ₂ e)
From 2nd December to 31st December 2010	20,845.4
2011	506,040.2
2012	524,729.1
2013	524,729.1
2014	524,729.1
2015	524,729.1
2016	524,729.1
2017	524,729.1
2018	524,729.1
2019	524,729.1
From January 1st to December 1st 2020	484,475.9
Total estimated ERs	5,209,194.6
Total number of crediting years	10
Average annual ERs	524,729.1

Table 1: Estimated GHG emission reductions by the project

1.8 Description of the Project Activity

The Sanibey Dam & HEPP reduces greenhouse gas emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources both in the operating margin and build margin of the system. The average annual emission reductions of the proposed Project are estimated to be 524,729 tonnes of CO₂e (tCO₂e).

- VCS crediting period start date: 2/ 12/ 2010

- VCS project crediting period: 10 years, renewable once.

Expected operational lifetime of the project activity: 35years.

The following table shows a full detail of the project's technical specifications:

Dam and Cofferdams		
Type		Concrete Faced Rock Fill
Height above Thalweg	m	105
Height above Foundation	m	130
Crest Width	m	8
Crest Length	m	400



Crest Elevation	m	240
Diversion and Bottom Outlet		
Type of Cross Section		Circular
Diameter	m	8
Length	m	891; 850
Number of Units		2
Spillway		
Type		Radial
		Chute and Flip Bucket
Sill Elevation		221.5
Maximum Capacity of Spillway	m ³ /s	9000
Penstock		
Type		Above ground
Number of Units		2
Diameter	m	6.3
Length	m	393;382
Power Plant Building		
Type		On the ground
Height	m	58.5
Length	m	65.3
Width	m	48.65
Turbines		
Type		Vertical axis FRANCIS
Number of Units		2
Unit Rated Power	kW	158,500
Total Installed Capacity	kW	317,000
Transformer		
Type		Outdoor Type, oily, three phased
Number of Units		3
Power of a Unit	MVA	175
Voltage	kV	14.4/380

Table 2: Sanibey Dam & HEPP's Technical properties

The turbine and generator manufacturer of the project is Alstom. The manufacturer is a French company, acclaimed for its integrated power plants, power production services and air quality control systems. Alstom has been selected as the equipment provider because of its reliable quality products and technology, which is a grid friendly technology with low maintenance needs as well as low noise and low environmental impacts.

The design will be set according to the Computational Fluid Dynamics based calculations. The equipments and mechanical parts will be manufactured abroad and then delivered to the project



site. This technology has been chosen because it has been considered to be the most suitable for the project.

Alstom offers a total guaranteed mechanical output of 310.66 MWe with two units, each with an installed capacity of 155.33 MWe working separately. The project has two penstocks to serve them. Alstom will provide the equipments' maintenance as well.

1.9 Project Location

The Project site is located in the Seyhan river basin in Turkey, in Eastern Mediterranean Region, in the boundaries of Imamoglu and Aladag district, Adana province; the project is located between 37°24' - 37°38' north latitudes and 35° 25' - 35° 35' east longitudes. The following figures show the project's location.

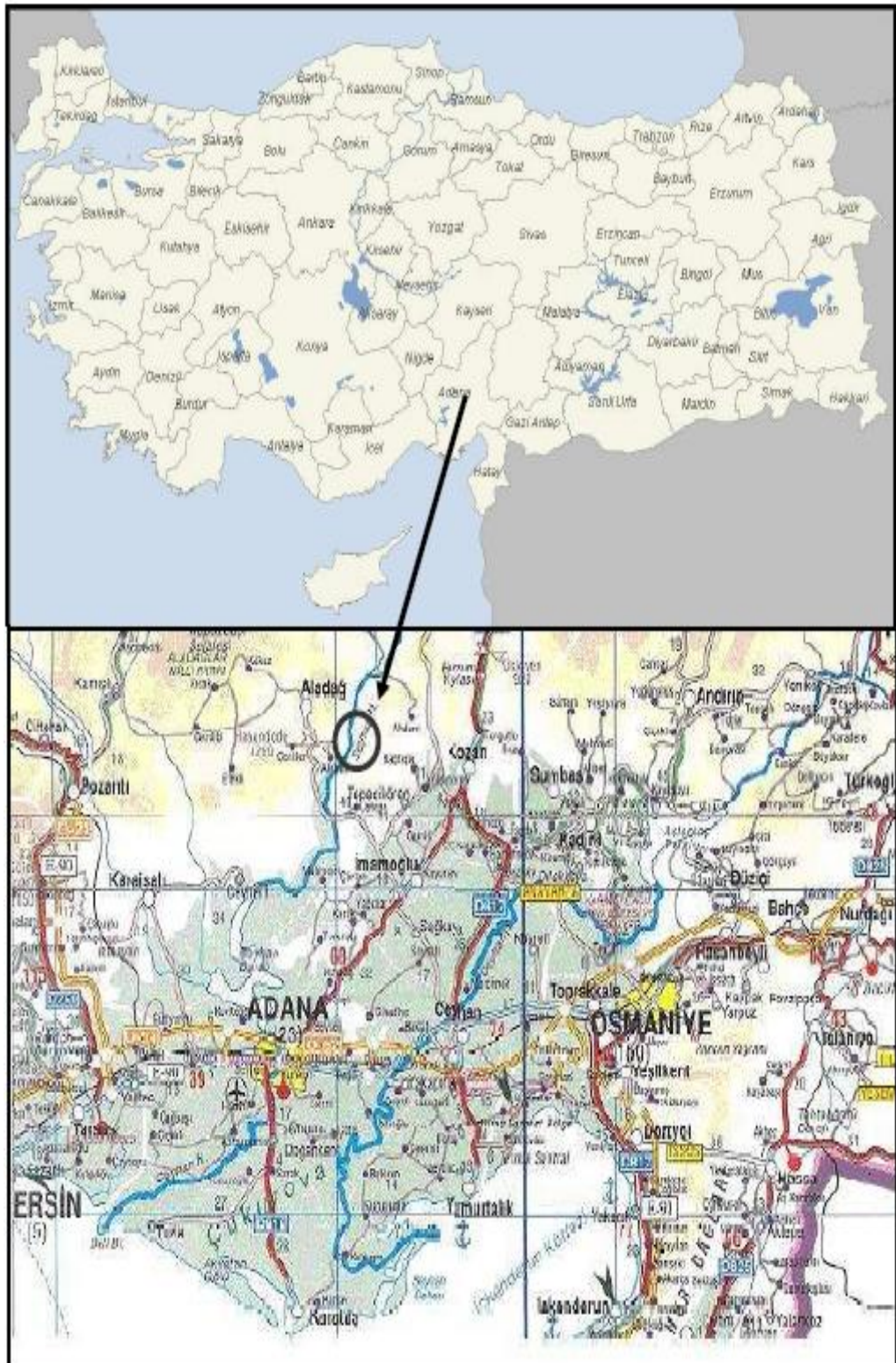


Figure 1: Project's location

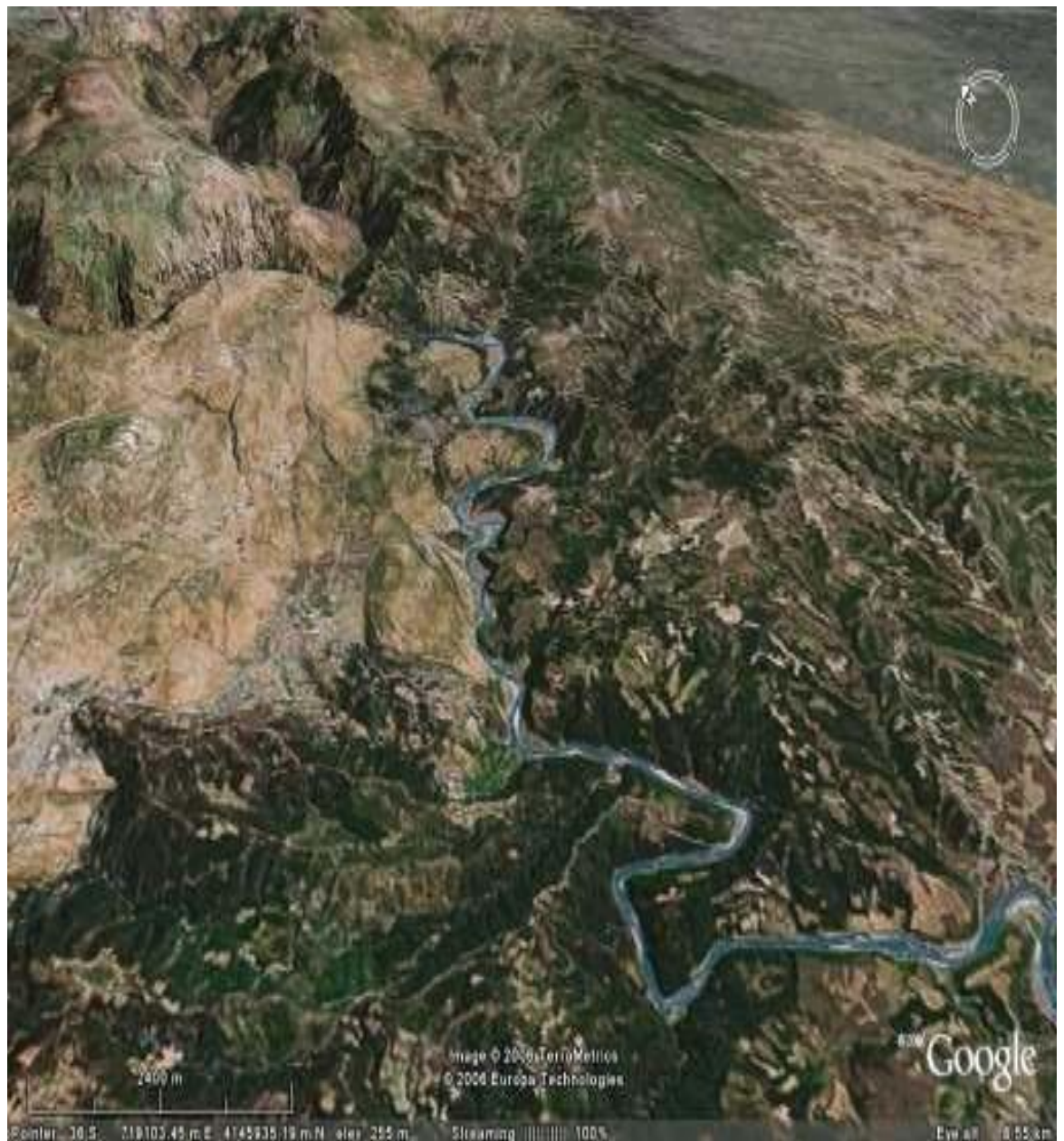


Figure 2: Satellite image of the Project

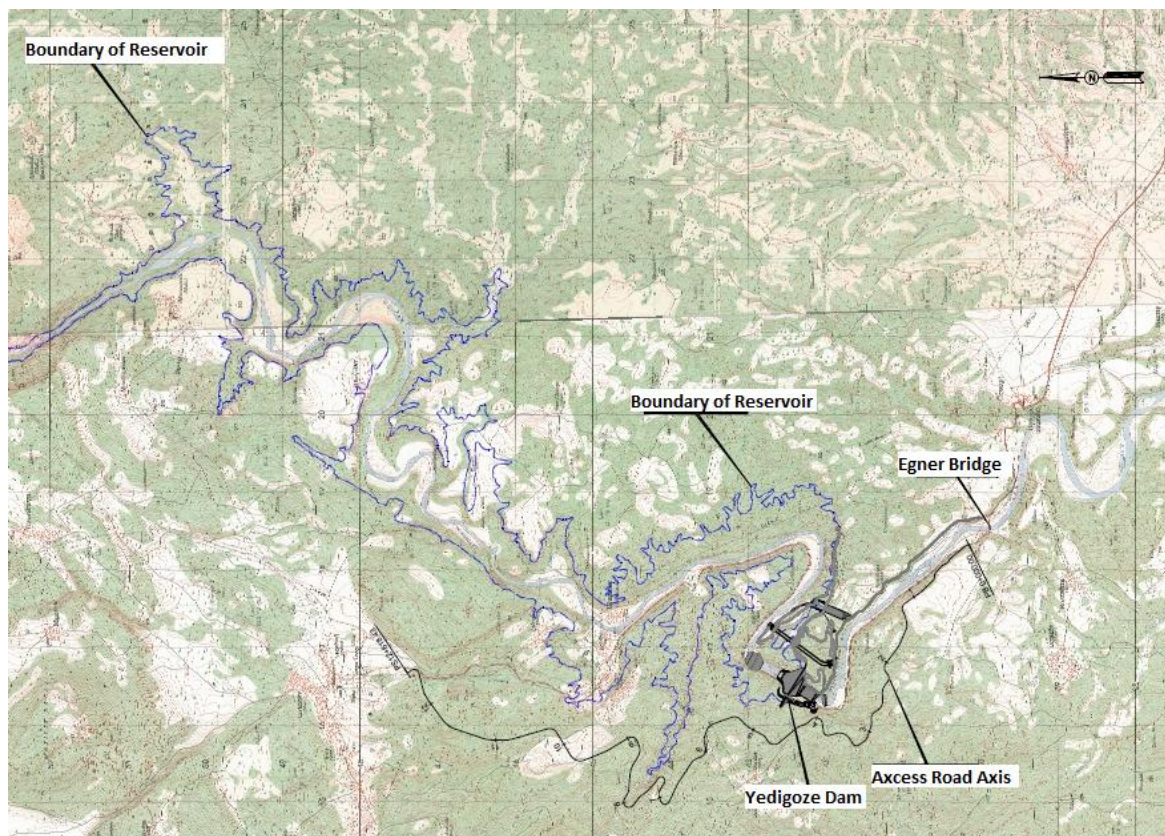


Figure 3: Plant layout

1.10 Conditions Prior to Project Initiation

As the project activity is a greenfield project, the conditions prior to the project initiation is the continuation of the current situation, i.e. the equivalent amount of energy would have been produced by other grid-connected units, which are mainly thermal power plants, undertaking business as usual maintenance. In addition, since the project is a Greenfield project, emissions that occur during construction and during the operation are negligible and non-existent respectively (the power density of the Project is 21.72 W/m^2 higher than 10 W/m^2); thus, has not been implemented to generate GHG emissions for the purpose of subsequent reduction.

The lands that were used prior to the project initiation were generally comprised of treasury land, expropriated land, land belonging to the village legal entity and forest. Some part of these lands became the reservoir area due to the project. The figure stated in the mentioned pdf file regarding the reservoir area is understood to be the reference used in the presentation submitted to the Board.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The applicable mandatory laws that will be applied for the project are:

- i. *Electricity Market Law*³: It was enacted in March 3rd, 2001. This Law aims to ensure the development of a financially sound and transparent electricity market operating in a competitive environment under the provisions of the civil law. It also underlines the needs to produce a

³ Law Number: 4628 Ratification Date: 20.02.2001 Enactment Date: 03.03.2001



sufficient, high quality, low cost and environmentally friendly electricity to consumers. The text also provides guidelines to structure the autonomous regulation and the supervision of the market.

- ii. *The Renewable Energy Law*⁴: It compels electricity selling companies to purchase from “Green” energy providers until 2011 at a defined ratio and price. This ratio is based on previous year sales over total energy sold in the country. The price is based on a yearly average wholesale purchase price predetermined by the Energy Market Regulatory Authority (EMRA).
- iii. *Environmental Law*⁵: This law came into force in 1983, it considers the environment as a single domain, aiming not only to prevent and eliminate environmental pollution, but also to allow the management of land and natural resources in an integrated manner. According to its basic principles, and as also stated in the Constitution, citizens as well as the State bear responsibility for the environment protection. Furthermore, this law states that in all economic activities, every measure should be taken to minimize pollution.⁶
- iv. Regulation on procedures and principles of signing the agreement of water resources utilization to generate electricity for the electricity market⁷.

The project complies with all aforementioned laws as its activity aims at generating electricity by using a renewable resource: hydroelectric power; in a sufficient, low-cost and environmentally-friendly manner, using the latest technology available on the market. Moreover, an Environmental Impact Assessment (EIA) has been carried out and the results of this study concluded that the project activity has no significant impacts on the environment. (Please refer to [Section 5](#) for detailed information).

Furthermore in the project site, there are no National Parks, Nature Park, Nature Protection Zone, Wild Life Protection Zones, Special and Environment Protection Zones, Wet Land, Biogenetic Reserve Zone, Biosphere Reserves under protection in accordance with the legislation of Ministry of Environment and Forestry and Ministry of Culture and Tourism and no registered pasture lands. There is no Culture and Tourism Protection and Development Site as well as Tourism Center announced by Law for the Encouragement of Tourism numbered 2634.⁸

1.12 Ownership and Other Programs

1.12.1 Proof of Title

The generation license is presented in **ANNEX 1** as proof of title.
The ownership of the emission reductions will be Sanibey Baraji Elektrik Uretim ve Ticaret A.S.

1.12.2 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

⁴ Law Number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005

⁵ Law Number 2872 Ratification Date: 09.08.1983 Enactment Date: 11.08.1983

⁶ “Turkey’s Environment: a review and evaluation of Turkey’s environment and its stakeholders”, May 2002.
<http://www.rec.org/REC/Programs/ExtensionToTurkey/TurkeysEnvironment.pdf>

⁷ Official Gazette: #25150, on 26.6.2003

⁸ EIA Report, Section X, p.154.



1.12.3 Participation under Other GHG Programs

The Project has not been registered or seeking registration under other GHG programs.

1.12.4 Other Forms of Environmental Credit

The project has not created another form of Environmental Credit. (Please refer to ANNEX 3)

1.12.5 Projects Rejected by Other GHG Programs

The Project has not been rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

This is not a grouped project.

Leakage Management

As suggested in ACM0002 / Version 12 1.0, the leakage emissions are not calculated and accepted as “0”. Please refer to Section 3.3.

Commercially Sensitive Information

On behalf of Sanibey Baraji Elektrik Uretim ve Ticaret A.S., there is no commercially sensitive information that needs to be excluded from the public version of the VCS PDD which will be displayed on the VCS Project Database.

Further Information

The Sanibey Dam &HEPP contributes to the region's sustainable development in particular and Turkey's sustainable development in general by:

- Increasing the use of renewable energy sources for generating electricity
- Meeting the need of electricity generation and supply in Turkey in a sustainable way,
- Decreasing the consumption of fossil fuels,
- Reducing emission of GHGs from the national electricity grid, thereby reducing the effects of global climate change in the medium and long term, and
- Contributing to local economy by providing better farming conditions and job opportunities by means of irrigation
- Contributing to local economy by giving priority to the usage regional sources and workforce.

The project contributed in the social and economic development in the project area significantly as:

- Irrigation of Imamoglu village as well as electricity generation has been realized by the project developer. Although the first investment plans of the project developer did not cover the irrigation project that State Water Works (DSI) had initially intended to do, the mentioned project was later decided to be realized and was finally granted to DSI. Water required for irrigation of 75,000 ha of area will be taken from the Sanibey Dam Reservoir, HEPP and Quarries Project. Therefore; realization of the irrigation of Imamoglu depends on the



implementation of the Sanibey Dam, HEPP and Quarries Project. Though taking irrigation water from the dam will cause a decrease in the total energy production, irrigation water to be supplied from the Sanibey Dam, HEPP and Quarries Project will essentially contribute to the region through better farming conditions⁹. The realization of the irrigation will provide employment opportunities for about 50,000 people and highly contribute to local economy.¹⁰

- The project developer makes utmost effort for maximizing the employment of local workers and ensuring that the employment practices of the contractors are realized in this manner as well. The contractors also implement preferential local hiring policy as much as possible. About 900 employees have been hired for the construction of the project. Out of all employees, 26% are from project-affected settlements, 28% are from project-affected districts and 46% are from other districts of Adana. It is determined that a total of 30 people – technical and administrative personnel will be employed during operation of the facility. These personnel will be chosen among inhabitants in the region as much as possible.
- The roads of Sagnaklar, Eyner, Ulucinar and Boztahta villages have been improved which help the villagers access surrounding regions easily. A 15 km-long road has been relocated around the area and possession of the road has been given to the Directorate General for the Highways.
- Basic infrastructure activities like providing water and electricity to the mentioned villages have been realized. The project owner made its machinery and equipment available for the construction and improvement of public buildings and infrastructure in the project area; for example, two mosque have been erected in Eyner and Aladag Villages, the mosques located in the rest of the mentioned villages were improved, a dining hall for the primary school in Boztahta and Uctepe Villages were constructed. The mukhtar houses of the mentioned villages have either be improved or reconstructed. The primary school in Imamoglu district has been rebuilt. A sound surrounding system was installed at Boztahta Primary School. All the other schools in the surrounding area have been renovated. Water supply infrastructure was constructed from Akoren Municipality to Eyner Village, Sagnaklar neighbourhood. Access road and a water storage tank were constructed at the new settlement of Ulucinar Village, thus, drinking water could be supplied to each dwellings. A well was drilled for water to be pumped to a storage tank.
- The project owner assisted the inhabitants to build better housing and create more efficient economic activities for themselves after evacuating the project's area mainly by compensating them with amounts of funds significantly higher than those set by the arbitration court. A total of 103 households (351 people) in the project area will have been subjected to the resettlement within the scope of the project. Out of this figure, 60 households (200 people) are from Eyner Village and 43 households (151 people) are from Ulucinar Village. While some of the affected villagers of Eyner and Ulucinar preferred to move to Adana, the rest of the villagers preferred to be moved to an appropriate area of higher elevation. During expropriation works, first, reciprocal treaty chances will be attempted with careful attention not to harm the population living in these areas; and conflicts will be compromised according to the Expropriation Law, number 4650 (come into force by 21.05.2001 dated and 24393 numbered Official Gazzete). So far, constructions of the new settlement areas have been started. Resettlement has been realized taking into consideration of the requirements of the villagers. For example, The Ulucinar Villagers asked their cemeteries to be transported due to their religious beliefs. In addition; the project owner has given fifty seven students scholarships since 2008.

⁹ <http://www.haberler.com/yedigoze-baraji-nda-ilk-adim-haberi/>

¹⁰ [Assessment of Land Aquisition and Involuntary Resettlement Process In Accordance With The Requirements Of the IFC \(Final\)](#)



- Necessary amount of air conditioners have been implemented to the Aladag District Attorney's building, the police station and gendarmerie commander's building and forest management directorate building of Imamoglu district.
- A garage and a solar electricity generation system have been constructed at the Imamoglu Gendarmerie Commander's.
- The project owner, Mr. Abdulkadir Konukoglu has also been granted awards for the protection of environment during the construction of the project by the Adana Province Environmental Initiative Foundation. This news had been published by several national and regional newspapers.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

Additionality, for the purpose of calculating the emission factor of the Turkish electricity grid," Tool to calculate emission factor for an electricity system", Version 02 is employed. The baseline for the project was established through the official methodology of ACM0002 / Version 12 1.0, named "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"⁸ as approved by the CDM Executive Board. Also, to prove additionality and to calculate the grid emission factor, the official methodologies: "Tool for the demonstration and assessment of additionality, Version 05.2"¹¹ and "Tool to calculate the emission factor for an electricity system, Version 02"¹² are used. Conservative options and data were selected during the implementation of the methodology.

2.2 Applicability of Methodology

The methodology is applicable to grid-connected renewable power generation activities under certain conditions. The applicability conditions of the approved consolidated methodology and how the project activity complies with them are described below:

Applicability condition in the ACM0002/Version 12 1.0	Compliance of the condition
This methodology is applicable when the project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is a Greenfield grid connected dam and HEPP. The project activity is located across the Seyhan River basin. Apart from the dam, the project also comprises a spillway, two-tunnel diversion structures, an energy water intake structure, two penstocks and a power station, having two Francis turbines of vertical axis with 158.5 MW power each.
In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a	This condition is not applicable to the project activity as it involves the installation of a new hydroelectric power plant.

¹¹ <http://cdm.unfccc.int/EB/016/eb16repan1.pdf>

¹² <http://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.pdf>



<p>minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.</p>	
<p>In case of hydro power plants, one of the following conditions must apply:</p> <ul style="list-style-type: none"> - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m²; or - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m². 	<p>The project activity involves the construction of a dam with a dam lake surface area of 14,299,206 m²</p> <p>The power density (PD) for this reservoir area is calculated as follows: PD = 310,660,000 W/14,299,206 m² 21.72 W/m² PD = W/m²</p> <p>PD > 10 W/m², therefore, according to the methodology, there will be no emissions from the reservoir.</p>
<p>This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the base line may be the continued use of fossil fuels at the site.</p>	<p>This condition is not applicable to the project activity as it does not involve switching from fossil fuel to renewable energy at the site of the project activity.</p>
<p>This methodology is not applicable to biomass fired power plants.</p>	<p>This condition is not applicable to the project activity as it does not involve the installation of a biomass fired power plant.</p>
<p>In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.</p>	<p>This condition is not applicable to the project activity as it does not involve a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit(s).</p>

Hence, the approved consolidated methodology ACM0002 / Version 12 1.0 is applicable to the project activity.

The project activity also complies with the applicability conditions of the “*Tool to calculate the emission factor for an electricity system*” (Version 02) as it displaces electricity generated by power plants in the Turkish electricity system. Moreover, it complies with the applicability criteria of the “*Tool for the demonstration and assessment of additionality*” (Version 05.2), as according



to paragraph 6, this tool provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types.

2.3 Project Boundary

The Sanibey Dam & HEPP entails the construction and operation of a 310.66 MWe hydroelectric power plant. The project consists of 2 hydro schemes with turbines of 155.33 MWe each.

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

Source		Gas	Included?	Justification / Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO ₂	Yes	Main emission source.
		CH ₄	No	Minor emission source.
		N ₂ O	No	Minor emission source.
Project activity	For hydro power plants, emissions of CH ₄ from the reservoir.	CO ₂	No	Minor emission source.
		CH ₄	Yes	CH ₄ emissions are neglected as the project activity's power density is above 10.
		N ₂ O	No	Minor emission source.

Table 3: The justification of the project boundary

Indirect emissions can result from project construction, transportation of materials and other upstream activities. In the case of the proposed project activity, these emissions are thought to be comparable or less than the life cycle emissions which would result from the eventual construction and operation of alternative capacity. The life cycle emissions of alternative power generation plants, in particular fossil fuel-fired power plants, are typically higher than those from hydroelectric power plants when including emissions due to mining, refining and transportation of fossil fuel. The project does not claim emissions reductions from these activities. Therefore no significant net leakage from the above activities was identified. This approach is stated to be conservative.

For the purpose of determining the electricity emission factor, the project electricity system is defined as the overall Turkish electricity network. There is an interconnected system for the electric distribution in Turkey¹³. Thus there is no independent regional electricity system or any significant transmission constraints. For electricity imports from neighbouring countries, the emission factor of 0 ton of CO₂ per MWh is applied.

No GHG sources in terms of sinks and reservoirs could be identified for this project.

¹³ TEİAŞ and Energy Efficiency and Renewable Energy, Turkey - National study, Pr Ahmet Koyun, Termodinamik Anabilim Dal, Yıldız Teknik Üniversitesi, March 2007, Page 71



2.4 Baseline Scenario

The project electricity system is defined as “the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints” in the “Tool to calculate the emission factor for an electricity system”. Similarly, “a connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint” in the same document.”

In this case “the project electricity system” and “the connected system” are same as also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.),¹⁴ the Turkish transmission system is interconnected. There is not an independent regional grid system neither in Adana nor in the Mediterranean Region.

In addition to this, since there is no DNA in the host country to delineate the project electricity system, the suggested criteria in “Tool to calculate the emission factor for an electricity system” was used. Since there is no capacity usage figure for transmission line published, the criteria “The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.” could not be proved.

On the other hand, there is no spot electricity market available in the country as suggested in the other criteria “In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.” Therefore, this criterion is not applicable as well.

As suggested in “Tool to calculate the emission factor for an electricity system”, “if these criteria does not result in a clear grid boundary, use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national).” However, there are no layered dispatch systems in the country. As a result the national grid was used as the project electricity system. Hence, the estimation of OM (Operating Margin) and BM (Built Margin) are based on the definition of the Turkish electricity network as one single interconnected system.

The method to describe and calculate the baseline has clearly been specified by the Baseline Methodology. CDM Executive Board has already provided a consolidated tool for appraising and demonstrating the additionality feature of the projects.

Since the project is an installation of a new grid-connected renewable power plant, the baseline scenario is formulated in ACM0002 / Version 12 1.0: *“Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the Combined Margin (CM) calculations described below”.*

The project is not a modification/retrofit of an existing grid-connected renewable power plant/unit. Therefore the other alternative baseline scenario mentioned in ACM0002 / Version 12 1.0 is not chosen.

¹⁴ TEIAS is the legal entity responsible by law to collect and announce data related to electricity production and consumption in electricity consumption etc figures(or data used in calculating the related data) used in this document were received from the internet site of TEIAS (which is [www. TEIAS.gov.tr](http://www.TEIAS.gov.tr)) unless otherwise stated. Turkey. All Turkey related electricity production, fuel consumption in electricity production, average full load working hour, electricity consumption etc figures(or data used in calculating the related data) used in this document were received from the internet site of TEIAS (which is www. TEIAS.gov.tr) unless otherwise stated.



According to the “Baseline Methodology Procedure” in “Tool to calculate the emission factor for an electricity system” following steps should be followed.

All the information pertaining to the grid and estimating baseline emissions are publicly available, and was available at the website of TEIAS (Turkish Electricity Transmission Company Inc. - www.teias.gov.tr)

According to the “Tool to calculate the emission factor for an electricity system”, Project participants shall apply the following six steps:

- STEP 1. Identify the relevant electric power system
- STEP 2. Choose whether to include Off-grid power plants in the project electricity system.
- STEP 3. Select an operating margin (OM) method.
- STEP 4. Calculate the operating margin emission factor according to the selected method.
- STEP 5. Identify the cohort of power units to be included in the build margin (BM).
- STEP 6. Calculate the build margin emission factor.
- STEP 7. Calculate the combined margin (CM) emissions factor.

STEP 1- Identify the relevant electric power system

The project electricity system is defined as “the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints” in the “Tool to calculate the emission factor for an electricity system”. Similarly, “a connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint” in the same document.”

In the project’s case “the project electricity system” and “the connected system” are same. As also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.), the Turkish transmission system is interconnected. There is not an independent regional grid system neither in Adana nor in Mediterranean Region.

In addition to this, since there is no DNA in the host country to delineate the project electricity system, the suggested criteria in “Tool to calculate the emission factor for an electricity system” was used. According to this, 1-The capacity usage figure for the transmission line should be checked. 2-Spot market prices of different systems in the country should be compared.

Since there is no capacity usage figure for transmission line published, the criteria “The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.” could not be proved.

On the other hand, there is no spot electricity market available in the country as suggested in the second criteria “In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year.” Therefore, this criterion is not applicable as well.

As suggested in “Tool to calculate the emission factor for an electricity system”, “if these criteria do not result in a clear grid boundary, use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national).” However, there are no layered dispatch systems in Turkey. As a result the national grid was used as the project electricity system. Hence, the estimation of OM (Operating Margin) and BM (Built Margin) are based on the definition of the Turkish electricity network as one single interconnected system.

The interconnected electricity transmission grid of Turkey is as shown below:

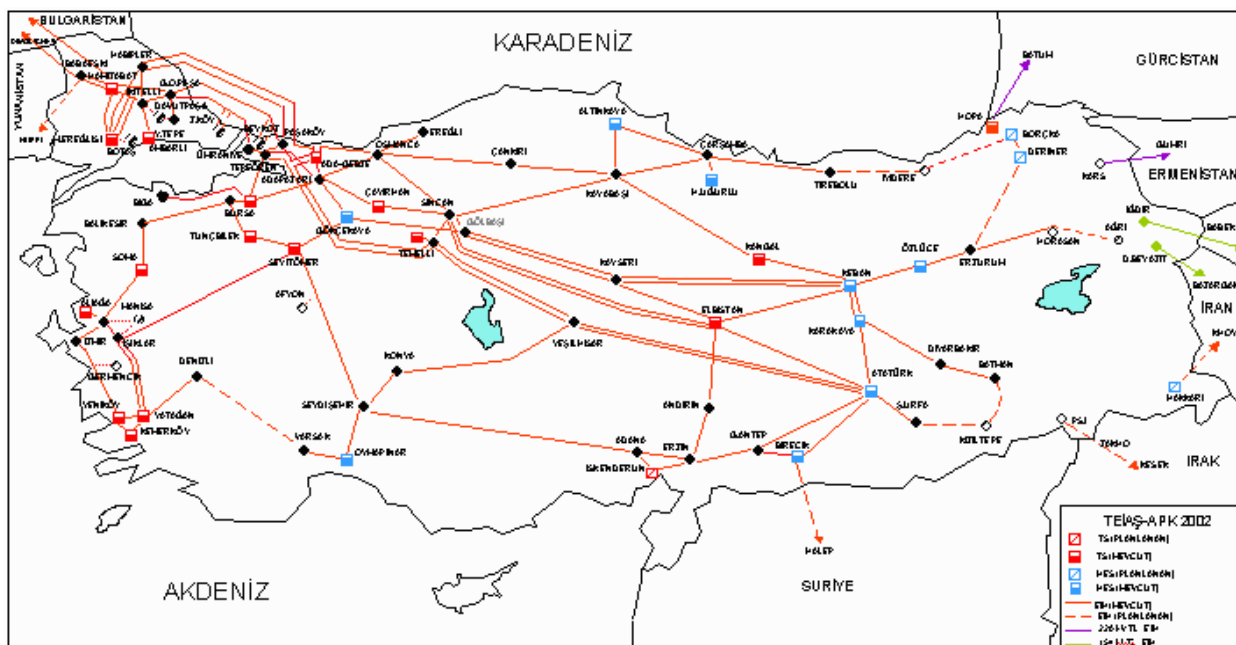


Figure 4: Turkish electricity grid

STEP 2: Choose whether to include Off-grid power plants in the project electricity system

According to “Tool to calculate the emission factor for an electricity system, Version 02”, the OM and BM values can be calculated based on the following two options:

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

Option I is selected in the calculation of Built Margin and Operating Margin for the proposed project activity. The reason why the tool suggests the Option II is, “in some countries off-grid power generation is significant and can partially be dispatched by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid.”

As Turkey’s grid is more appropriate for calculating the OM and BM values according to Option I, this option is selected.

STEP 3- Select an operating margin (OM) method

According to “Tool to calculate the emission factor for an electricity system”, four alternative methods to calculate OM can be chosen. In choosing the right method for the calculation of OM, “Simple adjusted OM”, “Dispatch data analysis OM” and “Average OM” methods are eliminated since all these methods require power plant specific information of power plants which are connected to the grid. However, no power plant specific information is available. Similarly, option A of “Simple OM” methods was also eliminated as again there is no power plant specific data is publicly available.



All in all, option B of “Simple OM” method was adopted as “the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system” is the only available data in the host country.

For the simple OM, the emissions factor can be calculated using either of the two following data vintages: Ex-ante and ex-post data vintages. Ex-ante data vintages have been used for the calculation of the emission factor of the Project.

STEP 4- Calculate the operating margin emission factor according to the selected method

For calculating the OM factor according to the selected method, Option B has been selected. Simple OM option B method is eligible when low cost and/or must run resources constitute, as an average of the five most recent years, less than 50 percent of the total generation for the grid. Nevertheless, the only relevant low operating cost and must run resource in Turkey is hydropower because the share of all other renewable resources is close to nil and therefore can be assumed negligible. The share of all non-hydro renewable resources in the entire electricity generation is 0.5 percent for the years between 2005 and 2009. There is no example of coal being used as must-run and nuclear energy is not practiced in Turkey.

As depicted in Table 5¹⁵ the share of low-cost/must run resources were never higher than 50 percent in the last five years.

	2005	2006	2007	2008	2009
Turkey's Gross Electricity Production (GWh)	161,956	176,300	191,558	198,418	194,813
Electricity Production from Hydro (GWh)	39,561	44,244	35,851	33,270	35,958
Electricity Production from Wind & Geothermal (GWh)	153	221	511	1,009	1,931
Total share of renewables (%)	25%	25%	19%	17%	19%

Table 4: Share of hydroelectric production in Turkey, 2005 – 2009¹⁶

The Simple Operating Margin Emission Factor ($EF_{OM,y}$) is computed as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of the entire bundle of generating sources that supply into the system, except for low operating cost and must run resources including hydro, geothermal, wind, low-cost biomass, nuclear and solar generation as determined by the Baseline Methodology.

According to “Tool to calculate the emission factor for an electricity system”, the formula given below is applied for computing the $EF_{grid,OMsimple,y}$.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y}$$

Where:

¹⁵ All data presented in the baseline calculations are provided from official sources as mentioned in related foot notes. Therefore, uncertainties of data sets were not estimated.

¹⁶ [http://www.teias.gov.tr/istatistik2009/32\(75-09\).xls](http://www.teias.gov.tr/istatistik2009/32(75-09).xls)



$EF_{grid,OMsimpl}$	=	Simple operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$FC_{i,y}^{e,y}$	=	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit)
$EFCO_{2,i,y}$	=	CO ₂ emission factor of fossil fuel type i in year y (tCO ₂ /GJ)
EG_y	=	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)
i	=	All fossil fuel types combusted in power sources in the project electricity system in year y
Y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In order to calculate the emission amounts from each fuel types, emission factors from IPCC website were used.¹⁷ Three sets of emission factors were identified as minimum, medium and maximum values. To be conservative side, the minimum values are used in the OM calculations.

	kg CO ₂ /GJ			Default Carbon
	min.	mid	max.	Oxidaton Factor
hard coal	92.8	96.1	100.0	1.0
lignite	90.9	101.0	115.0	1.0
fuel oil	75.5	77.4	78.8	1.0
diesel oil	72.6	74.1	74.8	1.0
natural gas	54.3	56.1	58.3	1.0
lpg	61.6	63.1	65.6	1.0
naphtha	69.3	73.3	76.3	1.0

Table 5: Emission factors from IPCC¹⁸

Turkey's GHG Emissions Inventories for year 2006 and 2007 are announced by Turkish Statistical Institute (TUIK). However, to be on the conservative side, CO₂ emissions figures from electricity production are not taken from these announced figures, as the calculation method is not known and these figures are a bit higher than the calculated figures.^{19, 20, 21} As a result, for years 2007, 2008 and 2009, the CO₂ emissions are calculated with the IPCC minimum values:

All in all;

¹⁷ http://www.ipcc-nggip.iges.or.jp/EFDB/find_ef_s1.php

¹⁸

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter 1 Introduction, Table 1.4
http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

¹⁹ <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=1996>

²⁰ <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=4078>

²¹ http://www.tuik.gov.tr/PrelstatistikTablo.do?istab_id=488



	2007	2008	2009
CO2 Emission from Electricity Production (tons)	98,352,660	104,062,368	98,532,497

Table 6: CO2 Emission of Turkey from Electricity Production

The calculation of net electricity production is demonstrated below.²² As the efficiency factor from gross to net electricity for thermal resources is not known, the overall relation between gross and net electricity production is assumed to be the same for thermal production. Table 7 shows the overall gross/net relation where the estimated net electricity production from thermal resources were calculated by using the same relation.

	2007	2008	2009
Gross Electricity Production (a) (GWh)	191,558	198,418	194,813
Net Electricity Production (b) (GWh)	183,340	189,762	186,619
Net/Gross (c= b/a)	0.957	0.956	0.958
Gross Electricity Production from thermal sources (d) (GWh)	154,983	163,919	156,583
Net Electricity Production from thermal sources (c*d) (GWh)	148,333	156,768	149,998

Table 7: Net Electricity Production of Turkey from Thermal Sources²³

Obviously, using the same relation for both overall electricity production and thermal production is an approximation based on a rough assumption. Yet, obviously, such assumption results in a very conservative estimation because the efficiency of thermal plants is much lower than other plants as the operational consumption in those plants are relatively higher and this would only lead to a lower net electricity generation with higher OM emission factor and higher emission reductions.

With respect to the Baseline Methodology, electricity import amount is added to the domestic supply where the imports from connected grids located in other countries are weighted with an emission factor of zero tCO₂/MWh.

The last part of Step 1 is calculating the ratio of emissions and generation. Based on the Simple Operating Margin Emission Factor formula $EF_{OM,y}$ values for 2007, 2008, 2009 are calculated as follows:

	2007	2008	2009
OM (tCO₂/MWh)	0.6631	0.6638	0.6569

Table 8: OM Emission Factor for 2007 – 2009

According to the methodology, two data vintages are allowed for the calculation of, ex-ante and ex-post:

- Ex-ante: A 3-year average, based on the most recent statistics available at the time of PDD submission
- Ex-post: The year in which project generation occurs, if the OM emission factor is updated based on ex-post monitoring

²² [http://www.teias.gov.tr/istatistik2009/30\(84-09\).xls](http://www.teias.gov.tr/istatistik2009/30(84-09).xls)

²³ [http://www.teias.gov.tr/istatistik2009/37\(06-09\).xls](http://www.teias.gov.tr/istatistik2009/37(06-09).xls)



In this case, the ex-ante approach is preferred because the data is available and it is a conservative approach due to the forecast that the weight of fossil fuel use in the generation of electricity in Turkey will increase.

As the weighted average of the figures between 2007 and 2009 is computed, the OM emission factor is 0.6613 tCO₂ / MWh.

STEP 5- Identify the cohort of power units to be included in the build margin (BM)

Computing the BM is based on the sample of plants, in either of the two proposed ways:

- The five power plants that have been built most recently, or
- The most recently built power plants with capacity additions to the electricity system that cover 20 percent of the system generation in MWh.

Among these two options, the sample group that comprises the larger annual generation should be used. For the proposed project, the sample group has been comprised of plants commissioned between 2006-2009.

The data for the recently built power plants is available for their capacity, type of utility in terms of IPP, auto-producer, BOT, fuel type and date of commissioning. According to the data:

- Since the recently commissioned power plants are given in a yearly basis, it is not known which power plant is commissioned most recently. On the other hand, since Turkey's electricity production figure is 194.8 TWh, none of the 5 power plants can exceed the 20% of the electricity generation capacity of the entire grid.
- Instead, the Build Margin could also be computed by using the most recent capacity additions that comprise the 20 percent of the total system generation. This corresponds to 38.9 TWh which is 20 percent of the overall generation of 194.8 TWh.

Please see annex 7 for the details of generation from those plants in specific.²⁴

STEP 6- Calculate the build margin emission factor

According to the Baseline Methodology, the Build Margin (BM) Emission Factor EF_{BM} is calculated as the generation-weighted average emission factor of a sample of power plants m for a specific year, as follows:

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

Where:

$EF_{grid,BM,y}$	Build margin CO ₂ emission factor in year y (tCO ₂ / MWh);
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

²⁴ References have been presented in Annex.7.



$EF_{EL,m,y}$	CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

There is no available CO₂ emission data for the power units included in the BM calculation. The available data for on plant basis is the name, type, installed capacity and annual electricity production figures of these facilities. However, there is no available data for the electricity production figures of some small facilities, most probably because these projects are included in the “Other Projects”. Therefore, annual electricity productions of these facilities were calculated with the following formula unless the exact production figures are reached. The data used in the BM calculation is provided from the Turkey’s Capacity Projection Reports published in years: 2010²⁵, 2009²⁶, 2008²⁷ and 2007²⁸.

$EG_{m,y} = \text{Full Load Working Hours} \times \text{Installed Capacity}$

In addition to this the efficiency rates for the fuel consumption of these facilities should be added to the calculation (as the thermal plants do not consume 100% of the fuel which they are fed with). Therefore an efficiency figure which represents how efficiently the thermal power plant consumes the fuel was estimated for each facility group in line with the data provided by TEIAS.. Within the context of the calculation in this document, higher the efficiency figure means lower the CO₂ emission (as the electricity calculation assumes that the electricity production is a function of the designed installed capacity not the efficiency. However, in theory the installed capacity of a plant increases with the higher efficiency).

Therefore, in the calculation of the $EF_{grid, BM, y}$, first $EF_{EL,m,y}$ values are calculated by using the formula (4) as suggested in the tool. Also, to calculate the $EF_{EL,m,y}$ values, the default efficiency figures listed under the “Appendix-1: Default efficiency factors for power plants” are used.

Generation Technology	Grid Power Plants	
	Old Units (before and in 2000)	New units (after 2000)
Coal	-	-
Subcritical	37%	39%
Supercritical	-	45%
Ultra-supercritical	-	50%
IGCC	-	50%
FBS	35.5%	-
CFBS	36.5%	40.0%
PFBS	-	41.5%
Oil	-	-
Steam turbine	37.5%	39%
Open cycle	30%	39.5%
Combined cycle	46%	46%
Natural Gas	-	-

²⁵ <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>

²⁶ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf>

²⁷ <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf>

²⁸ <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf>



Steam turbine	37.5%	37.5%
Open cycle	30%	39.5%
Combined cycle	46%	60%

Table 9: Default Efficiency Factors for power plants (Appendix 1 of the tool)

As seen in the table above, the efficiency figures of coal, oil and natural gas, for different generation technologies, are given in the tool. In Turkey, the generation technologies for natural gas and oil is “Combined cycle” and for coal “Subcritical”. Default values for lpg and naphta are not given in the tool. Therefore, to be on the conservative side, the efficiency factors of these fuel types are assumed as 60% (equal to the highest efficiency figure / Efficiency figure for Natural Gas-Combined Cycle).

In line with the tool, the efficiency factors for each fuel type are assumed as presented in the table below:

Fuel Type	Generation Technology	Efficiency Factor
hard coal	Coal - Subcritical	39%
Lignite	Coal - Subcritical	39%
fuel oil	Oil - Combined Cycle	46%
diesel oil	Oil - Combined Cycle	46%
natural gas	Natural Gas - Combined Cycle	60%
Naphta	-	60%

Table 10: Efficiency Factors used for BM Emission Factor Calculation

The Build Margin estimation is based on the emission factors calculated for each energy source.

Fuel Specific Emission Factors

Carbon content factors for each fuel type (tC/TJ) refer to the factors stated in “2006 IPCC Guidelines for National Greenhouse Gas Inventories” and the fuel specific CO₂ emission factors were estimated from the same factors. To be on the conservative side, minimum emission factors were used in the calculation.

Electric Efficiency Rates

The electric efficiency rates for different fuel types across ownership structures of the facilities (state owned versus privately owned versus mobile facilities) were calculated through actual energy consumption figures of these facility types in the last 3 years. All additional facilities were assumed to be equal to its specific group’s average efficiency.

Electricity Production

The announced electricity production figures of the facilities which were commissioned in the period between September 17th, 2006 and December 31st, 2009.

The computations display a weighted Build Margin emission factor of 0.4246 tCO₂ / MWh.

STEP 7- Calculate the combined margin (CM) emissions factor

The baseline emission factor is the weighted average of the Operating Margin Emission Factor and Build Margin Emission Factor. The ACM0002 / Version 12 guideline recommends equal weight values for hydropower projects as seen in the formula below:



$$EF_{\text{grid, CM, y}} = EF_{\text{grid, OM, y}} \times w_{\text{OM}} + EF_{\text{grid, BM, y}} \times w_{\text{BM}}$$

Where:

$EF_{\text{grid, BM, y}}$	=	Build margin CO ₂ emission factor in year y (tCO ₂ /MWh)
$EF_{\text{grid, OM, y}}$	=	Operating margin CO ₂ emission factor in year y (tCO ₂ /MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

The default values recommended by “Methodological tool (Version 02) Tool to calculate the emission factor for an electricity system” for wOM and wBM for activities other than wind and solar power generation projects are 0.5 and 0.5, respectively.

$$EF_{\text{grid, CM, y}} = 0.6613 \times 0.5 + 0.4246 \times 0.5$$

Therefore resulting $EF_{\text{grid, CM, y}}$ is 0.5429 tCO₂/MWh

2.5 Additionality

The project’s additionality has been demonstrated using the latest version of the “*Tool for the demonstration and assessment of additionality*”- Version 05.2. This tool equals the Test 1- The Project test.

The following steps from the additionality tool are completed below:

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 alternatives available to the proposed Project that provide outputs or services comparable with the proposed VCS project activity include:

Alternative 1: The proposed project activity undertaken without being registered as a VCS project activity.

Alternative 1 is in compliance with legal and regulatory requirements. Therefore, Alternative 1 is a credible alternative.

Alternative 2: Construction of a thermal power plant with equivalent installed capacity or annual electricity generation.

Although the coal and natural gas reserves in Turkey is very limited, there are many thermal power plants that have been being commissioned in recent years and Turkey’s grid mainly consists of thermal power plants. As they have become common practice in the energy sector due to off-take agreements provided by the government in the past, these projects face easier circumstances in terms of financing and realisation. In addition, most of coal powered thermal power plants use imported coal, so they can be realized regardless of their geographic proximity to coal supply. Therefore, construction of a thermal



power plant with the installed capacity of 310.66 MWe is viable since establishment of thermal plants with the mentioned capacity is frequently experienced in Turkey.²⁹

Hence, Alternative 2 is a credible alternative.

Alternative 3: Construction of a new power plant generating the same annual power generation from other renewable sources such as wind power, solar power and thermal energy.

Besides hydro energy, other renewable energies such as geothermal and wind energies are likely to be considered for electricity generation. Construction of a wind power plant is not credible considering the lack of appropriate land for generating huge amount of electricity from wind power. In addition, construction of a wind park with an installed capacity of 310.66 MWe has never been experienced in Turkey. Construction of a similar size run-off-river hydro project has not experienced in Turkey either.

Consequently, Alternative 3 is not a viable alternative and should be eliminated from further consideration.

Alternative 4: The continuation of the current situation. The equivalent electricity will be provided by the existing power units connected to the national grid.

This alternative is in compliance with legal and regulatory requirements. Based on the above analysis, it is a plausible and realistic alternative.

Outcome of Sub-step 1a: Out of all the identified alternatives, Alternatives 1, 2, and 4 are plausible and realistic.

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

As above mentioned all the alternatives available to the proposed Project that provide outputs or services comparable with the proposed VCS project activity are consistent with the mandatory laws and regulations.

Outcome of Sub-step 1b: The plausible and realistic alternatives are Alternative 1 “The proposed project activity undertaken without being registered as a VCS project activity, Alternative 2 “Construction of a thermal power plant with equivalent installed capacity or annual electricity generation” and Alternative 4 “The continuation of the current situation. The equivalent electricity will be provided by the existing power units connected to the national grid” Based on the above analysis, the proposed project activity is not only the alternative amongst the project participants that is in compliance with mandatory regulations. Therefore, the proposed VCS project activity may be additional.

STEP 2 – Investment analysis

The purpose of the investment analysis is to determine whether the proposed project activity is not:

- a) The most economically or financially attractive; or
- b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (VCS-VERs).

To conduct the investment analysis, the following Sub-steps were used:

Sub-step 2a- Determine appropriate analysis method

²⁹ Source: TEIAS Capacity Projection Report (2010-2019), Annex 1
<http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>



The “*Tool for the demonstration and assessment of additionality*” (Version 05.2) recommends three analysis methods, namely simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The proposed Project generates financial and economic benefits through the sales of electricity other than Voluntary Emissions Reduction (VCS-VER) related income. Therefore the simple cost analysis (Option I) cannot be taken.

Investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenarios of the proposed project are the proposed project activity undertaken without being registered as a VCS project activity, the continuation of the current situation and construction of a thermal power plant with equivalent installed capacity or annual electricity generation where the equivalent electricity will be provided by the existing power units connected to the national grid. Among the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) is preferred.

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

When using the benchmark analysis option, the equity IRR has been used as the project owner’s decision is based on the equity IRR.

According to the “*Tool for the demonstration and assessment of additionality*” (Version 05.2), in the cases of projects which could be developed by an entity other than the project participant the relevant benchmark for a Project’s IRR should be based on publicly available data sources which can be clearly validated by the DOE. The benchmark for a Project’s IRR shall, therefore, be derived from “*government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data*”³⁰.

For that reason, the IRR benchmark value has been selected as the Turkish Eurobonds rates, plus a risk premium as explained below.

Sanko Group decided to invest in Sanibey Dam & HEPP on 25th of December in 2006 after a final presentation submitted to the Board dated December 5th, 2006. This presentation summarizes technical issues and economical feasibility of the project to the Board. In addition to this similar issues were deeply analyzed in a feasibility report prepared by Sanko Muhendislik ve Danismanlik A.S. Some of the assumptions used in this presentation and the feasibility report are:

Parameter	Chosen Value	Source
Investment period	35years	FSR, p. 7-4 (Technical lifetime of the equipments suggested by DSI.)
Annual energy production	966,530 MWh	FSR, p. 1-9
Electricity sales price	5.5 Eurocents/KWh	Maximum guaranteed purchase price by law number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005
O&M expenses	1% of the investment amount	FSR, p. 7-4

³⁰ “*Tool for the demonstration and assessment of additionality*” (Version 05.2), page 6, available at http://cdm.unfccc.int/methodologies/PAMethodologies/AdditionalityTools/Additionality_tool.pdf



Interest on loan	9.0% (Libor+3.5% - 4.0%)	Presentation submitted to the Board ³¹
Other loan conditions	Debt to Equity: 75/25 Tenor: 3.5 + 8 years	Presentation submitted to the Board
Investment amount	US\$ 359,196,085	FSR
Euro / US\$ parity	1.2862 Euro/ US\$	Presentation submitted to the Board

Table 11: List of assumptions

The first assumption pertains to the cost of equity benchmark which is calculated as the Turkish risk premium plus risk free rate.

As the Turkish Eurobonds represent a risk-free rate, it must be increased by a suitable risk premium, which reflects the premium that investors demand for an average risk investment. The interest rate at the decision making date for Eurobond with longest duration of 30 years which is US900123AY60-17.03.2036– that is approximately 7.25%. However, the maturity of this Eurobond does not match with the assessment period of the investment analysis. Therefore, a theoretical Eurobond with 39 years maturity is created taking into account the assessment period (4 years for the construction phase and 35 years for the operational phase). As a result, the risk free rate is calculated as 7.43% .

According to Mr. Aswath Damodara, professor of Finance at the Stern School of Business at New York University³², the suitable risk premium for Turkey can be estimated as 9.41% for the year 2006.

The IRR benchmark value is then calculated using the interest rate of the theoretical Eurobond, 7.43%, delivered from the Turkish Eurobonds rates, plus the risk premium, 9.41%. As explained hereunder:

$$C_e = R_f + \beta \times (R_m - R_f)$$

Where:

³¹ The following presentation justifies that the interest, loan/equity ratio and tenor assumptions in the presentation submitted to the Board are acceptable and in line with the market conditions:

<http://www.iso.org.tr/tr/documents/cevre/tkb.pdf?redirected=1>

³² Aswath Damodaran is a Professor of Finance at the Stern School of Business at New York University, where he teaches corporate finance and equity valuation. He also teaches on the TRIUM Global Executive MBA Program, an alliance of NYU Stern, the London School of Economics and HEC School of Management. Professor Damodaran is best known as author of several widely used academic and practitioner texts on Valuation, Corporate Finance, and Investment Management



Parameter		Chosen Value	Source
Rf	Risk-free rate	7.43%	The yield of a synthetic bond with 39 years maturity at the time of decision was calculated using the yield curve derived from http://www.ziraatbank.com.tr/tr/p/n/Content.aspx?id=448 was used. The details of the calculation can be found in a separate excel sheet provided to DOE. Please see Annex 9 to see the yield curve.
B	Beta. Used to measure level of risk.	0.939	The average of energy companies traded in ISE 100 derived from one of the most prominent data provider Bloomberg. Please see Annex 9 for Betas of these companies
Rm-Rf	Market equity risk premium	9.41%	http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem05.xls
Rm	Expected market return	16.26%	-

Table 12: Benchmark Calculation

$$Rf + B \times (Rm - Rf) = Ce$$

$$7.43\% + 0.939 \times (9.41) = 16.26\%$$

Therefore, a realistic equity benchmark IRR for this type of project should be greater than the base investment threshold (Turkish Eurobonds) plus a risk premium, which given the figures referenced, is greater than 16.26%.

The technical assumptions along with construction and M&E costs are calculated per DSI and other international standards to build this size of diversion weir by an independent advisor to the project owner. The feasibility study was the base for the investment decision.

The cash flow was prepared for 35 years, estimated operational lifetime of the equipments as suggested by DSI

Electricity generation amount of 966.53 GWh was calculated from the inflows in the river during the years 1975 to 2006 in the technical part of the feasibility report.

Electricity Selling Price was assumed to be approximately 6.9 USD Cents/kWh / 5.5 Eurocents/kWh which was the selling price of electricity to the Turkish Transmission Line Company according to EMRA's board decision number 412, dated December 30th 2004.³³

Operation and Maintenance expenses were calculated according to State Hydraulic Works criteria based on their past experiences to be approximately 1% of the total construction and electromechanical costs.

Interest rate of 8.87% (all in cost) was assumed with a 8 year loan with 3.5 year grace period for the construction. The leverage of 75% was also assumed with 25% equity contribution.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

The parameters needed for calculation of key financial indicators are as follows:

³³ Source : <http://www.epdk.gov.tr/mevzuat/kurul/elektrik.htm>



	Data	Unit	Reference
Capacity	310.66	MWe	The Generation License
Estimation of annual grid-connected power generation	966,530	GWh	Presentation, The Generation License
Average sales price	0.055	EUR cent/kWh	The Law on Utilization of Renewable Energy Sources for the Purpose of Generating Electrical Energy, Part 3 Section C (published in the Official Gazette No. 27052)
Total investment	359,196,085	USD	FSR, p. 6-4
Annual operational costs	3,591,000	USD	Presentation, FSR section 7.2
Operational life	35	Years	Technical life time of electromechanical equipments suggested by DSI
Interest Rate	8.87% Libor +3.5%		See: IRR excel sheet, "Financing" page
Crediting period	20	Years	
Anticipated price of VCS-VERs	5.0	USD/tCO ₂	Expected by the Consultant

Table 13: Basic financial parameters of the proposed Project

In addition to the above mentioned parameters, the load factor of the project activity is calculated approximately as 35%. This figure has been achieved using this formula: (annual generation figure/installed capacity) : 8,760. As stated in the feasibility report, pages 5-11 and 5-12, rated power of each turbine is 158.5 MWm which add up to 317.0 MWm. Therefore, in order to calculate the load factor, the following formula is applied:

$$\begin{aligned} & (\text{Annual generation/ installed capacity})/8,760 \\ & = 966,530/317/8,760 \\ & = 0.3480 \end{aligned}$$

Therefore, it can be stated that the plant load factor is approximately 35%. Concordantly, on page 5-12 of the feasibility report, it is stated that the mentioned rated power enables the turbines function with the load factor of around 40%.

As a result, the calculation of the load factor corresponds to the figures in the feasibility report.

Based on the parameters above, the equity IRRs with and without the VCS-VERs sales revenue are calculated and shown in

IRR



Without VCS-VERs revenues	13.12%
With VCS-VERs revenues	13.74%

Table 14: Impact of VCS-VER revenues on the Proposed Project's IRR.

Table 15 shows that the IRR of the total investment of the proposed project without VCS-VERs sales revenue is 13.12 %, lower than the benchmark IRR of 16.26 %, which means that the proposed project activity indeed faces significant financial barriers. Therefore, the project activity is not the most economically or financially attractive choice of investment.

Sub-step 2d. Sensitivity Analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust under reasonable variations in the critical assumptions. According to the additionality tool, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subject to reasonable variation. For the project since no investment items exceeds the 20% of total investment nor the 20% of the total project revenue, But still to be on the conservative side, four basic parameters have been selected as sensitive factors to check out the financial attractiveness:

- Annual operational costs
- Electricity selling price
- Electricity production
- Investment costs

Table 15 shows the variation of IRR when the four parameters fluctuate from -10% to +10%.

	-10%	-5%	0%	+5%	+10%	+15%
Annual Operational costs	13.24%	13.18%	13.12%	13.06%	13.01%	
Electricity Production	11.18%	12.14%	13.12%	14.11%	15.11%	
Electricity Price	11.18%	12.14%	13.12%	14.11%	15.11%	16.11%
Investment Costs	13.28%	13.20%	13.12%	13.04%	12.97%	

Table 15: The variation of IRR

Sensitivity analysis has been carried out for the stated costs and assumptions. Within the project context, the range of variations regarding the electricity sales price has been widened to +15% as per EB 62 Annex 5. It came out that the IRR increased to 16.11%, which is still a lower figure than the benchmark, which is 16.26%.

The most up-to-date market price has been determined as 12.39 Krs/kWh by EPDK's website.³⁴ When the sensitivity analysis regarding the electricity sales price has been widened to +15% as per EB 62 Annex 5, the price increased to 0.079 USD which corresponds to 0.132 TL, a figure above the market price which is 12.39 Krs/kWh. The excel table displaying the average exchange rates has been provided separately. It shows that under none of those scenarios the IRR of the project exceeds the Benchmark.

Outcome of Step 2: Hence, the above figures have demonstrated that the project activity is not the most economically or financially attractive alternative.³⁵

³⁴ <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/144>

³⁵ All financial data and calculations will be provided to the D, OE.

**STEP 3 – Barrier analysis**

Not Applicable.

STEP 4 – Common Practice Analysis**Sub-step 4a- Analyze other activities similar to the proposed project activity**

Even though Turkey has significant hydroelectric power resources, fossil fuels remain the main source of energy production in the country. Gas, oil and coal represent about 70% of total power production.

However, there are more than 100 hydropower plants, with total installed capacity of 12,878 MW generating an average of 46,277 GWh/year, which is 36% of the economically viable hydroelectric potential. Forty-one hydroelectric power plants are currently under construction with 3,962 MW of installed capacity to generate an average annual 9,779 GWh representing 8% of the economically viable potential.

Aware of Turkey's hydroelectric power potential, the government has financed most of the existing power plants. For instance, the State Hydraulic Works (DSI) has developed 10,380 MW (81%) out of the 12,878 MW of total installed capacity in Turkey, and also, it has built 20 of the 25 largest hydroelectric power plants.³⁶

Moreover, it has put into practice the South-eastern Anatolia Project (GAP) along the basin of the Tigris and Euphrates Rivers. Under this project, which is considered one of the most ambitious water development projects ever undertaken, the Turkish government has completed 8 hydropower plants, representing 74% of total planned energy projects under the GAP scheme. The 8 power stations generated 18,700 GWh of electricity in 2005, adding substantially to the share of hydroelectricity in Turkey's energy mix.³⁷

In order to promote even more the electricity generation, in March 2001, a new Electricity Market Law was enacted. This law sets the stage for liberalization of power generation and distribution activities. And, in May 2005, Turkey adopted a Renewable Energy Law, taking a first step towards the implementation of renewable energies in the country.

However, in spite of these efforts, according to the Turkish Electricity Generation Company (EÜAŞ), only 20% of the hydroelectric installed capacity has a private participation³⁸, which shows that there is a lack of investor interest. Facing the growing demand for electricity and lacking the capital to realize hydro investment, the State outsourced the construction of those plants through licenses. As seen in the table below, the number of projects that are close to completion is very low. The low rate of completion of the projects confirms the barriers elaborated above and also proves that the electricity generation from HEPP business is not a common practice.

Completion Ratio (%)	Number of Facilities
<10% Completed	207

³⁶ "DSI in brief- General Directorate of State hydraulic works (DSI) 1954-2007", page 28

http://www.dsi.gov.tr/english/dsi_in_brief2007.pdf

³⁷ <http://www.eia.doe.gov/cabs/Turkey/Electricity.html>

³⁸ <http://www.teias.gov.tr/istatistik2009/7.xls>



>10% Completed	65
>20% Completed	32
>30% Completed	16
>40% Completed	23
>50% Completed	13
>60% Completed	11
>70% Completed	11
>80% Completed	10
>90% Completed	27

Table 16: Number of HEPP facilities completed over a certain completion ratio³⁹

When the electricity generation figures of HEPPs and Turkey's total electricity generation figures are considered, it is very clear that the use of hydropower in electricity generation, especially from privately held hydropower plants is very low and not common practice. The total electricity generation from hydropower fluctuated in years and decreased to 35,958 GWh in 2009, while it was 46,084 GWh in 2004. On the other hand, the electricity generation addition from private hydropower plants was only 10% of total electricity generation additions from 2008 to 2009. (Please see the table below for the details of the comparison of hydropower plants and Turkey's national grid in respect to electricity generation figures.)⁴⁰

(GWh)	2009	2008	2007	2006	2005	2004	2003	2002
Total Additional Electricity Generation	2,242	530	-362	1,239	-902	2,134	433	605
from private hydro								
Total Additional Electricity Generation	2,741	-2,581	-8,393	4,684	-6,523	10,754	1,646	9,674
from Hydro								
Total Additional Electricity Generation	23,489	6,860	15,258	14,344	11,258	10,118	11,181	6,675
Total Electricity Generation from Hydropower	35,958	33,270	35,851	44,244	39,561	46,084	35,330	33,684
Turkey's Total Electricity Generation	194,812	198,418	191,558	176,300	161,956	150,698	140,581	129,400
Additional Private Hydro/Total Addition	10%	7.7%	(-)2.4%	8.6%	8.0%	21.1%	3.9%	9.1%
Additional Hydro/Total Addition	12%	(-) 37.6%	(-)55.0%	32.7%	(-) 57.9%	106.3%	14.7%	144.9%
Additional Private Hydro/Total Generation	6%	0.3%	(-)0.2%	0.7%	(-)0.6%	1.4%	0.3%	0.5%
Additional Hydro/Total Generation	8%	(-)1.3%	(-)4.4%	2.7%	(-)4.0%	7.1%	1.2%	7.5%

Table 17: Electricity generation additions from hydropower plants and Turkey's total electricity generation additions

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

When it comes to developing common practice analysis for hydro projects, an assessment taking into consideration of the relevant basin has to be made. Turkey has been divided into 26 basins and Sanibey Dam&HEPP is located in the Seyhan Basin, covering the Adana and Kahramanmaras provinces.

Below is listed the privately-owned large-scale projects, having installed capacities of more than 150 MWm in the Seyhan Basin

³⁹ http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm (accessed on March 8th, 2011)

⁴⁰ [http://www.teias.gov.tr/istatistik2009/\(23\).xls](http://www.teias.gov.tr/istatistik2009/(23).xls).



Company Name	Project Name	Location	Installed Capacity (MWm)	Estimated production (kWh/year)	Rate of Completion Sep. 2010 (%)
Bereket Enerji Uretim A.S.	Goktaş HEPP	Adana	292.5	1,117,660,000	38
Enerjisa Enerji Uretim A.S.	Kavsak HEPP	Adana	185.5	741,030,000	25
Sanibey Baraji Elektrik Uretim ve Ticaret A.S.	Sani Bey Dam&HEPP	Adana	317	966,530,000	90
Enerjisa Enerji Uretim A.S.	Kandil Enerji Projesi	K.Maras	217.6	531,689,000	51.1

Table 19: The privately-owned large –scale projects, having installed capacities of more than 150 MW in the Seyhan Basin.

The lack of a registration office in Turkey hinders the transparency and accessibility of data, but still, taking into account the likely installed capacities and the location, only three more hydropower projects other than Sanibey Dam & HEPP have been detected. However, it is not possible to compare these projects with the subject project in respect to carbon revenues. There is no detailed information accessible for the similar projects if they benefit from carbon revenues or not, since there is no registration authority in the host country to apply for this information. Therefore, the scarcity of relevant projects being developed in the region also justifies that realizing HEPPs in the mentioned region is not a common practice.

All in all, the share of electricity generation from hydropower corresponds to 18% of the total generation. When it comes to privately owned hydropower plants, the share of electricity generation drops to only 4.9% of total generation. In addition to the mentioned facts above, the scarcity and the low completion rates of the projects confirm that the electricity generation from HEPP business is not a common practice. Therefore Step 4 is satisfied.

Impact of VCS-VER income

This section has clearly explained how the approval of the project as a VCS activity, and the attendant benefits and incentives derived from the project activity, will alleviate the barriers illustrated above, and thus enable the project to be undertaken.

As shown in Step 2 and Step 3 above, the project is unlikely to move forward without the additional financial support of the VCS-VER.

The financial benefit from the revenue obtained by selling the CO2 emissions reductions has been one of the key issues encouraging investment in the proposed project activity

Below is presented the project timeline and timeline of events and actions which have been taken to achieve VCS-VER registration:



Project Timeline and Timeline of events and actions which have been taken to achieve VCS-VER registration events and action	Date	Evidence
Stakeholder consultation	December 12 th 2006	Please refer to Section 6 Stakeholder's comments and Annex 7 The Participation List
Economical analysis of the project	5 th of December 2006	Presentation submitted to the Board (5 th of December)
First VER consideration	5 th December 2006	Presentation submitted to the Board (5 th of December)
Investment Decision	December 25 th 2006	Board Decision regarding benefiting from carbon asset development
Feasibility report	November 2007	The feasibility report prepared by SANKO Mühendislik ve Danismanlik A.S.
Contract signature for the construction-point of no return	July 01 st 2007	Agreement with Palet Insaat ve Tic. A.S.
Start of construction	July 01 st , 2007	Land delivery to the PALET-PUSTILER consortium.
EIA approval (by the Ministry of Environment and Forestry)	July 06 th 2007	Ministry of Environment and Forestry statement.
Contract signature for the equipments	March 20 th 2008	Equipment Contract
Loan signature	September 3 rd 2008	Contract with the bank. Please see Annex 10.
Contract with a PDD consultant	February 1 st 2011	VER services agreement
Contact with a DOE	August 2011	E-mail exchange between and the DOE.
Commissioning date of the power plant (two phases)	December 02 nd 2010, 26th January 2011	Provisional Acceptance Certificate

Table 18: Project timeline and early consideration of carbon credits.



2.6 Methodology Deviations

There are no methodology deviations.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

BE_y	Baseline emissions in year y (tCO ₂)
$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the <i>“Tool to calculate the emission factor for an electricity system”</i>

Calculation of $EG_{PJ,y}$

Since the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity:

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

Where:

$EG_{PJ,y}$	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)
$EG_{facility,y}$	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr).

3.2 Project Emissions

The project emissions shall be accounted using the following equation:

$$PE_y = PE_{EF,y} + PE_{GP,y} + PE_{HP,y}$$



Where:

PE_y	Project emissions in year y (tCO ₂ e/yr)
$PE_{FF,y}$	Project emissions from fossil fuel consumption in year y (tCO ₂ /yr)
$PE_{GP,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO ₂ e/yr)
$PE_{HP,y}$	Project emissions from water reservoirs of hydro power plants in year y (tCO ₂ e/yr)

Project emission from Fossil fuel consumption ($PE_{FF,y}$)

The project internal consumption is approximately 500 kVA, which can be considered negligible. This consumption will be satisfied from the electricity generation when the plant is in operation or from the grid when the plant is not in operation. Eventually, if there is no electricity available in the grid and the plant is not in operation the internal consumption will be satisfied from a diesel generator, but this would rarely occur. If diesel engines would be used, emissions associated would be calculated according to the “*Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion*” and considered as project emissions. Therefore:

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

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

Since the project activity does not involve the operation of a geothermal power plant,

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

“ACM0002 / Version 12.1.0” suggests that project proponents shall account for CH₄ and CO₂ emissions from the reservoir. The Project emissions are calculated with the formula mentioned in ACM0002 / Version 12.1.0 as:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:

$PE_{HP,y}$	=	Emission from reservoir expressed as tCO ₂ e/year
EF_{Res}	=	Default emission factor for emissions from reservoirs of hydro power plants in year y (CO ₂ e /MWh)
TEG_y	=	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

The project activity is comprised of construction of a dam and a Greenfield hydropower project. The diversion structure result in a regulation pond with a surface area of 14,940,000 m².⁴¹

However, again according to ACM0002 / Version 12.1.0 if the power density

(PD) of the hydro power plant is above 10 W / m², PE_y is 0.

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

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

⁴¹ FSR, Section 1.3.2.



Where:

- PD = Power density of the project activity, in W/m²
 CapPJ = Installed capacity of the hydro power plant after the implementation of the project activity (W)
 CapBL = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
 APJ = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²)
 ABL = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero.

The power density (PD) for this regulation pond is calculated as follows:

- CapPJ = 310,660,000 W
 CapBL = 0 (Justification: The project is a new hydro power plant)
 APJ = 14,299,206 m²⁴²
 ABL = 0 (Justification: The project is a new hydro power plant))

$$PD = 310,660,000 \text{ W} / 14,299,206 \text{ m}^2$$

$$PD = 21.72 \text{ W/m}^2$$

$$PD > 10 \text{ W/m}^2$$

Therefore, PEHP,y=0

Hence, PEy= 0

Therefore;

Since the Power Density of the Project is greater than 10 W/m² PEy is assumed to be 0 as suggested in ACM0002 / Version 12.1.0.

3.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing and transport). These emissions sources are neglected.

Please refer to ANNEX 7 for details of all baseline related calculations.

3.4 Summary of GHG Emission Reductions and Removals

Accordingly the baseline emissions BEy are calculated as following:

$$BEy = (EGy - EG_{\text{baseline}}) \times EF_{\text{grid}}, CM, y$$

Where:

- BEy Baseline emissions (tCO₂e)
 EGy Annual electricity supplied by the project to the grid (MWh)

⁴² FSR, Section 1.3.2.



EG_{baseline} Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh).
 For new power plants this value is taken as zero.
 EF_{grid, CM, y} Baseline emission factor (tCO₂e/MWh)
 Y Refers to a given year
 EG_y = 966,530 MWh/year

EG_{baseline} = 0 (The figure is zero for the project as the project is new)

Therefore, the expected baseline emission for the full year production of the project is:

$$BE_y = 0.5429 \times (966,530 - 0) = 524,729 \text{ tCO}_2\text{e}$$

According to the ACM0002, the generic equation for the calculation of emission reduction is:

$$ER_y = BE_y - PE_y$$

Where:

ER_y Emission reductions for the year y (tCO₂)
 BE_y Baseline emissions for the year y (tCO₂)
 PE_y Project emission for the year y (tCO₂)

$$ER_y = 524,729 - 0 \\ = 524,729 \text{ tCO}_2.$$

All in all, the expected emission reduction of the project is as following:

Year	Annual estimation of emissions reductions in tonnes of CO ₂ e
From 2 nd December to 31 st December 2010	20,845.4
2011	506,040.2
2012	524,729.1
2013	524,729.1
2014	524,729.1
2015	524,729.1
2016	524,729.1
2017	524,729.1
2018	524,729.1
2019	524,729.1
From January 1 st to December 1 st 2020	484,475.9
Total estimated reductions (tonnes of CO ₂)	5,209,194.6
Total number of crediting years	10
Annual average over the crediting period of	524,729.1



estimated reductions (tonnes of CO2e)	
---------------------------------------	--

Table 19: Emission reduction of the proposed project

Years	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
From 2 nd December to 31 st December 2010	20,845.4	0	0	20,845.4
2011	506,040.2	0	0	506,040.2
2012	524,729.1	0	0	524,729.1
2013	524,729.1	0	0	524,729.1
2014	524,729.1	0	0	524,729.1
2015	524,729.1	0	0	524,729.1
2016	524,729.1	0	0	524,729.1
2017	524,729.1	0	0	524,729.1
2018	524,729.1	0	0	524,729.1
2019	524,729.1	0	0	524,729.1
From January 1 st to December 1 st 2020	484,475.9	0	0	484,475.9
Total	5,209,194.6	0	0	5,209,194.6

Table 20: Summary of GHG Emission Reductions and Removals

4 MONITORING

4.1 Data and Parameters Available at Validation

Data Unit / Parameter:	EGgross, y
Data unit:	GWh
Description:	Turkey's Gross Electricity Generated by primary energy source for the five most recent years (2005 - 2009).
Source of data:	Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/istatistik2009/32(75-09).xls
Value applied:	Please see Section 2.4 and the link above



Justification of choice of data or description of measurement methods and procedures applied:	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available.
Any comment:	

Data Unit / Parameter:	Cap_{BL}
Data unit:	W
Description:	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data:	Project site
Value applied:	0 (this is a new hydro power plant)
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

Data Unit / Parameter:	A_{BL}
Data unit:	m ²
Description:	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2).
Source of data:	Project site
Value applied:	0 (this is a new hydro power plant)
Justification of choice of data or description of measurement methods and procedures applied:	N/A
Any comment:	-

Data Unit / Parameter:	FC_{i,y}
Data unit:	Ton (m ³ for Natural Gas)
Description:	Amount of fossil fuel type <i>i</i> consumed in the project electricity system in year <i>y</i>
Source of data:	Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/istatistik2009/43.xls http://www.teias.gov.tr/istatistik2009/44.xls
Value applied:	Please see Section 2.4 and the links above
Justification of choice of data or description of measurement methods and procedures	TEIAS (Turkish Electricity Transmission Company) is the official source for this data,



applied:	providing the most up-to-date and accurate information available.
Any comment:	

Data Unit / Parameter:	NCV
Data unit:	TJ/Ton (TJ/m ³ for Natural Gas)
Description:	Net calorific value of fossil fuel type
Source of data:	TEIAS website: "Heating Values of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities" 2007-2009: http://www.teias.gov.tr/istatistik2009/46.xls
Value applied:	Please see Annex 7
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, providing the most up-to-date and accurate information available.
Any comment:	The conversion factor of 4.187 Joules/Cal is used.

Data Unit / Parameter:	EFCO_{2,i}, y
Data unit:	tCO ₂ /MWh
Description:	Default CO ₂ emission factor of fossil fuel type i
Source of data:	IPCC default values (as provided in Table 1.4, Chapter 1, Volume 2 (Energy), 2006 IPCC Guidelines for National Greenhouse Gas Inventory) are used. Link: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value applied:	Please see Section 2.3
Justification of choice of data or description of measurement methods and procedures applied:	There is no information on the fuel specific default emission factor in Turkey. Hence, IPCC values have been used as per the "Tool to calculate the emission factor for an electricity system (version 02)".
Any comment:	

Data Unit / Parameter:	Electricity Imports
Data unit:	GWh
Description:	Electricity imported to the Grid from other countries



Source of data:	Turkish Electricity Transmission Company (TEIAS) http://www.teias.gov.tr/istatistik2008/23.xls http://www.teias.gov.tr/istatistik2009/23.xls
Value applied:	Please refer to the link above for Turkey's electricity imports.
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available.
Any comment:	

Data Unit / Parameter:	$EG_{\text{facility},y}$
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project to the grid in year y .
Source of data:	Project activity site. (The Monthly Meter Reading Protocols)
Value applied:	966,530 MWh/yr
Justification of choice of data or description of measurement methods and procedures applied:	Continuous measurement and monthly readings. Monthly meter reading protocols will not include the transmission losses.
Any comment:	N/A

Data Unit / Parameter:	Electricity Capacity Additions
Data unit:	Name of the plant; Installed capacity (MW); Fuel type; Commissioning date.
Description:	Set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently.
Source of data:	Turkish Electricity Transmission Company (TEIAS) Generation units put into operation in 2007, 2008, 2009, 2010. http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJE.pdf http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSI http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSI http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJE.pdf
Value applied:	Please refer to Section 2.4 for Capacity Additions
Justification of choice of data or description of measurement methods and procedures applied:	TEIAS (Turkish Electricity Transmission Company) is the official source for this data, hence providing the most up-to-date and accurate information available.



Any comment:	
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Data Unit / Parameter:	$\eta_{m,y}$
Data unit:	%
Description:	Average net energy conversion efficiency of power unit <i>m</i> in year <i>y</i>
Source of data:	UNFCCC web site: “Tool to calculate the emission factor for an electricity system”.
Description of measurement methods and procedures to be applied:	-
Frequency of monitoring/recording:	Once for each crediting period.
Value applied:	Please refer to ANNEX 7
Monitoring equipment:	
QA/QC procedures to be applied:	-
Calculation method:	-
Any comment:	- No official efficiency values based on each power plant or each fuel type is available in Turkey Most natural gas power plants in Turkey are combined cycle, most coal power plants operate sub-critical and most liquid fuel power plants adopt an open cycle technology.

4.2 Data and Parameters Monitored

Data Unit / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data:	Project site.
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc
Frequency of monitoring/recording:	Yearly
Value applied:	14,299,206
Monitoring equipment:	Topographical surveys, maps, satellite pictures



QA/QC procedures to be applied:	The readings will be done during the period when the water flow is high to have the largest reservoir area
Calculation method:	
Any comment:	-

Data Unit / Parameter:	EG_{facility,y}
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project to the grid in year y.
Source of data:	Project activity site. (The Monthly Meter Reading Protocols)
Description of measurement methods and procedures to be applied:	Electricity meters.
Frequency of monitoring/recording:	Continuous measurement and at least monthly recording.
Value applied:	966,530 MWh/yr
Monitoring equipment:	Electric meters
QA/QC procedures to be applied:	Cross check measurements results with records for sold electricity. Calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately.
Calculation method:	Annual electricity generation of the plant will be calculated as the sum of the monthly generations obtained from the meter reading records In which the consideration of transmission losses are not included.
Any comment:	-

Data Unit / Parameter:	Cap_{PJ}
Data unit:	MW
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project site.
Description of measurement methods and procedures to be applied:	Supplier information on the equipment



Frequency of monitoring/recording:	Yearly
Value applied:	310.66
Monitoring equipment:	N/A
QA/QC procedures to be applied:	Supplier information on the related equipment and the existence of the equipment will be checked. Also, this information may be checked from EMRA website.
Calculation method:	N/A
Any comment:	-

4.3 Description of the Monitoring Plan

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the proposed Project within the crediting period is complete, consistent, clear and accurate.

The project is operated by Sanibey Baraji Elektrik Uretim ve Ticaret A.S. which ensures the overall site management in accordance with Turkish Laws and technology providers' guidelines.

The monitoring will be performed in-house by the project proponent:

1. Electrical Engineers will undertake the specific actions required by the monitoring plan, i.e. they will measure the electricity generation, , the electricity supplied to the Turkish grid by the power plant, the electricity imports and the amount of fuel consumed, if fuel is consumed. A representative from the group will also provide necessary training once a year in terms of monitoring and verification aspects.
2. Mechanical Engineers will ensure that all the instrumentations and devices to perform the monitoring are working properly.
3. Accounting Manager will be in charge of providing the electricity sales receipts to the Operations Manager of the plant.
4. Operations Manager will be the VER coordinator. He will be in charge of:
 - a) Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
 - b) Communicating and coordinating the monitoring tasks of all business units.
 - c) Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of the data obtained from the electrical engineers and the accounting manager. He will also record this operation properly to be able to provide it to the DOE during the verification process.
 - d) Calculating and report the emission reductions, and
 - e) Organizing in-house seminars to inform and train the company staff to the monitoring procedures.

Please refer to *Figure 5* where the site organizational chart is presented.

In order to verify the generated units of emission reductions, the VER coordinator, Operation Manager will prepare an annual Report of Vigilance of the Project, in which the following important aspects will be included:

- Year
- Net electricity supplied by the project activity to the grid (in MWh)



- Annual gross electricity generation(in MWh)
- Annual electricity consumption (in MWh)
- Calculation of the emissions reductions: ERs per year (in tCO₂e/yr) produced from the activity of the project

After the proposed Project is registered and begins its operations, the monitoring report will be submitted at the end of every year for the verification of DOE. The report will cover the monitoring of grid-connected power generation, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

Data will be recorded for each crediting period and maintained at least 2 years after its end. The company will establish a dedicated maintenance system to ensure the data availability for the required period.

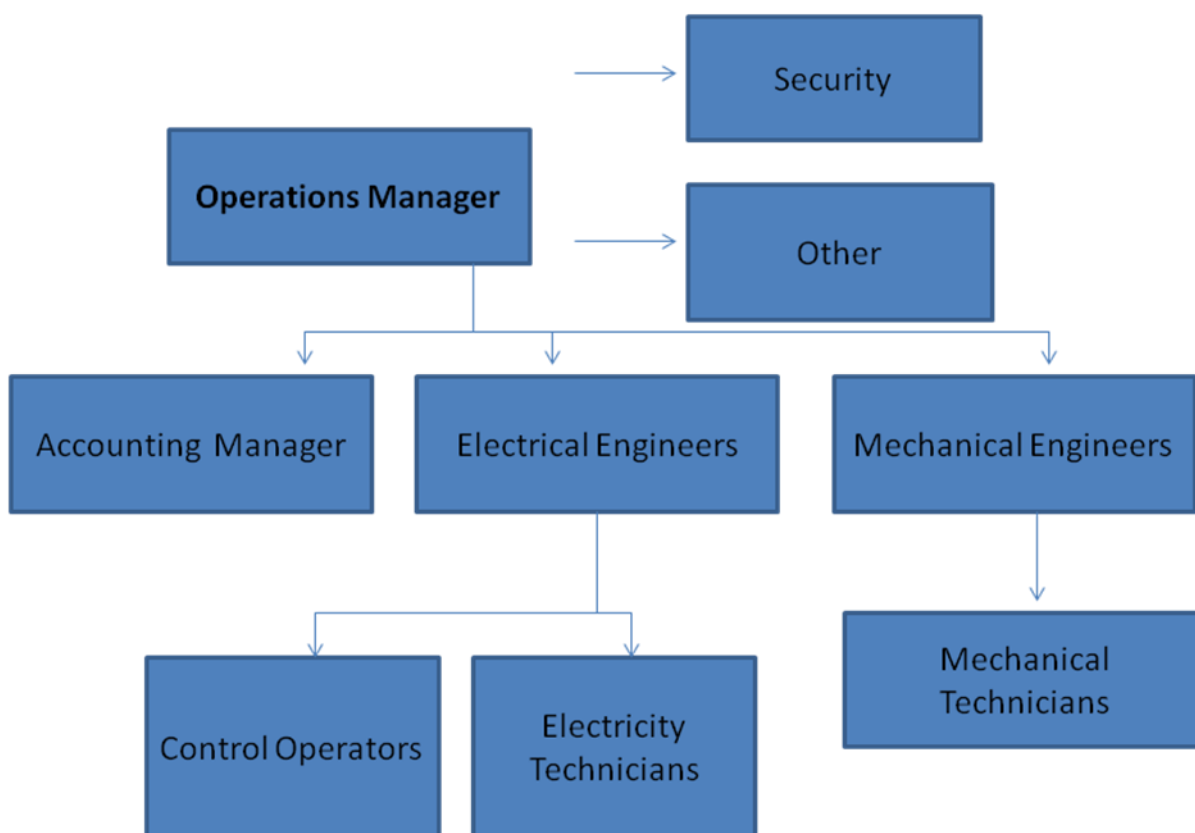


Figure 5: Site Organizational Chart

Measuring

The meter (ACE SL7000 series developed for Turkey) which will be used in the power house is produced by Actaris and is in line with the EMRA requirements for electricity meters. The meters used for the project activity are Actaris SL 7000 761 A 071. The serial numbers are 53042206 and 53042209. The standard and class of the product production is 0.2s-2 . (Please find the



information on the technical specifications of the meter and its conformity with the EMRA requirements on the website of Aktif Enerji which is the exclusive distributor for Actaris products in Turkey.)⁴³

Also, the Actaris meter fully conforms to or exceeds all relevant IEC standards for electronic metering equipments. The Actaris meter ensures long term stability of the accuracy, and achieves a maintenance free design which makes unnecessary the re-calibration of the meter. However re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years.⁴⁴

Besides, in order to measure the electricity production figure of the plant accurately, there will be two sets of meters in the power house. One is the main meter for measuring and the other is the check meter for control. Both of these meters are metering the energy in two directions (consumption and production). If there is a measuring difference between these two meters and one of the parties (TEIAS or the company) requests for calibration of the meters, in this case, the meters will be calibrated without waiting for the periodic calibration date. (TEIAS System Usage Agreement, Art 3, B./2./b))⁴⁵ This calibration process is done by another third party under the control of TEIAS. The company is not responsible for calibration of the meters in Turkey according to the local standards.

On the other hand, the emission reductions will be calculated according to the measurements of the main electricity meter, since the electricity production invoices are made out based on this meter. PMUM records will be the basis of crosscheck and monthly meter reading protocol will be prepared for each month. The project developer is not responsible for the transmission losses; therefore transmission losses are not included. During the each monitoring period, the invoices will be presented to the DOE, together with the calculation details.

The Electrical Engineers will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter's reading and calibration and reading's recording, adjustment and reporting. One of the personnel from the team will be giving the mentioned training once a year. If new personnel are hired, they will have to follow up a training program and will be trained in the specific skills required to carry out the Monitoring Plan.

All data collected as part of monitoring plan is indicated in Section 4.2. They will be archived electronically and be kept at least for two years after the end of the last crediting period.

5 ENVIRONMENTAL IMPACT

According to the Turkish law, a comprehensive EIA report is required to the projects which have a 25 MW or exceeding amount of installed capacity⁴⁶. In terms of its dimension, Sanibey Dam & HEPP falls under the EIA requirement zone. Hence, an EIA report has been carried out and it has concluded that the project activity will not lead to significant negative impacts. The lenders of the Project are Equator Principles Financial Institutions (EPFIs) which have adopted these Principles in order to ensure that the projects financed by themselves are developed in a manner that is socially responsible and reflect sound environmental practices. Within this framework, besides the Turkish Legislation, the Project is also

⁴³ <http://www.aktifenerji.com.tr/index2.php?aktif=alturun&urun=1&id=36>

⁴⁴ <http://www.mevzuat.adalet.gov.tr/html/21179.html>

⁴⁵ www.teias.gov.tr/sistemkullanim1.doc

⁴⁶ Turkish Environmental Impact Assessment Regulation entered into force on 17.07.2008 and the latest revision was published in Official Gazette N°26939, dated 17.07.2008.



required to comply with the International Finance Corporation (IFC) Performance Standards (PS') on Social and Environmental Sustainability which form the basis of these Principles.⁴⁷

Furthermore, it will contribute to improve the environmental situation in the region and in the country. Avoiding fossil fuel-based electricity, it will enhance the air quality and help reduce the adverse affects on the climate. Renewable technologies for the electricity generation will be introduced and sustainable development will be promoted.

The EIA report did not only assess the environmental impacts but it also presented a monitoring plan to be implemented during construction and operation phases. Monitoring Forms has been prepared and presented to the Ministry within periods of six months.

A summary of the potential negative environmental impacts and measures to be taken by the project participant to mitigate them is presented as follows:

Impacts on the landscape

In order to prevent erosion in the slopes and to form a security band, reforestation works will be carried out under the control of the Environment and Forestry Directorate and Operational Directorates. The species that will be used are local species. 4000 trees have been planted for the preservation of the landscape.

Noise impacts

The noise will be negligible as floor tile having vibration and sound absorbent property will be used in power station building to decrease the effect of noise. Also, the noise impacts from the studies on the surface will be minimized by limiting the activities to the daytime and by warning the local residents. In addition, noise measurements will be conducted twice a year in order to determine possible turbine and generator noise levels.

Measures to be taken by the project participant

According to the environmental impact studies and within the framework of Equator Principles Financial Institutions (EPFIs) as well as the Turkish Legislation, the implementation of the project activity is not considered to present any significant risks for human health or the environment and the Project is required to comply with the International Finance Corporation (IFC) Performance Standards (PS') on Social and Environmental Sustainability which form the basis of EPFIs. Environmental and social audits in order to assess compliance with the applicable IFC PS' for the Project which are listed below:

- PS1: Social and Environmental Assessment and Management System,
- PS2: Labor and Working Conditions,
- PS3: Pollution Prevention and Abatement,
- PS4: Community Health, Safety and Security,
- PS5: Land Acquisition and Involuntary Resettlement,
- PS6: Biodiversity Conservation and Sustainable Natural Resource Management, and
- PS8: Cultural Heritage

The following sub-plans in addition to the Environmental Management and Monitoring Plan (EMMP) have been prepared and implemented:

- Occupational Health and Safety Plan,
- Traffic Management Plan,
- Emergency Response Plan,

⁴⁷ Annual Environmental and Social Audit Report (2010) by Dokay Engineering and Consultancy Ltd. Co.



- Pollution Prevention Plan,
- Waste Management Plan,
- Quarries and Aggregates Management Plan, and
- Emergency Response Plan for the Inside of Derivation Tunnel.

The following assessments and plans have been prepared for the Sanibey Dam &HEPP Project:

- Social Impact Assessment
- Social Management Plan
- Land Acquisition and Resettlement Plan
- Complaint Procedure

All kinds of precautions have been realized during the construction phase. Below are the crucial precautions taken:

In order to determine environmental quality of the Site possibly affected by the Project construction works, air quality measurements, noise measurements, WWTP discharge water quality measurements and water samplings and analyses are carried out at the downstream of the construction site once in three months.

Waste lubricants, produced as a result of construction equipment maintenance, are temporarily stored in closed containers located on an impervious (concrete) platform at the construction sites. Pent roofs for the protection of containers from weather conditions (e.g. rain, sun) were constructed at the waste lubricant storage area. Lubricant changing of the construction equipments is performed at concrete, impermeable platform. Drip trays are used to prevent possible leakage. Oil separator has been installed for possible leakages from the lubricant storage area of concrete mixing plant.

The explosives such as dynamite, capsule used during the dam construction are stored away from the construction site, social facilities and the residential units at convenient locations defined by the regulations. The dynamite and capsule are stored at depots with a wooden interior surface and these depots are fenced. Warning signs are placed around the depots.

Wastewater produced at the concrete mixing plant is sent to the sedimentation tanks prior to being discharged for the protection of surface and groundwater in the vicinity of the construction site.

In the scope of resource conservation and pollution prevention, in order to minimize unnecessary usage of fuels, Sanibey Baraji Elektrik Uretim ve Ticaret A.S. records the kilometers traveled by each vehicle and warns the responsible personnel if necessary. Moreover, the periodical maintenances of the vehicles are performed to minimize fuel consumption.

Recyclables (e.g. paper, plastic, glass and metal) have been sent to ANKA Recyclable Waste Collection Oil Trade Co. (ANKA), a licensed recycling company in Adana, in accordance with a contract made between Sanibey Baraji Elektrik Uretim ve Ticaret A.S. and ANKA.

In order to minimize dust originating from the construction site and service roads around this site, water spraying is being performed for the unpaved roads and filling area of dam body and switchyard construction. Moreover, water sprays were installed to the crusher of the Project close to K1 Rock Quarry.

Vegetative oils are used for cooking purposes in the kitchens located at the labor camp sites. Waste vegetative oils being produced at these places are temporarily stored in covered plastic oil drums installed in the kitchens by licensed firms. As a requirement of Regulation on the Control of Waste Vegetative Oils, waste vegetative oils are transferred by a licensed company to another licensed company for biodiesel production.

Waste dry batteries being produced at the construction sites and the labor camp site are collected separately from other type of wastes. Sanibey Baraji Elektrik Uretim ve Ticaret A.S. has been made a contact with TAP (Licensed Dry Battery Recovery Company) and a container has been installed on office site for the collection of dry batteries.



It is possible that the traffic increase due to transportation of the construction materials, access of personnel and heavy construction equipment causes traffic accidents. This will be prevented by training the personnel, speed limitation, putting traffic signs and periodical maintenance and control of the vehicles.

In order to determine environmental quality of the Site possibly affected by the Project construction works, air quality measurements, noise measurements, WWTP discharge water quality measurements and water samplings and analyses are carried out at the downstream of the construction site once in three months. The emissions from all the machines used during the construction phase will be measured periodically and the machines will be maintained if required. The vehicles carrying the excavation material will be covered and the internal roads will be watered periodically.

To minimize the possible work accidents, qualified personnel will be hired and will be continuously trained for work safety. The contractors ensure that all new personnel undergo HSE training. Moreover, the project developer provides HSE training to the contractor personnel periodically in the 1st and 3rd weeks of every month. Also, the personnel will be equipped with personnel protection equipments required by Turkish Labour Safety Regulations and appropriate healthcare and labour safety conditions will be provided. Community meetings have been held during the construction period on six months basis with the most affected communities in order to inform the communities about the progress of the Project, record any concerns and feedbacks as well as to create awareness on Health and Safety (H&S) issues. In accordance with this item, community meetings have been held in Eyner and Ulucinar villages.

Finally, the project developer has expressed that Sanibey Baraji Elektrik Uretim ve Ticaret A.S. is required to publish quarterly progress reports that disclose the social standing of the Project (including but not limited to the number of complaints received, addressed and closed; number of local workers; community and stakeholder meetings held; any favours realized within the scope of community investment etc. Sanibey Baraji Elektrik Uretim ve Ticaret A.S. strictly adopts a HR policy in line with the requirements of the national legislation and pertinent International Labor Organization (ILO) standards. The Company has also been monitoring the HR policies of the contractors to ensure that they full comply with the national and ILO requirement realized within the scope of community investment; local expenditures in terms of contribution to local economy etc.). Up to date, quarterly progress reports have been published respectively in July 2009, October 2009, January 2010, April 2010, July 2010 and October 2010.





Figure 6: A scene from the collection of the recyclables.



Figure 7: A scene of the storage of waste lubricants temporarily stored in closed containers located on an impervious platform at the construction site.



Figure 8: A scene from the chemicals that are stored in closed containers with secondary containment.



Figure 9: A scene from the solid waste disposal of the project which has permit from Imamoglu and Akoren municipalities .



Figure 10: The sign of the free call center



6 STAKEHOLDER COMMENTS

The project developer has exercised two different activities to acquire requests and complaints of the stakeholders. The first one is the establishment of a call center which is a continuous process and the second activity is the stakeholder's meeting.

Regarding to the first activity, the project developer has exercised a very unique project in order to implement a high degree of sensitivity both for the protection of the environment and for the satisfaction of the villagers living in the region. An infrastructure of a free call-center for reporting requests and complaints has been established. It is expressed that the application of a call-center is going to be an on-going process; thus will not be removed at the end of the construction phase. So far, free phone line has not been much used. Locals and other stakeholders rather prefer to call the construction officer directly to transmit their inquiries/complaints/feedbacks etc. 50 complaints and requests have been recorded so far. Generally speaking; some of the complaints were about muddy roads and dust pollution. Rest of the complaints mainly focused on the damaged roads due to construction and damaged houses due to explosions. There was also a complaint about the explosions mentioning that an announcement has to be made beforehand. It is clearly observed that numbers of requests outweigh the number of complaints. Requests mainly focused on relocation of villagers' fruit trees in their gardens, donations for mosque repair, providing job opportunities, help for cutting trees and need of disabled vehicles. All complaints and requests have been closed up in a timely manner and currently there are not any open complaints.

Regarding to the latter activity, the Article 9 of the EIA Regulation stipulates a public participation process in order to provide participation of the communities in EIA process, to inform the communities about the proposed facility and to gather their opinions.

In order to satisfy this requirement, announcements were published in two newspapers (Zirve Newspaper on 06.12.2006 and Vatan Newspaper on 04.12.2006) –one national and one local- declaring the date, time, venue and topic of the meeting. (The mentioned announcements are presented in the following section.)

The announcements, the meeting was held on December 12th 2006 in the conference room of the Akoren Municipality building in Aladag district of Adana province. The meeting which started at 14:00 under the chairmanship of the Adana Provincial Directorate of Environment and Forestry received a broad participation.(Please refer to ANNEX 8 for the participants list)

The participants are comprised of representatives from the community, relevant municipalities, public institutions and organizations, scientists, and inhabitants of the surrounding villages. (Please refer to ANNEX 8). It was observed that public and local authorities gave support for the implementation of the Sanibey Dam and HEPP Project.

All the aspects of the project including the socio-economic and environmental aspects were presented to the participants by a project developer representative and were discussed by the stakeholders. Clarifications were requested and the overall response to the project was encouraging and positive. All the hearings were held in Turkish.

The minutes kept regarding the concerns, opinions/suggestions and reviews of the participants is summarized below:

Regarding to the 9th article of the EIA Regulations, a stakeholder meeting by Sanibey Baraji Elektrik Uretim ve Ticaret A.S. was held in Aladag district, in the conference room of the municipality building of Akoren on 12/12/2006 at 14:00.

The meeting started with the opening speech of Mr. Abdullah Gunduz, the representative of the Adana provincial director of environment and forest. It was followed by a detailed presentation about the activities carried out by the project. The presentation was realized by Prof. Coskun Yurteri (DOKAY Engineering). Mr. Irfan Aslankurt, the branch manager of DSI, was present in the meeting.



Figure 11: Scenes from the Community Meeting.

Mr. Ali Cinar, a villager from the Ulucinar village asked if the mentioned village was going to be transported and if the expropriation merit was going to be satisfactory. Mr. Abdulkadir Konukoglu, the executive president of Sanko Holding, answered that the merit of expropriation was going to be determined, taking into consideration the circumstances of the region. Mr. Ali Cinar also asked if the equipments were going to be supplied from the region. Mr. Abdulkadir Konukoglu answered that all regional resources were going to be given the priority.

Mr. Bayram Karabulut from the Egner Village asked when the merits of expropriation would be paid. Mr. Abdulkadir Konukoglu answered that the payments in cash would be realized in return of the land deeds on the basis of mutual reconciliation. He also expressed that they had handled the same situation in the same manner at different projects. He asserted that the inhabitants would be provided with better housing and the Project would create more efficient economic activities for themselves after evacuating the project's area mainly by compensating them with amounts of funds significantly higher than those set by the arbitration court.

The mukhtar of the Dayılar Village expressed that they were very happy of such a project to be realized around the area. Mr. Abdulkadir Konukoglu expressed that all kinds of financial aids would be provided to the region.



DUYURU

Adana ili, İmamoğlu, Kozan ve Aladağ ilçesi sınırları içerisinde,
Yedigöze Elektrik Üretim ve Ticaret Ltd.Şti. tarafından
"Yedigöze Barajı ve Hidroelektrik Santrali Projesi"nin yapılması planlanmaktadır.
Söz konusu faaliyet ile ilgili olarak, 16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği gereğince, aşağıda belirtilen yer, gün ve saatte "ÇED Sürecine Halkın Katılımı Toplantısı" düzenlenecektir.
Yer : Belediye Başkanlığı Düğün Salonu
Adres : Aladağ İlçesi, Akören Beldesi, ADANA
Tarih : 12.12.2006
Saat : 14.00
İlgili yönetmeliğin 9. Maddesi gereğince
HALKIMIZA DUYURULUR.
YEDİGÖZE ELEKTRİK ÜRETİM VE TİCARET LTD. ŞTİ.
(BASIN Ç-)

DUYURU

Adana İli, İmamoğlu, Kozan ve İlçesi sınırları içerisinde;
Yedigöze Elektrik Üretim ve Ticaret Ltd. Şti tarafından,
"Yedigöze Barajı ve Hidroelektrik Santrali Projesi"nin yapılması planlanmaktadır.
Söz konusu faaliyet ile ilgili olarak, 16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği gereğince, aşağıda belirtilen yer, gün ve saatte "**ÇED Sürecine Halkın Katılımı Toplantısı**" düzenlenecektir.
Yer : Belediye Başkanlığı Düğün Salonu
Adres : Aladağ İlçesi, Akören Beldesi ADANA
Tarih : 12.12.2006
Saat : 14:00
İlgili yönetmeliğin 9. Maddesi gereğince
HALKIMIZA DUYURULUR.
YEDİGÖZE ELEKTRİK ÜRETİM VE TİCARET LTD.ŞTİ.

Figure 12: The newspaper advertisements announcing the stakeholders' meeting.

**ANNEX 1**

The Licence for Electric Generation for **SANIBEY** Dam & HEPP, which justifies the permission of EPDK granted to **Sanibey Barajı Elektrik Üretim Ve Ticaret A.S.** to generate energy for 49 years.



The image shows a production license certificate from the Energy Market Regulation Authority (EPDK) of the Republic of Turkey. The certificate is titled "ÜRETİM LİSANSI" (Production License) and is issued for a renewable energy source. The license number is EÜ/799-2/651 and the date of issuance is 22/06/2006. The license is granted to Yedigöze Elektrik Üretim ve Ticaret Anonim Şirketi for the Yedigöze Hydroelectric Power Plant. The certificate is signed by Hasan Köktaş, Chairman of the EPDK.

T.C.
ENERJİ PİYASASI DÜZENLEME
KURUMU

E P D K

ÜRETİM LİSANSI

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

Lisans No : EÜ/799-2/651
Tarih : 22/06/2006

Bu Lisans, Yedigöze Elektrik Üretim ve Ticaret Anonim Şirketi'ne, Adana İli'nde kurulacak olan Yedigöze Hidroelektrik Santrali üretim tesisinde 22/06/2006 tarihinden itibaren 49 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 22/06/2006 tarihli ve 799-2 sayılı Kararı ile verilmiştir.

Hasan KÖKTAŞ
Başkan

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

**ANNEX 2**

The form of EIA Positive for the proposed project granted by the Ministry of Environment and Forestry stating that the proposed project does cause neither any environmental nor social damages.

	<p>T.C. ÇEVRE ve ORMAN BAKANLIĞI Çevresel Etki Değerlendirmesi ve Planlama Genel Müdürlüğü</p>
	<p>Karar Tarihi: 06/06/2007 Karar No : 1267</p>
<p>ÇED OLUMLU BELGESİ</p>	
<p>16.12.2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin 14.maddesi gereğince; "Yedigöze Barajı, HES ve Malzeme Ocakları" projesi hakkında "Çevresel Etki Değerlendirmesi Olumlu Kararı" verilmiştir.</p>	
	<p> Ömer SOYLU Bakan a. Genel Müdür V.</p>
Proje Sahibi	: Yedigöze Elektrik Üretim ve Ticaret Ltd.Şti.
Projenin Yeri	: Adana İli sınırları içerisinde Çatalan Barajı Membasında, Seyhan Nehri üzerinde



ANNEX 3

The declaration letter that the proposed project has not created another form of environmental credits


SUBJECT: Declaration that the Project has not created another form of environmental credits.

To: Voluntary Carbon Standard

Aware of the necessity of avoiding GHG double counting, Yedigöze Elektrik Üretim ve Ticaret A.Ş. declares that:

- 1- The GHG reductions generated by Yedigöze Sani Bey Dam and HEPP project has not been included in any emissions trading program other than the Voluntary Carbon Standard (VCS).
- 2- Yedigöze Sani Bey Dam and HEPP project does not take place in a jurisdiction in which binding limits are established on GHG emissions, and therefore, the emission reductions will not be used for the purpose of demonstrating compliance with binding limits at the project site.

Sincerely yours,
Zehra Korkmaz

 **SANKO** YEDİGÖZE Elektrik Üretim ve Ticaret Anonim Şirketi
Burak Mahallesi Sani Komukoğlu Bulvarı No: 221 ŞEHİTKAMİL/GAZİANTEP
Tel: (0342) 211 37 00 Faks: (0342) 211 37 26

**ANNEX 4**

The Official Letter Of The Ministry Of Culture Declaring That The Proposed Project is eligible to be realised after the survey studies of the historical assets located in the region are completed by the General Directorate of Ancient Arts and Museums.

EK = 1

T.C.
KÜLTÜR BAKANLIĞI
Adana Kültür ve Tabiat Varlıklarını
Koruma Kurulu Müdürlüğü
K A R A R

Toplantı Tarihi ve No : 24.06.1997 -205
Karar Tarihi ve No. : 24.06.1997 -2844

Toplantı Yeri: ADANA

Adana İli, Aladağ İlçesi, Eğner Köyü yakınlarında, Seyhan Nehri üzerinde yapılmak istenilen Yedigöze Barajı ve Hidroelektrik Santral Tesisleri Sahasının ÇED kapsamında araştırılmasına ilişkin, ERG İnşaat Kollektif Şirketi'nin 31.03.1997 gün ve 97/57 sayılı ve 24.04.1997 gün ve 1997/53 sayılı yazıları, Adana Kültür ve Tabiat Varlıklarını Koruma Kurulu Müdürlüğü Uzmanları tarafından hazırlanan 13.06.1997 günlü rapor okundu, ekleri, dosyası incelendi ve yapılan görüşmeler sonunda:

Adana İli, Aladağ İlçesi, Eğner Köyü yakınlarında, Seyhan Nehri üzerinde yapılmak istenilen Yedigöze Barajı ve Hidroelektrik Santral Tesisleri sahasında bulunan, Kurulumuzun 06.05.1988 gün ve 30 sayılı kararı ile liste tescilli yapılan ve kararımız eki listede yer alan Kültür Varlığı Kalıntılarının, Anıtlar ve Müzeler Genel Müdürlüğü tarafından temizlik ve kazılarının yaptırılması, rölöve projelerinin hazırlanması koşulu ile Yedigöze Barajının yapılmasını uygun olduğuna karar verildi.

3

42

B A Ş K A N
Prof.Dr.RAMAZAN OZGAN
Bulunmadı

BAŞKAN YARDIMCISI
Doç.Dr.TAMER GÖK
İmza

Üye
Prof.Dr. İLTER (Fügen)

Üye
Yrd.Doç.Dr. TANYELİ (Gülsün)

Üye
Prof.Dr. ERTEN (Erkin)
İmza

Üye
POYRAZ (Oya)
Adana Valilik Temsilcisi

Üye
İsmail SALMAN
Müdür
MAYIS 1999

06.07.1999 tarihli Usulan Raporu ektir.

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**ANNEX 5**

The Official Report written by the Adana Provincial Department of Environment and Forestry to the Ministry of Environment and Forestry declaring the Stakeholders' Meeting that was held for the project. It has been mentioned that the list of attendants and the minutes of the meeting were attached to the letter.

T.C.
ADANA VALİLİĞİ
İl Çevre ve Orman Müdürlüğü

Kısım: ÇED
Sayı: B.18.İÇÖ.01.03/6954-768-4646
Konu: Yedigöze Barajı ve Hidroelektrik Santrali

ADANA
9 ARA 2006


ÇEVRE VE ORMAN BAKANLIĞINA
(ÇED ve Planlama Genel Müdürlüğü)
ANKARA

İlgi : ÇED ve Planlama Genel Müdürlüğünün 20.11.2006 tarih ve B.18.0.ÇED.0.01.03/228-07-9532-56597 sayılı yazısı.

İlgi yazı gereği, İlimiz sınırları içerisinde Çatalan Barajı membasında, Seyhan Nehri üzerinde, Yedigöze Elektrik Üretim ve Ticaret Limited Şirketi tarafından yapılması planlanan "Yedigöze Barajı ve HES" projesi ile ilgili hazırlanarak Bakanlığımıza sunulan Proje Tanıtım Dosyası'na ilişkin ÇED süreci kapsamında 12.12.2006 tarihinde İlimizde yapılması gereken "Halkın Katılımı Toplantısı", 12.12.2006 tarihinde, saat 14:00'da, İlimiz Aladağ İlçesi, Akören Beldesi, Belediye Başkanlığı Döğün Salonunda yapılmıştır.

Söz konusu Halkın Katılım Toplantısı ile ilgili olarak düzenlenen toplantı tutanağı ve katılım listesi yazımız ekinde gönderilmektedir.

Gereğini bilgilerinize arz ederim.


Erdem KIYAK
Vali a.
Vali Yardımcısı

EKLER
Ek- 1: Tutanak aslı (4 sayfa)
Ek- 2: Toplantıya Katılım Listesi fotokopisi(19 sayfa)

N.P

Sekreterlik : 0.322.459 00 75 Faks: 0.322. 458 84 13 Valilik Binası D Blok Kat 3 Seyhan/ADANA

**ANNEX 6****BASELINE INFORMATION****Details of OM Calculation***Turkey's Gross/Net Electricity Generations and Imports*

Electricity Generation [GWh]	2007	2008	2009
Gross Electricity Production	191,558.10	198,418.00	194,812.90
Net Electricity Production	183,339.70	189,761.90	186,619.30
Net/Gross	0.957	0.956	0.958
Loss Rate [%]	4.29%	4.36%	4.21%
Gross Electricity Production from Thermal Sources	154,983	163,919	156,583
Net Electricity Production from Thermal Sources	148,333	156,768	149,998
Imports	864	789	812
Net Generated + Imports	149,198	157,558	150,810

Sources: [http://www.teias.gov.tr/istatistik2009/30\(84-09\).xls](http://www.teias.gov.tr/istatistik2009/30(84-09).xls), [http://www.teias.gov.tr/istatistik2009/32\(75-09\).xls](http://www.teias.gov.tr/istatistik2009/32(75-09).xls)

Default IPCC Values

	kg CO ₂ /GJ			Default Carbon Oxidation Factor
	Min	mid	max	
hard coal	92.8	96.1	100.0	1.0
lignite	90.9	101.0	115.0	1.0
fuel oil	75.5	77.4	78.8	1.0
diesel oil	72.6	74.1	74.8	1.0
natural gas	54.3	56.1	58.3	1.0
lpg	61.6	63.1	65.6	1.0
naphta	69.3	73.3	76.3	1.0

Source: http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf

Fuel Consumptions

	Fuel Consumption (FC i,y) [t] [m ³ for natural gas]		
	2007	2008	2009
hard coal	6,029,143	6,270,008	6,621,177
lignite	61,223,821	66,374,120	63,620,518
fuel oil	2,250,686	2,173,371	1,594,321
diesel oil	50,233	131,206	180,857
natural gas	20,457,793	21,607,635	20,978,040
lpg	0	0	111



naphtha	11,441	10,606	8,077
---------	--------	--------	-------

Sources: <http://www.teias.gov.tr/istatistik2009/43.xls>, <http://www.teias.gov.tr/istatistik2009/44.xls>

Net Calorific Values

	Net Calorific Value (NCVi.y) [GJ/t] [GJ/m3 for natural gas]		
	2007	2008	2009
hard coal	22.3	22.2	22.2
Lignite	6.9	6.8	6.4
fuel oil	39.9	39.7	39.8
diesel oil	43.1	42.4	42.4
natural gas	36.7	36.6	37.2
Lpg	0.0	0.0	0.0
Naphtha	43.2	44.6	43.6

Sources: <http://www.teias.gov.tr/istatistik2009/43.xls>, <http://www.teias.gov.tr/istatistik2009/44.xls>,
<http://www.teias.gov.tr/istatistik2009/45.xls>, <http://www.teias.gov.tr/istatistik2009/46.xls>

OM Emission Factor

	2007	2008	2009
OM Emission Factors [tCO ₂ /MWh]	0.6631	0.6638	0.6569
EFGGrid [tCO₂/MWh]			0.6613



Details of BM Calculation

Recently Commissioned Power Plants

2009											
Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO ₂ EF (ton/TJ)	tCO ₂ /MWh *	Facility Energy Efficiency	BM Emission Factor tCO ₂ /MWh	CO ₂ (tons)	
AK ENERJİ (AYYILDIZ RES)	WIND	AR	15	2009	51.0	-	-	na	-	0.0	
AK GIDA SAN. VE TİC. A.Ş. (Pamukova)	N.GAS	ANG	7.5	2009	61.0	54.3	0.20	60.0%	0.33	0.0	
AKÇAY HES ELEKTRİK ÜR. (akçay hes)	HYDRO	AH	28.8	2009		-		na			
AKSA AKRİLİK KİMYA SAN. A.Ş. (YALOVA)	N.GAS	ANG	70	2009	539.0	54.3	0.20	60.0%	0.33	175.5	
AKSA ENERJİ (Antalya) (İlave)	N.GAS	ANG	300	2009	2,310.0	54.3	0.20	60.0%	0.33	752.0	
AKSA ENERJİ (Antalya) (İlave)	N.GAS	ANG	300	2009	2,310.0	54.3	0.20	60.0%	0.33	752.0	
AKSA ENERJİ (Manisa) (İlave)	N.GAS	ANG	10.5	2009	83.1	54.3	0.20	60.0%	0.33	27.1	
AKSA ENERJİ (Manisa) (İlave)	N.GAS	ANG	52.4	2009	414.9	54.3	0.20	60.0%	0.33	135.1	
AKUA ENERJİ (Kayalık Reg. Ve HES)	HYDRO	AH	5.8	2009	39.0	-	-	na	-	0.0	
ALİZE ENERJİ (ÇAMSEKİ RES)	WIND	AR	20.8	2009		-		na			
ALİZE ENERJİ (KELTEPE RES)	WIND	AR	18.9	2009		-		na			
ALİZE ENERJİ	WIND	AR	28.8	2009				na			

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(SARIKAYA RES) (Şarköy)						-					
ALKİM ALKALI KİMYA (Cihanbeyli/KONYA)	LIGNITE	AL	0.4	2009	3.0	90.9	0.33	39.0%	0.84	2.5	
ANADOLU ELEKTRİK (ÇAKIRLAR HES)	HYDRO	AH	16.2	2009		-		na			
ANTALYA ENERJİ (İlave)	N.GAS	ANG	41.8	2009	302.1	54.3	0.20	60.0%	0.33	98.3	
ARENKO ELEKTRİK ÜRETİM A.Ş. (Denizli)	N.GAS	ANG	12	2009	84.0	54.3	0.20	60.0%	0.33	27.3	
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR	WIND	AR	16.8	2009		-		na			
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR İlave	WIND	AR	14.7	2009		-		na			
BAĞIŞLI REG. VE HES (CEYKAR ELEKT.)	HYDRO	AH	9.9	2009		-		na			
BAĞIŞLI REG. VE HES (CEYKAR ELEKT.) İlave	HYDRO	AH	19.7	2009		-		na			
BAKİ ELEKTRİK ŞAMLI RÜZGAR	WIND	AR	36	2009		-		na			
BAKİ ELEKTRİK ŞAMLI RÜZGAR	WIND	AR	33	2009		-		na			
BELEN ELEKTRİK BELEN RÜZGAR - HATAY	WIND	AR	15	2009		-		na			
BELEN ELEKTRİK BELEN RÜZGAR - HATAY	WIND	AR	15	2009		-		na			
BEREKET ENERJİ (KOYULHİSAR HES)	HYDRO	AH	42	2009	329.0	-	-	na	-	0.0	
BEYOBASI EN. ÜR.	HYDRO	AH	5.9	2009		-	-	na	-	0.0	



A.Ş. (SIRMA HES)					23.0	-					
BİL ENERJİ (DG+M) (Balgat)	N.GAS	ANG	36.6	2009	229.0	54.3	0.20	60.0%	0.33	74.6	
BORASCO ENERJİ (BANDIRMA RES)	WIND	AR	21	2009		-		na			
BORASCO ENERJİ (BANDIRMA RES)	WIND	AR	24	2009		-		na			
CAM İŞ ELEKTRİK (Mersin) (İlave)	N.GAS	ANG	126.1	2009	1,008.0	54.3	0.20	60.0%	0.33	328.1	
CARGILL TARIM VE GIDA SAN. TİC. A.Ş.	BIOGAS	AR	0.1	2009	0.7	-	-	na	-	0.0	
CİNDERE HES (Denizli)	HYDRO	AH	19.1	2009	58.0	-	-	na	-	0.0	
ÇELİKLER TAAH. İNŞ. (RİXOX GRAND)				2009		#YOK		#YOK			
DALSAN ALÇI SAN. VE TİC. A.Ş.	N.GAS	ANG	1.2	2009	9.0	54.3	0.20	60.0%	0.33	2.9	
DATÇA RES (Datça)	WIND	AR	0.8	2009		-		na			
DATÇA RES (Datça)	WIND	AR	8.9	2009		-		na			
DATÇA RES (Datça) (İlave)	WIND	AR	11.8	2009		-		na			
DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	HYDRO	AH	12.9	2009	35.4	-	-	na	-	0.0	
DELTA ENERJİ ÜRETİM VE TİC. A.Ş.	N.GAS	ANG	47	2009	365.8	54.3	0.20	60.0%	0.33	119.1	
DELTA ENERJİ ÜRETİM VE TİC. A.Ş. (İlave)	N.GAS	ANG	13	2009	101.2	54.3	0.20	60.0%	0.33	32.9	
DENİZLİ ELEKTRİK (EGE I HES)	HYDRO	AH	0.9	2009	4.0	-	-	na	-	0.0	
DESA ENERJİ ELEKTRİK ÜRETİM A.Ş.	N.GAS	ANG	9.8	2009	70.0	54.3	0.20	60.0%	0.33	22.8	
E.ŞEHİR END.	N.GAS	ANG	59	2009			0.20	60.0%	0.33	147.1	



ENERJİ (DG+M) (Eskişehir-2)					452.0	54.3					
EGE BİRLEŞİK ENERJİ (LPG+DG+M) (Aliğa)	N.GAS	ANG	12.8	2009	107.0	54.3	0.20	60.0%	0.33	34.8	
ELESTAŞ ELEKTRİK (YAYLABEY HES)	HYDRO	AH	5.1	2009	20.0	-	-	na	-	0.0	
ELESTAŞ ELEKTRİK (YAZI HES)	HYDRO	AH	1.1	2009	6.0	-	-	na	-	0.0	
ENTEK KÖSEKÖY (İztek) (Düzelme)	N.GAS	ANG	0.8	2009	6.4	54.3	0.20	60.0%	0.33	2.1	
ENTEK KÖSEKÖY (İztek) (Düzelme)	N.GAS	ANG	36.3	2009	288.9	54.3	0.20	60.0%	0.33	94.0	
ERDEMİR (Ereğli- Zonguldak)	N.GAS	ANG	39.2	2009	236.7	54.3	0.20	60.0%	0.33	77.0	
ERVA ENERJİ (KABACA REG. VE HES)	HYDRO	AH	4.2	2009	16.3	-	-	na	-	0.0	
ERVA ENERJİ (KABACA REG. VE HES)	HYDRO	AH	4.2	2009	16.3	-	-	na	-	0.0	
FALEZ ELEKTRİK ÜRETİMİ A.Ş.	N.GAS	ANG	11.7	2009	88.0	54.3	0.20	60.0%	0.33	28.6	
FİLYOS ENERJİ (YALNIZCA REG. VE HES)	HYDRO	AH	14.4	2009		-		na			
GLOBAL ENERJİ (PELİTLİK)	N.GAS	ANG	8.6	2009	65.7	54.3	0.20	60.0%	0.33	21.4	
GÜL ENERJİ ELKT. ÜRET. SN. VE TİC. A.Ş.	N.GAS	ANG	24.3	2009	170.0	54.3	0.20	60.0%	0.33	55.3	
GÜRMAT ELEKT. (GÜRMAT JEOTERMAL)	GEOTHERMAL	AH	47.4	2009	313.0	-	-	na	-	0.0	
HABAŞ ALIĞA	N.GAS	ANG	224.5	2009	1,796.0	54.3	0.20	60.0%	0.33	584.7	



HABAŞ (BİLECİK) (Paşalar)	F.OIL	AF	18	2009	144.0	75.5	0.27	46.0%	0.59	85.0
HABAŞ (İZMİR) (Habaş)	F.OIL	AF	36	2009	288.0	75.5	0.27	46.0%	0.59	170.0
HAYAT KAĞIT	N.GAS	ANG	7.5	2009	56.0	54.3	0.20	60.0%	0.33	18.2
ITC-KA ENERJİ (SİNCAN)	RENEW.+WASTES	AR	2.8	2009		-		na		
ITC-KA ENERJİ MAMAK KATI ATIK TOP. MERK.	RENEW.+WASTES	AR	2.8	2009		-		na		
İÇDAŞ ÇELİK (İlave)	IMPORTED COAL	AHC	135	2009	961.7	92.8	0.33	39.0%	0.86	823.1
İÇDAŞ ÇELİK (İlave)	IMPORTED COAL	AHC	135	2009	961.7	92.8	0.33	39.0%	0.86	823.1
KALEN ENERJİ (KALEN I-II HES)	HYDRO	AH	15.7	2009		-		na		
KAREL ENERJİ (Pamukova)	HYDRO	AH	9.3	2009	55.0	-	-	na	-	0.0
KASAR DUAL TEKSTİL SAN. A.Ş. (Çorlu)	N.GAS	ANG	5.7	2009	38.0	54.3	0.20	60.0%	0.33	12.4
KAYEN ALFA ENERJİ (KALETEPE HES)	HYDRO	AH	10.2	2009	37.0	-	-	na	-	0.0
KEN KİPAŞ ELEKTRİK ÜRETİM (KAREN)	N.GAS	ANG	41.8	2009	180.0	54.3	0.20	60.0%	0.33	58.6
KEN KİPAŞ ELKT. ÜR. (KAREN) (K.MARAŞ)	N.GAS	ANG	17.5	2009	75.4	54.3	0.20	60.0%	0.33	24.5
KISIK	HYDRO	EH	9.6	2009	26.0	-	-	na	-	0.0
KONYA ŞEKER SAN. VE TİC. A.Ş.				2009		#YOK		#YOK		
KORES KOÇADAĞ RES (Urla/İZMİR)	WIND	AR	15	2009		-		na		



LAMAS III-IV HES (TGT ENERJİ ÜRETİM)	HYDRO	AH	35.7	2009		-		na		
MAKSİ ENERJİ ELEKTRİK ÜRETİM A.Ş.	N.GAS	ANG	7.7	2009	55.0	54.3	0.20	60.0%	0.33	17.9
MARMARA PAMUKLU MENS. SN. TİC. A.Ş.	N.GAS	ANG	34.9	2009	271.5	54.3	0.20	60.0%	0.33	88.4
MAURİ MAYA SAN. A.Ş.	N.GAS	ANG	0.3	2009	2.5	54.3	0.20	60.0%	0.33	0.8
MAURİ MAYA SAN. A.Ş.	N.GAS	ANG	2	2009	16.5	54.3	0.20	60.0%	0.33	5.4
MAZI-3 RES ELEKT. ÜR. A.Ş. (MAZI-3 RES)	WIND	AR	10	2009		-		na		
MAZI-3 RES ELEKT. ÜR. A.Ş. (MAZI-3 RES)	WIND	AR	12.5	2009		-		na		
MODERN ENERJİ (B.Karıştıran)	N.GAS	ANG	96.8	2009	680.0	54.3	0.20	60.0%	0.33	221.4
MOSB Enerji Elektrik Üretim Ltd. Şti.	N.GAS	ANG	84.8	2009	434.0	54.3	0.20	60.0%	0.33	141.3
NUH ÇİMENTO SAN. TİC A.Ş. (Nuh Çim.) (İlave)	N.GAS	ANG	47	2009	329.0	54.3	0.20	60.0%	0.33	107.1
OBRUK HES	HYDRO	EH	212.4	2009	473.0	-	-	na	-	0.0
ORTADOĞU ENERJİ (KÖMÜRÇÜODA)	RENEW.+WASTES	AR	5.8	2009		-		na		
ORTADOĞU ENERJİ (ODAYERİ) İlave	RENEW.+WASTES	AR	4.2	2009		-		na		
ORTADOĞU ENERJİ (ODAYERİ) İlave	RENEW.+WASTES	AR	5.7	2009		-		na		
ÖZGÜR ELEKTRİK /AZMAK II REG. VE HES)	HYDRO	AH	24.4	2009	91.0	-	-	na	-	0.0



ÖZTAY ENERJİ (GÜNAYSE REG. VE HES)	HYDRO	AH	8.3	2009		-		na		
ÖZYAKUT ELKT. ÜR. A.Ş. (GÜNEŞLİ HES)	HYDRO	AH	0.6	2009	2.7	-	-	na	-	0.0
ÖZYAKUT ELKT. ÜR. A.Ş. (GÜNEŞLİ HES)	HYDRO	AH	1.2	2009	5.3	-	-	na	-	0.0
PETKİM ALIĞA (Aliğa)	F.OIL	AF	222	2009	1,554.0	75.5	0.27	46.0%	0.59	917.5
PETKİM ALIĞA (Aliğa) (Düzelme) (ilave)	F.OIL	AF	52	2009	364.0	75.5	0.27	46.0%	0.59	214.9
RASA ENERJİ VAN	N.GAS	ANG	78.6	2009	500.0	54.3	0.20	60.0%	0.33	162.8
REŞADİYE 3 HES	HYDRO	AH	22.3	2009	175.0	-	-	na	-	0.0
ROTOR ELEKTRİK (OSMANİYE RES)	WIND	AR	17.5	2009		-		na		
ROTOR ELEKTRİK (OSMANİYE RES)	WIND	AR	17.5	2009		-		na		
ROTOR ELEKTRİK (OSMANİYE RES)	WIND	AR	22.5	2009		-		na		
SARITEPE HES	HYDRO	AH	2.5	2009	10.0	-	-	na	-	0.0
SARITEPE HES	HYDRO	AH	2.5	2009	10.0	-	-	na	-	0.0
SAYALAR RÜZGAR	WIND	AR	3.6	2009		-		na		
SELKASAN KAĞIT PAKETLEME MALZ. İM.	N.GAS	ANG	9.9	2009	73.0	54.3	0.20	60.0%	0.33	23.8
ŞİLOPİ ELEKTRİK ÜRETİM A.Ş.	IMPORTED COAL	AHC	135	2009	945.0	92.8	0.33	39.0%	0.86	808.9
ŞİLOPİ ELEKTRİK ÜRETİM A.Ş. (Esenboğa)	F.OIL	AF	44.8	2009	315.0	75.5	0.27	46.0%	0.59	186.0
SOMA ENERJİ	WIND	AR	18	2009				na		



ÜRETİM (SOMA RES)							-			
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	WIND	AR	10.8	2009			-	na		
SOMA ENERJİ ÜRETİM (SOMA RES) (İlave)	WIND	AR	16.2	2009			-	na		
SÖNMEZ ELEKTRİK (UŞAK) (İlave)	N.GAS	ANG	8.7	2009	67.1	54.3	0.20	60.0%	0.33	21.8
SÜPER FİLM (G.Antep)	F.OIL	AF	25.3	2009	203.0	75.5	0.27	46.0%	0.59	119.9
ŞAHİNLER ENERJİ (Çorlu/TEKİRDAĞ)	N.GAS	ANG	26	2009	185.0	54.3	0.20	60.0%	0.33	60.2
ŞİRİKÇİOĞLU EL. (KOZAK BENDİ VE HES)	HYDRO	AH	4.4	2009	15.0	-	-	na	-	0.0
TAŞOVA YENİDEREKÖY HES (HAMEKA A.Ş.)	HYDRO	AH	2	2009	10.0	-	-	na	-	0.0
TAV İSTANBUL TERMİNAL İŞLETME A.Ş.	N.GAS	ANG	3.3	2009	27.6	54.3	0.20	60.0%	0.33	9.0
TAV İSTANBUL TERMİNAL İŞLETME A.Ş.	N.GAS	ANG	6.5	2009	54.4	54.3	0.20	60.0%	0.33	17.7
TEKTUĞ (Erkenek)	HYDRO	AH	6	2009	24.0	-	-	na	-	0.0
TEKTUĞ (Erkenek) (İlave)	HYDRO	AH	6.5	2009	26.0	-	-	na	-	0.0
TESCO KİPA KİTLE PAZ. TİC. VE GIDA A.Ş.	N.GAS	ANG	2.3	2009	18.0	54.3	0.20	60.0%	0.33	5.9
TİRE-KUTSAN (Tire)	F.OIL	AF	8	2009	37.0	75.5	0.27	46.0%	0.59	21.8
TOCAK I HES (YURT ENERJİ ÜRETİM)	HYDRO	AH	4.8	2009	13.0	-	-	na	-	0.0



SN.)											
TÜM ENERJİ (PINAR REG. VE HES)	HYDRO	AH	30.1	2009	138.0	-	-	na	-	0.0	
TÜPRAŞ RAFİNERİ (Aliağa/İZMİR)	N.GAS	ANG	24.7	2009	170.0	54.3	0.20	60.0%	0.33	55.3	
TÜPRAŞ O.A.RAFİNERİ (Kırıkkale) (Düzeltilme)	F.OIL	AF	10	2009	70.0	75.5	0.27	46.0%	0.59	41.3	
UZUNÇAYIR HES (Tunceli)	HYDRO	AH	27.3	2009		-		na			
ÜTOPYA ELEKTRİK (DÜZOVA RES)	WIND	AR	15	2009		-		na			
YAPISAN (KARICA REG. VE DARICA I HES)	HYDRO	AH	48.5	2009	164.0	-	-	na	-	0.0	
YAPISAN (KARICA REG. VE DARICA I HES)	HYDRO	AH	48.5	2009	164.0	-	-	na	-	0.0	
YEŞİLBAŞ ENERJİ (YEŞİLBAŞ HES)	HYDRO	AH	14	2009	56.0	-	-	na	-	0.0	
YPM GÖLOVA HES	HYDRO	AH	1.1	2009	3.0	-	-	na	-	0.0	
YPM SEVİNDİK HES	HYDRO	AH	5.7	2009	36.0	-	-	na	-	0.0	
YURTBAY ELEKTRİK ÜRETİM A.Ş.	N.GAS	ANG	6.9	2009	50.0	54.3	0.20	60.0%	0.33	16.3	
ZORLU ENERJİ (B.KARIŞTIRAN) (İlave)	N.GAS	ANG	49.5	2009	395.0	54.3	0.20	60.0%	0.33	128.6	
2008											
Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO₂ EF (ton/TJ)	tCO₂/MWh *	Facility Energy Efficiency	BM Emission Factor tCO₂/MWh	CO₂ (tons)	
MB Şeker Nişasta San. A.Ş.	N.GAS	ANG	8.80	2008	60.0	54.3	0.20	60.0%	0.33	19.5	

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(Sultanhanı)											
AKSA ENERJİ (Antalya)	N.GAS	ANG	183.80	2008	1,290.0	54.3	0.20	60.0%	0.33	419.9	
AKSA ENERJİ (Manisa)	N.GAS	ANG	52.38	2008	370.0	54.3	0.20	60.0%	0.33	120.4	
ANTALYA ENERJİ (ilave)	N.GAS	ANG	17.46	2008	122.3	54.3	0.20	60.0%	0.33	39.8	
ATAÇ İNŞAAT SAN. A.S.B. (ANTALYA)	N.GAS	ANG	5.40	2008	37.0	54.3	0.20	60.0%	0.33	12.0	
BAHÇIVAN GIDA (LÜLEBURGAZ)	N.GAS	ANG	1.17	2008	8.0	54.3	0.20	60.0%	0.33	2.6	
CAN ENERJİ (Çorlu - Tekirdağ) (ilave)	N.GAS	ANG	52.38	2008	304.2	54.3	0.20	60.0%	0.33	99.0	
FOUR SEASONS OTEL (ATİK PASHA TUR A.Ş.)	N.GAS	ANG	1.17	2008	7.0	54.3	0.20	60.0%	0.33	2.3	
FRITOLAY GIDA San. Ve TIC. A.Ş. (ilave)	N.GAS	ANG	0.60	2008	4.0	54.3	0.20	60.0%	0.33	1.3	
ITC-KA Enerji Üretim A.Ş. (Mamak) (ilave)	RENEW.+WASTES	AR	14.13	2008		-		na			
KARKEY (SİLOPİ-5) (154kV) (ilave)	F.OIL	AF	14.78	2008	103.2	75.5	0.27	46.0%	0.59	60.9	
MELİKE TEKSTİL (GAZİANTEP)	N.GAS	ANG	1.58	2008	11.0	54.3	0.20	60.0%	0.33	3.6	
MİSİS APRE TEKSTİL BOYA EN. SAN.	N.GAS	ANG	2.00	2008	14.0	54.3	0.20	60.0%	0.33	4.6	
MODERN ENERJİ (LİLEBURGAZ)	N.GAS	ANG	13.40	2008	94.1	54.3	0.20	60.0%	0.33	30.6	
ORTADOĞU ENERJİ (ODA YERİ) (Eyip/İST.)	RENEW.+WASTES	AR	2.83	2008		-		na			
POLAT TURZ. (POLAT RENAISSANCE İST.OT.)	N.GAS	ANG	1.60	2008	11.0	54.3	0.20	60.0%	0.33	3.6	



SARAYKÖY JEOTERMAL (Denizli)	GEOTHERMAL	AH	6.85	2008	50.0	-	-	na	-	0.0
YILDIZ SUNTA (Uzunçiftlik- Köseköy)(Düzelt)	N.GAS	ANG	22.63	2008	146.5	54.3	0.20	60.0%	0.33	47.7
SÖNMEZ Elektrik (İlave)	N.GAS	ANG	8.73	2008	67.3	54.3	0.20	60.0%	0.33	21.9
ALP ELEKTRİK TINAZTEPE / ANTALYA	HYDRO	AH	7.69	2008	29.0	-	-	na	-	0.0
CANSU ELEKTRİK (Murgul/Artvin)	HYDRO	AH	9.18	2008	47.0	-	-	na	-	0.0
ÇELDERE ELK. (ÇALDERE HES)	HYDRO	AH	8.74	2008	35.0	-	-	na	-	0.0
DAREN HES ELEKTRİK	HYDRO	AH	49.70	2008	182.0	-	-	na	-	0.0
DEĞİRMENÜSTÜ EN. (Kahramanmaraş)	HYDRO	AH	25.70	2008	69.0	-	-	na	-	0.0
GÖZEDE HES (TEMSA ELEKTRİK) Bursa	HYDRO	AH	2.40	2008	10.0	-	-	na	-	0.0
H.G.M. Enerji (KEKLİCEK HES)	HYDRO	AH	8.67	2008	18.0	-	-	na	-	0.0
HAMZALI HES (TURKON MNG ELEKTRİK)	HYDRO	AH	16.70	2008		-		na		
HİDRO KNT. (YUKARI MANAHOZ Reg. Ve Hes)	HYDRO	AH	22.40	2008	79.0	-	-	na	-	0.0
İÇ-EN ELK. (ÇALKIŞLA REG. Ve HES)	HYDRO	AH	7.66	2008	18.0	-	-	na	-	0.0
KALEN ENERJİ (KALEN II Reg. Ve Hes)	HYDRO	AH	15.65	2008		-		na		



MARAŞ ENERJİ (FIRNİS Reg. Ve HES)	HYDRO	AH	7.22	2008	36.0	-	-	na	-	0.0
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	HYDRO	AH	21.04	2008	96.0	-	-	na	-	0.0
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	HYDRO	AH	21.58	2008	108.0	-	-	na	-	0.0
TORUL	HYDRO	EH	105.60	2008	322.0	-	-	na	-	0.0
YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	HYDRO	AH	0.82	2008	5.0	-	-	na	-	0.0
ZORLU ENERJİ (MERCAN)	HYDRO	AH	1.28	2008	4.9	-	-	na	-	0.0
BAKİ ELEKTRİK ŞAMLI RÜZGAR	WIND	AR	21.00	2008		-		na		
DATÇA RES	WIND	AR	8.10	2008		-		na		
ERTÜRK ELEKTRİK Çatalca RES	WIND	AR	60.00	2008		-		na		
INNORES ELEKTRİK Yuntdağ RÜZG. (Aliağa)	WIND	AR	42.50	2008		-		na		
LODOS RES (Taşoluk)	WIND	AR	24.00	2008	85.0	-	-	na	-	0.0
SAYALAR RÜZGAR	WIND	AR	30.60	2008		-		na		
SEBENOBA (Deniz Elk.)	WIND	AR	31.20	2008	100.0	-	-	na	-	0.0
2007										
Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO₂ EF (ton/TJ)	tCO₂/MWh *	Facility Energy Efficiency	BM Emission Factor tCO₂/MWh	CO₂ (tons)

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HABAŞ (Aliağa - İlave)	N.GAS	ANG	9.10	2007	72.8	54.3	0.20	60.0%	0.33	23.7
MODERN ENERJİ	N.GAS	ANG	5.20	2007	38.7	54.3	0.20	60.0%	0.33	12.6
ARENKO	N.GAS	ANG	0.10	2007	0.8	54.3	0.20	60.0%	0.33	0.3
ALTINMARKA GIDA	N.GAS	ANG	0.10	2007	0.8	54.3	0.20	60.0%	0.33	0.3
TEKBOY ENERJİ	N.GAS	ANG	0.10	2007	0.7	54.3	0.20	60.0%	0.33	0.2
VELSAN AKRILIK	N.GAS	ANG	0.10	2007	0.6	54.3	0.20	60.0%	0.33	0.2
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kadıköy	N.GAS	ANG	0.50	2007	4.0	54.3	0.20	60.0%	0.33	1.3
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Kozyatağı	N.GAS	ANG	0.60	2007	5.0	54.3	0.20	60.0%	0.33	1.6
Acıbaden Sağlık Hiz. Ve Tic. A.Ş. / Bursa	N.GAS	ANG	1.30	2007	11.0	54.3	0.20	60.0%	0.33	3.6
AKATEKS	N.GAS	ANG	1.80	2007	14.0	54.3	0.20	60.0%	0.33	4.6
FLOKSER TEKSTİL / Poliser Tesisi	N.GAS	ANG	2.10	2007	17.0	54.3	0.20	60.0%	0.33	5.5
FLOKSER TEKSTİL / Sütser Tesisi	N.GAS	ANG	2.10	2007	17.0	54.3	0.20	60.0%	0.33	5.5
FRITOLAY GIDA	N.GAS	ANG	0.50	2007	4.0	54.3	0.20	60.0%	0.33	1.3
KIVANÇ TEKSTİL	N.GAS	ANG	3.90	2007	33.0	54.3	0.20	60.0%	0.33	10.7
KİL-KAN Kil San. Ve Tic	N.GAS	ANG	3.20	2007	25.0	54.3	0.20	60.0%	0.33	8.1
SÜPERBOY BOYA SAN.	N.GAS	ANG	1.00	2007	8.0	54.3	0.20	60.0%	0.33	2.6
SWISS OTEL	N.GAS	ANG	1.60	2007	11.0	54.3	0.20	60.0%	0.33	3.6
TAV Esenboğa	N.GAS	ANG	3.90	2007	33.0	54.3	0.20	60.0%	0.33	10.7



NUH ENERJİ-2	N.GAS	ANG	73.00	2007	514.0	54.3	0.20	60.0%	0.33	167.3
AKTEKS	F.OIL	AF	0.80	2007	5.4	75.5	0.27	46.0%	0.59	3.2
UŞAK ŞEKER	LIGNITE	AL	1.70	2007	10.3	90.9	0.33	39.0%	0.84	8.6
BOĞAZLIYAN ŞEKER	N.GAS+NAPHTHA	ANG	16.40	2007	102.6	54.3	0.20	60.0%	0.33	33.4
KARTONSAN	N.GAS+NAPHTHA	ANG	5.00	2007	40.0	54.3	0.20	60.0%	0.33	13.0
ESKİŞEHİR END. ENERJİ	N.GAS+NAPHTHA	ANG	3.50	2007	26.8	54.3	0.20	60.0%	0.33	8.7
ESKİŞEHİR ŞEKER	N.GAS+NAPHTHA	ANG	2.90	2007	18.1	54.3	0.20	60.0%	0.33	5.9
İGSAŞ	N.GAS+NAPHTHA	ANG	2.20	2007	15.2	54.3	0.20	60.0%	0.33	4.9
DESA	N.GAS+NAPHTHA	ANG	0.70	2007	5.6	54.3	0.20	60.0%	0.33	1.8
DENTAŞ	N.GAS+NAPHTHA	ANG	0.30	2007	2.3	54.3	0.20	60.0%	0.33	0.7
SÜPER FİLMCİLİK	N.GAS+NAPHTHA	ANG	0.10	2007	0.8	54.3	0.20	60.0%	0.33	0.3
ATAER ENERJİ	N.GAS+NAPHTHA	ANG	0.10	2007	0.6	54.3	0.20	60.0%	0.33	0.2
BİL ENERJİ	N.GAS+NAPHTHA	ANG	0.10	2007	0.7	54.3	0.20	60.0%	0.33	0.2
ITC-KA	RENEW.+WASTES	AR	1.40	2007		-		na		
BİS ENERJİ Bursa ilave	N.GAS	ANG	43.00	2007	354.8	54.3	0.20	60.0%	0.33	115.5
ALİAĞA ÇAKMAKTEPE	N.GAS	ANG	34.80	2007	278.0	54.3	0.20	60.0%	0.33	90.5
BİS ENERJİ Bursa DÜZELTİLME	N.GAS	ANG	28.30	2007	233.5	54.3	0.20	60.0%	0.33	76.0
BİS ENERJİ Bursa ilave	N.GAS	ANG	48.00	2007	396.1	54.3	0.20	60.0%	0.33	128.9
BOSEN ENERJİ	N.GAS	ANG	142.80	2007			0.20	60.0%	0.33	348.7



					1,071.0	54.3				
SAYENERJİ ELEKTRİK	N.GAS	ANG	5.90	2007	47.0	54.3	0.20	60.0%	0.33	15.3
T ENERJİ ÜRETİM A.Ş.	N.GAS	ANG	1.60	2007	13.0	54.3	0.20	60.0%	0.33	4.2
ZORLU ENERJİ Kayseri	N.GAS	ANG	7.20	2007	55.0	54.3	0.20	60.0%	0.33	17.9
SIİRT	F.OIL	AF	25.60	2007	190.0	75.5	0.27	46.0%	0.59	112.2
MARDİN KIZILTEPE	F.OIL	AF	34.10	2007	250.0	75.5	0.27	46.0%	0.59	147.6
KAREN	F.OIL	AF	24.30	2007	180.0	75.5	0.27	46.0%	0.59	106.3
İDİL 2 (PS3 A-2)	F.OIL	AF	24.40	2007	180.0	75.5	0.27	46.0%	0.59	106.3
BORÇKA HES	HYDRO	EH	300.60	2007	1,039.0	-	-	na	-	0.0
TEKTUĞ (KEBAN DERESİ)	HYDRO	AH	5.00	2007	32.0	-	-	na	-	0.0
YPM Ener. Yat. A.Ş. Altıntepe Hidro	HYDRO	AH	4.00	2007	18.0	-	-	na	-	0.0
YPM Ener. Yat. A.Ş. Beyınar Hidro	HYDRO	AH	3.60	2007	18.0	-	-	na	-	0.0
YPM Ener. Yat. A.Ş. Konak Hidro	HYDRO	AH	4.00	2007	19.0	-	-	na	-	0.0
KURTEKS Tekstil (KARASU HES - Andırın)	HYDRO	AH	2.40	2007	19.0	-	-	na	-	0.0
ISKUR TEKSTİL (SULEYMANLI HES)	HYDRO	AH	4.60	2007	18.0	-	-	na	-	0.0
ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta)	HYDRO	AH	6.30	2007	27.0	-	-	na	-	0.0
ÖZGÜR ELK. AŞ. (K.MARAŞ) (Tahta) İlave	HYDRO	AH	6.30	2007	27.0	-	-	na	-	0.0
ANEMON EN: ELEK. ÜRETİM A.Ş.	WIND	AR	8.00	2007		-		na		



ANEMON EN: ELEK. ÜRETİM A.Ş. İlave	WIND	AR	15.20	2007			-		na		
ANEMON EN: ELEK. ÜRETİM A.Ş. İlave	WIND	AR	7.20	2007			-		na		
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	WIND	AR	4.00	2007			-		na		
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	WIND	AR	10.90	2007			-		na		
DENİZ ELEK. ÜRETİM Ltd. Şti. (Karakurt)	WIND	AR	10.80	2007	28.0		-	-	na	-	0.0
MARE MMANASTIR RÜZGAR ENERJİ	WIND	AR	11.2	2007			-		na		
MARE MMANASTIR RÜZGAR ENERJİ	WIND	AR	20.00	2007			-		na		
2006											
Company	Facility	Index	Installed Capacity (MW)	Commissioning Date	Energy Production (MWh)*	CO ₂ EF (ton/TJ)	tCO ₂ /MWh *	Facility Energy Efficiency	BM Emission Factor tCO ₂ /MWh	CO ₂ (tons)	
EKOTEN TEKSTİL GR-I	N.GAS	ANG	1.93	16.02.2006	14.0	54.3	0.20	60.0%	0.33	4.6	
ERAK GİYİM GR-I	N.GAS	ANG	1.37	22.02.2006	10.0	54.3	0.20	60.0%	0.33	3.3	
ALARKO ALTEK GR-III	N.GAS	ANG	21.89	23.02.2006	158.3	54.3	0.20	60.0%	0.33	51.5	
AYDIN ÖRME GR-I	N.GAS	ANG	7.52	25.02.2006	60.0	54.3	0.20	60.0%	0.33	19.5	
NUH ENERJİ-2 GR II	N.GAS	ANG	26.08	02.03.2006	180.1	54.3	0.20	60.0%	0.33	58.6	
MARMARA ELEKTRİK (Çorlu) GR-I	N.GAS	ANG	8.73	13.04.2006	63.0	54.3	0.20	60.0%	0.33	20.5	
MARMARA PAMUK (Çorlu) GR-I	N.GAS	ANG	8.73	13.04.2006	63.0	54.3	0.20	60.0%	0.33	20.5	
ENTEK (Köseköy)	N.GAS	ANG	47.62	14.04.2006			0.20	60.0%	0.33	127.4	

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.



GR IV					391.3	54.3					
ELSE TEKSTİL (Çorlu) GR I-II	N.GAS	ANG	3.16	15.04.2006	25.0	54.3	0.20	60.0%	0.33	8.1	
BARES IX GRUP	WIND	AR	13.50	20.04.2006	47.3	-	-	na	-	0.0	
SÖNMEZ ELEKTRİK (Çorlu) GR I - II	N.GAS	ANG	17.46	03.05.2006	126.0	54.3	0.20	60.0%	0.33	41.0	
DENİZLİ ÇİMENTO (DÜZELTME)	N.GAS	ANG	0.45	04.05.2006	3.2	54.3	0.20	60.0%	0.33	1.0	
MENDERES ELEKTRİK GR I	GEOTHERMAL	AH	7.95	10.05.2006	56.0	-	-	na	-	0.0	
KASTAMONU ENTEĞRE BALIKSİR GR-I	N.GAS	ANG	7.52	24.05.2006	54.0	54.3	0.20	60.0%	0.33	17.6	
BARES X. VE XX. GRUPLAR	WIND	AR	16.50	26.05.2006	57.8	-	-	na	-	0.0	
BOZ ENERJİ GR-I	N.GAS	ANG	8.73	09.06.2006	70.0	54.3	0.20	60.0%	0.33	22.8	
ADANA ATIK SU ARITMA TESİSİ	RENEW.+WASTES	AR	0.80	09.06.2006	6.0	-	-	na	-	0.0	
AMYLUM NIŞASTA (ADANA)	N.GAS	ANG	14.25	09.06.2006	34.0	54.3	0.20	60.0%	0.33	11.1	
ŞİK MAKAS (Çorlu) GR-I	N.GAS	ANG	1.58	22.06.2006	13.0	54.3	0.20	60.0%	0.33	4.2	
ELBİSTAN B GR-III	LIGNITE	EL	360.00	23.06.2006	2,340.0	90.9	0.33	39.0%	0.84	1,961.9	
ANTALYA ENERJİ GR I - II - III - IV	N.GAS	ANG	34.92	29.06.2006	245.0	54.3	0.20	60.0%	0.33	79.8	
HAYAT TEM. VE SAĞLIK GR I - II	N.GAS	ANG	15.04	30.06.2006	108.0	54.3	0.20	60.0%	0.33	35.2	
EKOLOJİK EN. (Kemerburgaz) GR I	RENEW.+WASTES	AR	0.98	31.07.2006	6.0	-	-	na	-	0.0	
EROĞLU GİYİM (Çorlu) GR-I	N.GAS	ANG	1.17	01.08.2006	9.0	54.3	0.20	60.0%	0.33	2.9	
CAM İŞ ELEKTRİK (Mersin) GR I	N.GAS	ANG	126.10	13.09.2006	1,008.0	54.3	0.20	60.0%	0.33	328.1	
ELBİSTAN B GR II	LIGNITE	EL	360.00	17.09.2006			0.33	39.0%	0.84	1,961.9	



					2,340.0	90.9				
--	--	--	--	--	---------	------	--	--	--	--

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf>

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf>

Source: <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf>

NOTE 1: The projects in the table above which are coloured in green are excluded from the Built Margin emission Factor Calculations, since these projects are developed as VER projects.

NOTE 2: The projects in the table above which are coloured in red are also excluded from the calculations, since the electricity productions figures for these power plants are not available.

Built Margin Emission Factor

	Total Elect.	Net Elect.	Total CO2	BM
2009	23,067.7	22,097.5	9,004.3	0.40748
2008	3,943.6	3,771.5	889.9	0.23595
2007	5,532.1	5,294.8	1,614.2	0.30487
2006	7,487.8	7,200.8	4,781.5	0.66402

BM Emission Factor :	0.4246
-----------------------------	--------

Summary of Grid Emission Factor Calculation

Parameter	SI Unit	Result
EF _{Grid,OM,y}	tCO2/MWh	0.6613
EF _{Grid,BM,y}	tCO2/MWh	0.4246
EF _{Grid,CM,y}	tCO2/MWh	0.5429

T.C.
ADANA VALİLİĞİ
ÇEVRE VE ORMAN İL MÜDÜRLÜĞÜ
Yedigöze Barajı ve Hidroelektrik Santrali Projesi
Halkın Katılımı Toplantısı Katılımcı Listesi

	Adı Soyadı	Toplantıya Nereden Katıldığı	İmza
1	Yahya V. ÖZCE	Ulugınar Köyü	[İmza]
2	Demir Kızılcı	" "	[İmza]
3	Tanrıhan	" "	[İmza]
4	Tahir T. ÖZEL	" "	[İmza]
5	Hüseyin T. ÖZEL	" "	[İmza]
6	İsa D. ÖZMEZ	" "	[İmza]
7	Ali D. ÖZMEZ	" "	[İmza]
8	İbrahim Z. ÖZEL	" "	[İmza]
9	M. ÖZMEZ	Populü Köyü	[İmza]
10	Eniş L. ÖZAN	Bozdağ	[İmza]
11	Ahmet ÖZAN	Bozdağ	[İmza]
12	Eniş S. ÖZAN	Bozdağ	[İmza]
13	Bahadır Alyaz	Bozdağ	[İmza]
14	Ali Y. ÖZAN	Bozdağ	[İmza]
	Ali ÖZAN	Bozdağ	[İmza]
	M. ÖZAN	Bozdağ	[İmza]
	Ali ÖZAN	Bozdağ	[İmza]
	M. ÖZAN	Bozdağ	[İmza]
	HACI D. ÖZAN	Bozdağ	[İmza]
	HACI D. ÖZAN	Bozdağ	[İmza]
	Ali ÖZAN	Bozdağ	[İmza]

T.C.
ADANA VALİLİĞİ
ÇEVRE VE ORMAN İL MÜDÜRLÜĞÜ
Yedigöze Barajı ve Hidroelektrik Santrali Projesi
Halkın Katılımı Toplantısı Katılımcı Listesi

	Adı Soyadı	Toplantıya Nereden Katıldığı	İmza
1	Yolcu T.Ö.	Uluçmarak Köyü	[İmza]
2	Demet Karagözü	" "	[İmza]
3	Tanrıhan	" "	[İmza]
4	Tahsin T.Ö.	" "	[İmza]
5	Hacı T.Ö.	" "	[İmza]
6	İsa Demmez	" "	[İmza]
7	Halil Demmez	" "	[İmza]
8	Bekir Z.Ö.	" "	[İmza]
9	Mali M.Ö.	Populu Köyü	[İmza]
10	Emirhan L.Ö.	Başköy	[İmza]
11	Alihan M.Ö.	Populu	[İmza]
12	Kadir S.Ö.	Yedigöze Köyü	[İmza]
13	Bahadır Alyağout	Yedigöze Köyü	[İmza]
14	Ali Yakar	Yedigöze	[İmza]
	Ali Şimşek	Yedigöze	[İmza]
	Mehmet Ali	Yedigöze	[İmza]
	Halil İbrahim	Yedigöze	[İmza]
	Alihan	Yedigöze	[İmza]
	Halil İbrahim	Yedigöze	[İmza]
	Hacı Dağdu	Yedigöze	[İmza]
	Alihan	Yedigöze	[İmza]

T.C.
ADANA VALİLİĞİ
ÇEVRE VE ORMAN İL MÜDÜRLÜĞÜ
Yedigöze Barajı ve Hidroelektrik Santrali Projesi
Halkın Katılımı Toplantısı Katılımcı Listesi

	Adı Soyadı	Toplantıya Nereden Katıldığı	İmza
1	İsmail T. İsmail	Akşen Köyü	
2	M. Akif Çant	D. İsmail - Akşen	
3			
4	M. İsmail Köse	Uşaklı Köyü	
5	Erol T. İsmail	Tirol Köyü M. İsmail	
6	Mustafa Mentas	Sarıcağaç Köyü	
7	Murat Şahin	ALANPAZ 3. Kat Odası	
8	Menderes Köse	Dağlık Köyü Muhtarı	
9	Ahmet Yılmaz	Boztahta Köyü Muhtarı	
10	Fidil SEVİĞİ	Adana İl Müdürlüğü	
11	Ali Bekar	Alaköy Akören Orman Şefi	
12	Musa Paşa Hüseyin	İmameşli Sevineli Köyü Muhtarı	
13	Yemliha Bulut	İmameşli Sevineli Köyü	
14	Dağcı Albuluk	Sevineli Köyü 1721951	
15	ARÖN KÖYÜ	Mehmet KOSU	
16	İbrahim Yılmaz	Kandıköy	
17	Keser Sevineli	Uluşınar köyünden	
18	Harun Güllü	Uluşınar köyünden	
19	Hosun Topal	Alaköy Köyü	
20	Recep Yıldız	Uluşınar Köyü	
21	Kerem Şen	Uluşınar Köyü	

T.C.
ADANA VALİLİĞİ
ÇEVRE VE ORMAN İL MÜDÜRLÜĞÜ
Yedigöze Barajı ve Hidroelektrik Santrali Projesi
Halkın Katılımı Toplantısı Katılımcı Listesi

	Adı Soyadı	Toplantıya Nereden Katıldığı	İmza
1	Halil TURPÇU	Eğner Köyü	
2	Kürat TURPÇU	Eğner Köyü	
3	Mehmet ŞERİN TURPÇU	Eğner Köyü	
4	Mustafa Küçük	Eğner Köyü	
5	Soban Çelik	Saygıcit	
6	Yusuf Bicer	Saygıcit	
7	Mithat İnkent	Saygıcit	
8	Rıza Bulut	Harabulut	
9	Hasan Önder	Akören	
10	Ertan Sobel	Akören	
11	Eyüp Önder	Akören	
12	Mustafa Altınbaş	Akören	
13	Duran Güzel	Akören	
14	Hasan Yazar	Akören	
15	Emir Bedir	Akören	
16	Velî Örselik	Akören	
17	Aydın Aydın	Akören	
18			

T.C.
ADANA VALİLİĞİ
ÇEVRE VE ORMAN İL MÜDÜRLÜĞÜ
Yedigöze Barajı ve Hidroelektrik Santrali Projesi
Halkın Katılımı Toplantısı Katılımcı Listesi

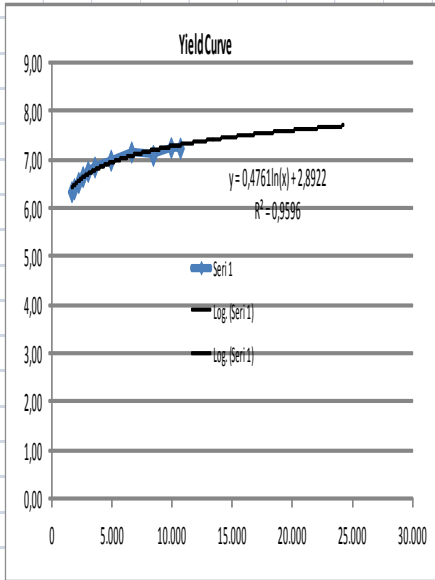
Adı Soyadı	Toplantıya Nereden Katıldığı	İmza
KAMAL YILDIRIM	Akören	
Mehmet Yücesel	Akören	
Mehmet Yücesel	Akören	
Ahmet KAYA	Akören	
MUSTAFA TOŞKUN	Akören	
SEFER BİLMEZ	Akören	
DURMUŞ YILDIRIM	Akören	
Ahmet KOR	Akören	
MUSA YILDIRIM	Akören	
Ahmet KAYA	Akören	
Ali KEBEK	Akören	
Ahmet DURRALI	Doğanalan Köyü	
Ramazan YILDIRIM	Doğanalan Köyü	
Ali SÜREK	Doğanalan Köyü	
Baki SÜREK	Doğanalan Köyü	
Mehmet YILDIRIM	Doğanalan Köyü	

ANNEX 8 Yield

As of	25.11.2006	Bond Name	Maturity	Days to Maturity	FX	Price (Sell)	Yield (Sell)	Price (Buy)	Yield (Buy)
		US900123AU49	30.06.2011	1648	USD	114,625	6,35	116,95	5,81
		US900123AN06	23.01.2012	1855	USD	126,60556	6,41	0	0
		US900123AR10	14.01.2013	2212	USD	126,91944	6,54	0	0
		US900123AS92	15.01.2014	2578	USD	119,97222	6,66	122,55139	6,26
		US900123AV22	15.03.2015	3002	USD	105,01389	6,77	107,57431	6,38
		US900123AZ36	26.09.2016	3563	USD	102,73056	6,86	105,28889	6,51
		US900123AX87	05.06.2020	4911	USD	100,38889	7	102,94722	6,71
		US900123AW05	05.02.2025	6617	USD	104,86806	7,17	107,42951	6,93
		US900123AL40	15.01.2030	8422	USD	159,02778	7,1	0	0
		US900123AT75	14.02.2034	9913	USD	111,66111	7,26	0	0
		US900123AV60	17.03.2036	10675	USD	97,37153	7,25	99,92882	7,04
		Theoretical Eurobond	30.11.2041	12789	USD				7,39

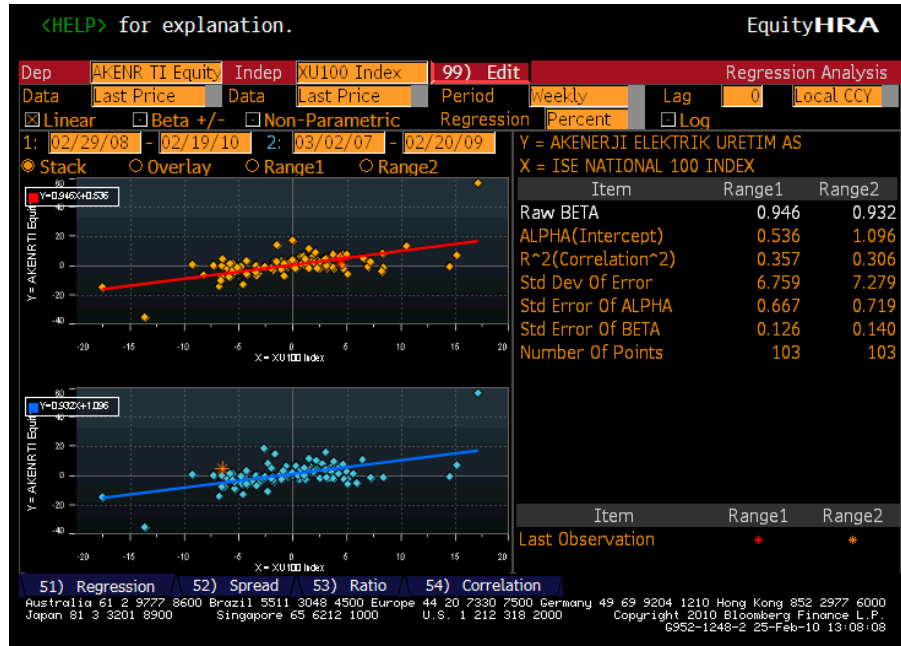
$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

Risk Free Rate (R _f)	7,39% http://www.ziraat.com.tr/tr/bankamiz/faz-ve-ucretler.aspx/eurobond.aspx
The Beta Coefficient (β _i)	0,939 <i>Beta Values are received from Bloomberg</i>
Market risk premium (E(R _m) - R _f)	9,41% http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem15.xls
Expected Market Return (E(R _i))	16,23%

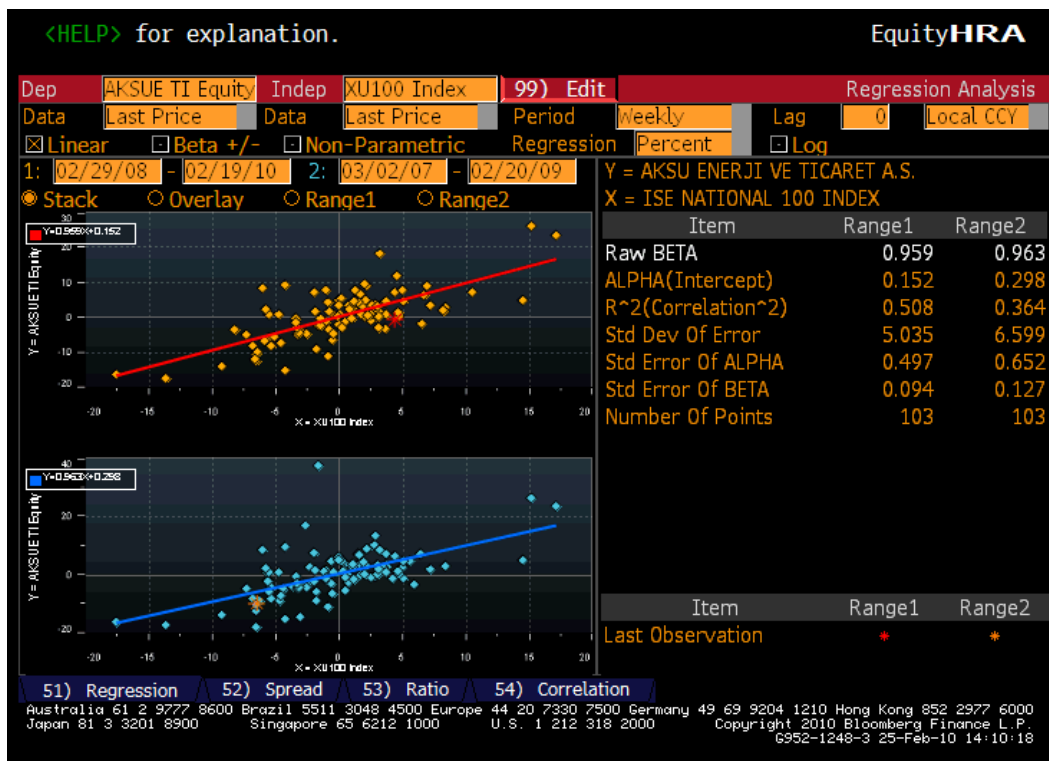


Beta Values of the energy companies traded in ISE 100 derived from Bloomberg:

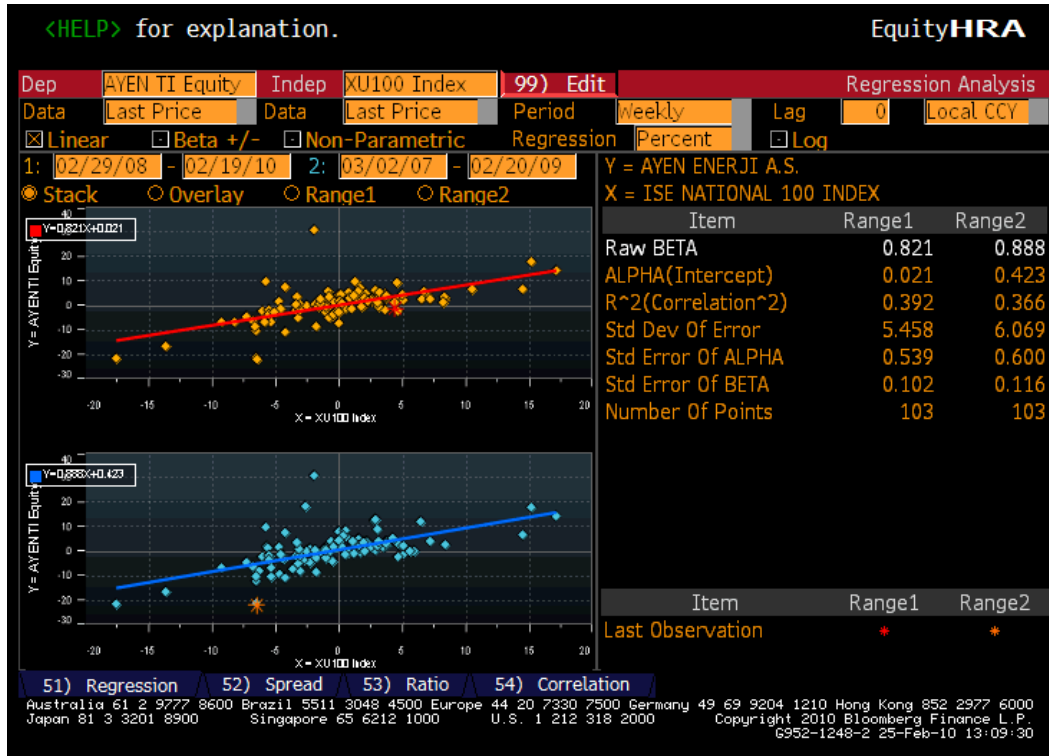
AK ENERJI



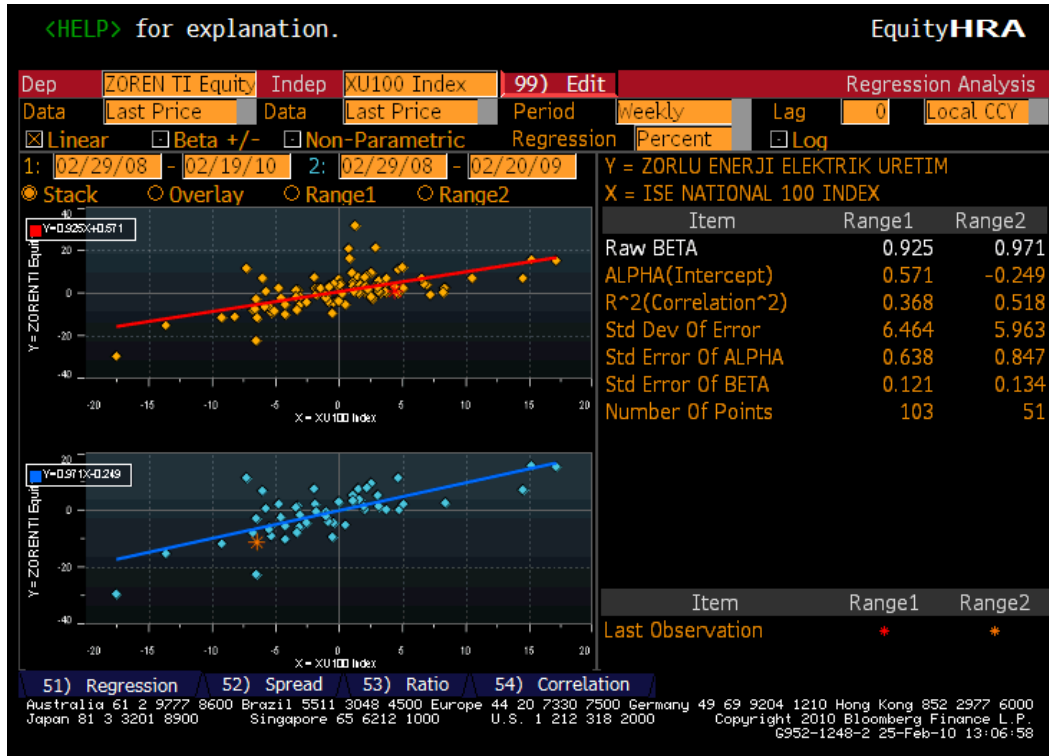
AKSU ENERJI



AYEN



ZORLU ENERJI



ANNEX 9

The bank letter



Yapı ve Kredi Bankası A.Ş.
Genel Müdürlük
Yapı Kredi Plaza D Blok
Levent 34330 İstanbul
Tel: (0212) 339 70 00
Faks: (0212) 339 60 00
www.yapikredi.com.tr

23/09/2009

*"We as Yapı Kredi have considered the additional income to be generated from VER Carbon credits and possible utilization of CER Carbon credits in the future during our financial feasibility appraisal of YedigözeProject and our loan is granted under such consideration
This letter is issued without bearing any responsibility and engagement on our part."*

Yapı ve Kredi Bankası A.Ş.
Gaziantep Branch

ANNEX 10
Loan agreement

YEDİGÖZE ELEKTRİK ÜRETİM VE TİCARET A.Ş.

AS THE BORROWER

YAPI VE KREDİ BANKASI A.Ş. GAZİANTEP BRANCH

AS AGENT AND SECURITY TRUSTEE

YAPI VE KREDİ BANKASI A.Ş. BAHRAIN BRANCH, DENİZBANK A.Ş. BAHRAIN
BRANCH AND NATIONAL BANK OF GREECE S.A. LONDON BRANCH

AS LENDERS

SANKO HOLDİNG A.Ş.

AS GUARANTOR

LOAN AGREEMENT

DATED

03/09/2008



ANNEX 11

The application letter to EPDK for the revision of the project title

SANİBEY

SAYI : 724-2011/ Teknik Şeffik (387) 23.08.2011
KONU : Unvan Değişikliği

**T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU
Kamulaştırma Dairesi Başkanlığı**

Şirketimiz Adana İli, Aladağ İlçesi, Egner Mevkii'nde tamamı işletmede olan Yedigöze Sanibey Barajı ve HES üretim tesisi için verilen 22.06.2006 tarihli ve EÜ/799-2/651 numaralı üretim lisansı sahibidir.

Şirketimizin "YEDİGÖZE ELEKTRİK ÜRETİM VE TİCARET ANONİM ŞİRKETİ" olan unvanını "SANİBEY BARAJI ELEKTRİK ÜRETİM VE TİCARET ANONİM ŞİRKETİ" olarak değiştirilmiş olup, ilgili Ticaret Sicil Gazetesi yazımız ekinde Kurumunuza sunulmaktadır. Bilgilerinizi ve gereğini saygılarımızla arz ederiz.

EPDK T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

23.08.2011+ 45022


Alaaddin COŞKUN
Yönetim Kurulu Başkan Vekili
SANİBEY BARAJI
ELEKTRİK ÜRETİM
ve TİC. A.Ş.

Mühür Numarası: CAG 181 5110 00380 Yabancılar /AŞKAPD
www.224.gov.tr - www.epdk.org.tr

EK - 1
EK - A : 16.08.2011 tarihli ve 7881 Sayılı Ticaret Sicil Gazetesi. (Unvan Değişikliği)


SANİBEY Barajı Elektrik Üretim ve Ticaret Anonim Şirketi
Burak Mahallesi Sani Konaközü Bulvarı No:221 ŞEHİTKAMİL/GAZİANTEP

ANNEX 12

The application letter to the Ministry of Environment and Urban Planning for the change of title of the project

SANİBEY

SAYI : 720-2011/ Teknik Şeflik (383)
KONU : Unvan Değişikliği

23.08.2011

T.C.
ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI
Çevresel Etki Değerlendirmesi, İzin ve Denetim Genel Müdürlüğü

Şirketimiz Adana İli, Aladağ İlçesi, Eğner Mevkii'nde tamamı işletmede olan Yedigöze Sanibey Barajı ve HES üretim tesisi için verilen 22.06.2006 tarihli ve EÜ/799-2/651 numaralı üretim lisansı sahibidir.

Yedigöze Sanibey Barajı ve HES projemiz için "YEDİGÖZE ELEKTRİK ÜRETİM VE TİCARET ANONİM ŞİRKETİ" unvanı altında Şirketimize, Müdürlüğünüz tarafından 06.06.2007 Tarih ve 1267 Karar No ile "Yedigöze Barajı HES ve Malzeme Ocakları" ile ilgili olarak ÇED Yönetmeliği'nin 14. maddesi gereğince "Çevresel Etki Değerlendirmesi Olumlu Kararı" verilmiştir.

Şirketimizin unvanı "SANİBEY BARAJI ELEKTRİK ÜRETİM VE TİCARET ANONİM ŞİRKETİ" olarak değiştirilmiş olup, ilgili Ticaret Sicil Gazetesi yazımız ekinde Kurumunuza sunulmaktadır. Kayıtlarımızın bu bilgi ve belgelere göre değiştirilmesi hususunu saygılarımızla arz ederiz.

Tarih : 23.08.2011

Sayı : 13385


Alaaddin COŞKUN
Yönetim Kurulu Başkan Vekili
SANİBEY BARAJI
ELEKTRİK ÜRETİM
ve TİC. A.Ş.

EK :

EK- A : 16.08.2011 tarihli ve 7881 Sayılı Ticaret Sicil Gazetesi. (Unvan Değişikliği)



SANİBEY Barajı Elektrik Üretim ve Ticaret Anonim Şirketi
Barak Mahallesi Sanı Konukoğlu Bulvarı No: 221 ŞEHİTKAMİL,GAZİANTEP
T.C. 0332553113716-0332553113716-0332553113716