CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 31 November 2008

Grid-Connected Electricity Generation From Renewable Sources:

AY-YILDIZ 15 MW WPP

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Title: AY-YILDIZ 15 MW WPP
Version: 05.1
Date: 31/05/2010

A.2. Description of the project activity:

Akenerji Elektrik Uretimi AS, which is the one of the largest and most credible companies of Turkey, develops hydro and wind energy based projects, one of the principal forms of energy generation from renewable energy. Akenerji realizes self-developed projects within a production company model in accordance with market conditions. Such projects will gap some of the national energy deficit, will contribute the development of local industries as it will allow the use of cheaper energy for industrialists and gain advantage in a competitive environment.

In this scope, Akenerji Elektrik Uretimi A.S. plans to install 5 x 3 MW Wind Turbines at Ayyildiz Hill near the town of Bandirma in the province of Balikesir with the purpose of contributing to national economy and providing a portion of growing electricity demand. Total installed power of the facility will be 15 MW.

License application for the Wind Energy Power Plant was made to the Energy Market Regulatory Authority and the Production License was awarded in accordance with the Electricity Market Law (No: 4628) for a period of 49 years by the decision numbered EU/973-2/739 on November 11th, 2006 (see Annex 6).

The project consists of 80 meter high wind turbines, each 3 MW and a 34.5 kV switchyard. The annual projected energy of 51.32 GWh will be transferred to the interconnected grid by a 5 km long power transmission line from the project switchyard to TEIAS Bandirma II TM substation.

The project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants connected to Turkish National Power Grid. The average annual generated energy of 51.32 GWh, will be able to deliver a reduction in emissions of around 30,997 tCO_2e (tons of carbon dioxide equivalent) per annum. This generation figure which is taken as reference in emission reduction calculations is net of internal consumption of plant but it does not include transmission loss of the grid.

The project complies with the relevant regulations and laws in Turkey. In line with Turkish environmental regulations, an "Environmental Impact Assessment (EIA) Exemption Letter" was approved by the Ministry of Environment and Forestry in September 2007.

Main goals of the Ayyildiz Wind Power Plant project include;

- Utilization of the wind potential of Turkey in order to meet increasing electricity demand and maintain energy security. In total, the wind energy capacity of Turkey is lower than 1% of the total installed capacity, whereas the generation potential of Turkey is much higher than 10,000 MW.
- Reduction of GHG emissions through increasing share of renewable resources.

- Contribution to economic development by creating direct and indirect job opportunities during construction and operation phases.
- Reduction of import dependency on fossil fuel weighed electricity sector and diversify generation mix through use of local resources.

In terms of local benefits, the project will mainly contribute to the reduction of local air pollutants. It is also expected that the project will contribute to local employment during both the construction and operation. About 50 people will be employed during construction stage. Also, about 7 people will be employed permanently during the operating life time of the plant.

The number of employees and their classification is given in Table below.

Classification	**Number**
Construction Phase	
Engineers	8
Technicians	5
Blue Collars	37
TOTAL	**50**
Operation Phase	
Engineer	2
Administrative Staff	1
Operators&Technicians	5
Security&Support Staff	4
TOTAL	**12**

Table 1. Numbers and Classification of the Workers

Considering the contribution of the project on local and national economy, environment and local community, project will definitely have positive influences on sustainable development in the region and in Turkey. The Ayyildiz WPP will enable the use of local resources for energy production and thus decrease dependency on imported fossil fuels as an energy source. In addition, the project will have a significant effect on air quality; directly and indirectly, create new jobs for local inhabitants during the construction and operation phases.

Main milestones of the project is given in table below.

Milestone	**Date**
License Issuance	09/11/2006
Carbon Certification Agreement	10/06/2008
License Amendment	23/10/2008
Equipment Purchase Contract	05/11/2008
Start of Construction	01/03/2009
LSC Meeting	19/09/2008
Commissioning Date	01/09/2009

Table 2. Ayyildiz Project Milestones

A.3. Project participants:

Name of Party involved (*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Turkey (Host)*	Akenerji Elektrik Uretim AS. Global Tan Energy Ltd.	No

* Host country Turkey has recently ratified Kyoto however; there exist no official DNA yet

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

Ayyildiz Wind Power Plant Project is located at Ayyildiz Hill near the town of Bandirma in the province of Balikesir. The project will consist of 5 turbines, 3 MW each. The turbine coordinates are given in Table 2 below.

Turbine No.	Turbine coordinates (UTM ED 50)	
	Easting	Northing
T1	574.923	4.467.686
T2	575.171	4.467.514
T3	575.482	4.468.079
T4	575.774	4.467.996
T5	576.023	4.467.825

Table 3. Turbine Coordinates

Nearby settlements is Village of Edincik (about 6 km South of project Site)

Figure 1. Project Location Map

A.4.1.1.	**Host Party(ies):**

Although Turkey, the Host Country, passed legislation in Parliament on February 5th 2009 to ratify the Kyoto Protocol - Turkey does not yet have a quantitative emission reduction limit and it is likely that it will not until post 2012 and therefore continues to be eligible for voluntary emission reduction projects in the interim period.

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

Marmara Region, Balikesir Province

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

Bandirma District, Edincik ward

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

Figure 2. Location of the project activity

Figure 3. Views from project site

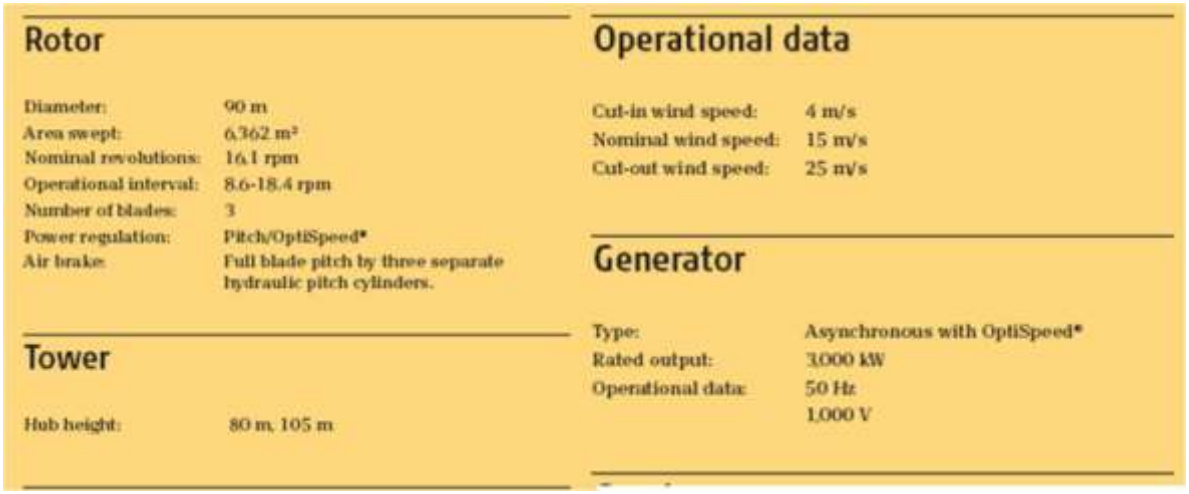
A.4.2. Category of project activity:

Project activity involves electricity generation from renewable sources therefore it is categorized in the sectoral scope 1 "Energy Industry – Renewable Sources" according to the UNFCCC definition.

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

Wind Power Plants use wind energy converters (WEC), called wind turbines to convert the wind energy into electrical energy. Average annual wind speeds measured at the project site at 20 and 30 meters above ground level are 7.51 meters per second and 7.95 meters per second respectively. The project uses 5 WEC's of 3 MW each, with 90 meters rotor diameter. The annual electricity generation from these turbines are estimated to be 51.32 GWh. This energy is converted to 34.5 kV at the site switchyard and connected to the national grid.

The technical data of Vestas V90/3000kW WEC's to be used at site:



Rotor

Diameter:	90 m
Area swept:	6,362 m²
Nominal revolutions:	16.1 rpm
Operational interval:	8.6-18.4 rpm
Number of blades:	3
Power regulation:	Pitch/OptiSpeed®
Air brake:	Full blade pitch by three separate hydraulic pitch cylinders.

Tower

Hub height:	80 m, 105 m

Operational data

Cut-in wind speed:	4 m/s
Nominal wind speed:	15 m/s
Cut-out wind speed:	25 m/s

Generator

Type:	Asynchronous with OptiSpeed®
Rated output:	3,000 kW
Operational data:	50 Hz 1,000 V

Figure 4. Technical data of turbines to be used

The Vestas V90 turbine is one of the most advanced models in the market in terms of installed capacity and includes several innovations in blade technology, materials used and aerodynamic design. Together with new low-weight blades, these breakthroughs have made the V90 remarkably light for a turbine of its size – and remarkably efficient for a turbine of any dimension which makes it one of the state of the art products in turbine technology.[1] Since the Vestas V90 turbines have an average lifetime of 20 years (which is in parallel with the license issued for the Ayyildiz WPP) and project financial analysis is made on this fact, the turbines are not likely to be substituted within the project period[2].

According to feasibility report,for selected turbines, annual net generation is calculated as 51,320 MWh in financial analysis.

[1] http://www.vestas.com/en/wind-power-solutions/wind-turbines/3.0-mw.aspx

[2] http://www.vestas.com/files//Filer/EN/Press_releases/VWS/2005/050412-PMUK-02.pdf

Staff recruited for the project activities will be trained to get high voltage certificate. Also, project staff will be trained by equipment manufacturers for the first line maintanance and operation of the equipments. Second line maintanance of the equipments will be carried out by equipment manufacturer company.

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

The project activity will use a renewable crediting period. The estimated amounts of emission reductions for the first crediting period are listed in the following table.

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2009 (01/09/2009 – 31/12/2009)	10,332
2010	30,997
2011	30,997
2012	30,997
2013	30,997
2014	30,997
2015	30,997
2016 (01/01/2016 – 30/08/2016)	20,665
Total emission reductions (Tonnes of CO_2 e)	**216,981**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	30,997

Table 4. Estimated amount of emission reduction

A.4.5. Public funding of the project activity:

No public funding or ODA is used for the project. ODA Declaration is submitted in Annex.

SECTION B. Application of a baseline and monitoring methodology

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

The United Nations approved consolidated baseline methodology applicable to this project is ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", Version 9[3].

ACM0002 refers to the following tools:

- "Tool for the demonstration and assessment of additionality", Version 05.2,[4] and
- ''Tool to calculate the emission factor for an electricity system'', Version 01.1[5].

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

The choice of methodology ACM0002, Version 9, is justified as the project activity meets its applicability criteria:

- Ayyildiz Wind Power Plant Project is a 15 MW grid connected renewable electricity generation project,
- The project does not involve switching from fossil fuel use to renewable energy at the site of the project activity; and
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

[3] http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_71ZC14NVE4V5DHA3TUT3896PFLPVGG

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

[5] http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf

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

GHG included in the project boundary and used in calculation of emission reduction by the project activity are given in table below.

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in baseline (Turkey Grid)	CO_2	Yes	Main Emission Source
		CH_4	No	Minor emission source. Excluded for simplification
		N_2O	No	Minor emission source. Excluded for simplification
Project Activity	Emission from back up diesel generator	CO_2	No	Minor emission source.
		CH_4	No	Zero-emission electricity generation
		N_2O	No	Zero-emission electricity generation

Table 5. GHGs included in the project boundary

The project boundary is National Electricity Grid of Turkey. The Geographical and physical boundaries of the Turkish grid and location of the power plants are well identified.

However, since the Turkish grid capacity is not enough to meet sharp increases in electricity demand, companies that build a power plant should also make an additional investment to build the connection transmission line to the grid, which increases the overall investment cost.

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

This project follows the methodology described in the ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 09. Selected methodology has been applied together with the "tool to calculate the emission factor for an electricity system, version 01.1" and "tool for assessment and demonstration of additionality, version 5.2".

> The baseline scenario has been identified as "*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 in the "Tool to calculate the emission factor for an electricity system"*

Since Turkey is a developing country, there is an increasing demand for electricity which is fully expected to continue in the foreseeable future as shown in figure 5. Turkish electricity generation is mainly composed of thermal power plants. Distribution of installed power according to primary resources is given in figure 6 below.

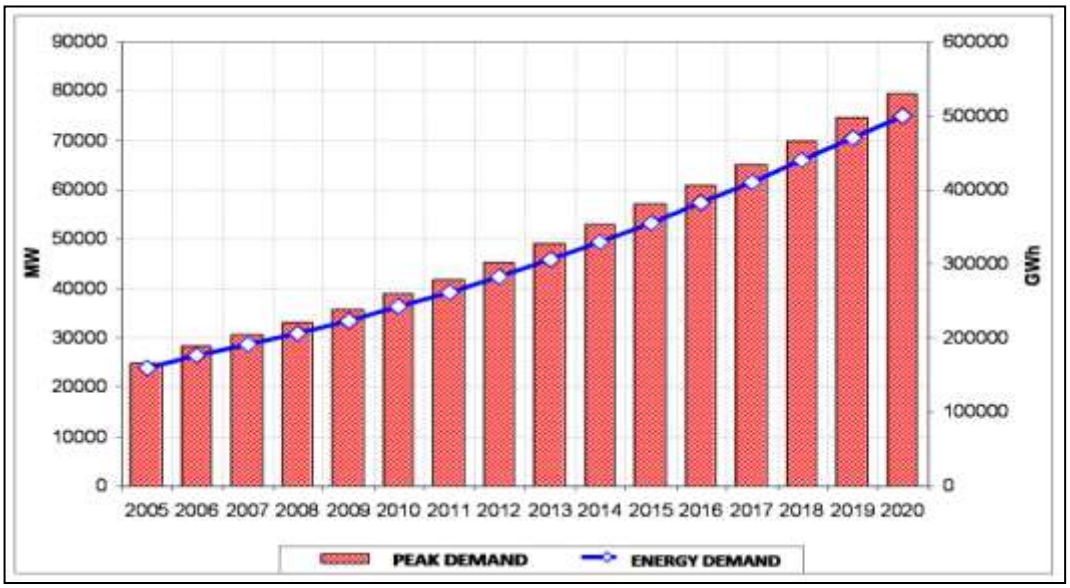


Figure 5. Peak load and consumption projection for Turkish electricity system between 2005-2020[6]

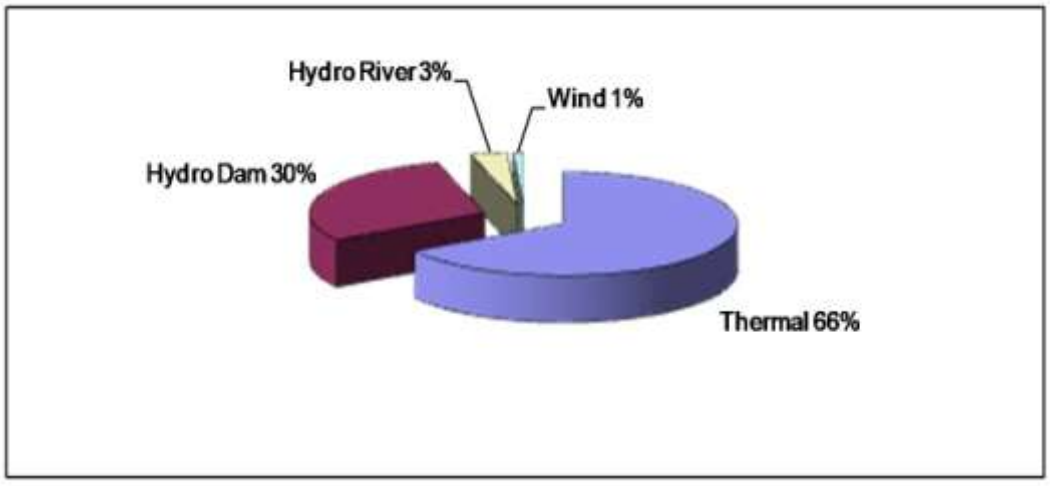


Figure 6. Distribution of installed capacity in Turkey according to primary resources[7]

Although Turkey has the second largest wind potential in Europe after U.K., since the legal framework is still not settled and due to the insufficiency of the grid, the wind potential could not be fully developed. The Renewable Energy Law enacted in 2005 was not sufficient to promote investment in the field. The

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

[7] http://www.teias.gov.tr/yukdagitim/kuruluguc.xls

total capacity of installed wind power projects by february of 2009 is 433 MW as given in Table 5 below. This capacity represents only 1% of Turkey's total installed capacity[8,9].
Considering the rapid increase in electricty demand and tendency to invest in higher capacity thermal power plants, it is apparent that in the absence of the proposed project activity, same amount of electricity is to be supplied via either the current power plants or newly built thermal power plants thus increasing GHG emissions.

Company	Location	Comm. Date	Installed Cap (MW)	Developed as*
Alize A.S.	Izmir-Cesme	1998	1.50	BOT
Gucbirligi A.S.	Izmir-Cesme	1998	7.20	BOT
Bores A.S.	Canakkale-Bozcaada	2000	10.20	BOT
Sunjut A.S.	Istanbul-Hadimkoy	2003	1,20	BOT
Yapisan A.S.	Balikesir-Bandirma	I/2006	30.00	VER
Erturk A.S.	Istanbul-Silivri	II/2006	0.85	BO
Mare A.S.	Izmir-Cesme	I/2007	39.20	VER
Deniz A.S.	Manisa-Akhisar	I/2007	10.80	VER
Anemon A.S.	Canakkale-Intepe	I/2007	30.40	VER
Dogal A.S.	Canakkale-Gelibolu	II/2007	14.90	VER
Deniz A.S.	Hatay-Samandag	I/2008	30.00	VER
Dogal A.S.	Manisa-Sayalar	I/2008	30.60	VER
Innores A.S.	Izmir-Aliaga	I/2008	42.50	VER
Lodos A.S.	Istanbul-Gaziosmanpasa	I/2008	24.00	VER
Erturk A.S.	Istanbul-Catalca	I/2008	60.00	VER
Baki A.S.	Balikesir-Samli	II/2008	90.00	VER
Dares A.S.	Mugla-Datca	II/2008	10.00	VER
CAPACITY UNDER OPERATION			**433.35**	

*BOT= Build Operate Transfer, BO= Build Operate, VER =Voluntary Emission Reduction

Table 6. Wind power plants in Turkey, February 2009 [10],[11]

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

[8] http://www.teias.gov.tr/ist2007/1.xls
[9] http://www.epdk.org.tr/lisans/elektrik/yururluk.htm

[10] Turkish Wind Energy Association, February 2009 Report

[11] https://gs1.apx.com

According to the applied methodology (ACM0002, ver.9) baseline scenario for the project has been defined as "generation of equal amount of electricity by the grid". Emission factor for the baseline scenario has been calculated according to the combined margin approach as defined by the selected methodology.
Within this framework, project is expected to generate about 51.32 GWh of electricity and reduce about 30,997tCO_2 through replacing the electricity that would otherwise be supplied via the TEIAS National grid in the absence of the project activity. Additionality of the proposed project has been assessed according to the applied tool for demonstration of additionality as shown in following steps.

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

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

Most realistic and reliable alternatives to the project activity are:

1. Proposed project not undertaken as a VER project activity
2. Continuation of the current situation-supply of equal amount of electricity in the grid
3. Construction of a thermal power plant with the same installed capacity or the same annual power output.

First alternative, which is the implementation of the project without VER income is not financially attractive as discussed in investment analysis section below. The Second alternative (Scenario 2) is the baseline scenario and implementation of the proposed project as a VER activity would be additional to this scenario. Last alternative is a significant alternative to the project activity since the share of thermal power plants have increased and is expected to increase in the future by nearly 100% from the current level of approximately 41,000 MW[12] to 79,000 MW by 2020[13].

Outcome of Step 1a
Continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore first and third alternatives are more likely to happen.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law[14]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy[15]
3. Energy Efficiency Law [16]

[12] http://www.teias.gov.tr/ist2007/13.xls

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

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

[15] Law number 5346, enactment date 18/05/2005

4. Forest Law[17]
5. Environment Law[18]

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

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

Step 2 - Investment analysis
The investment analysis has been done in order to make an economic and financial evaluation of the project. No public funding or ODA are available in Turkey for financing this type of projects. As the loan agreement has not been finalized yet, the project is financed by company's own resources.

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

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

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

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

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

According to the "Tool for the demonstration and assessment of additionality", a relevant benchmark for an equity IRR can be derived from government bond rates increased by a suitable risk premium (to reflect private investment and/or project type). For benchmark analysis of the project, Eurobond[19] rates from web page of a government bank[20] have been used as given in table 6 below.

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

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

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

19 Eurobonds are long-term coupon bonds that are issued internationally in foreign currency by corporations / institutions and/ or by governmental bodies.

20 http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/aspx/eurobond.aspx (

Eurobond Code	Due Date	Currency	Rate
US900123AX87	05.06.2020	USD	7.25
US900123AW05	05.02.2025	USD	7.54
US900123AL40	15.01.2030	USD	7.31
US900123AT75	14.02.2034	USD	7.73
US900123AY60	17.03.2036	USD	7.76

Table 7. Eurobond rates used for the benchmark analysis

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

Parameters	Unit	Data Value
Installed Capacity[21]	MW	15
Grid Connected output[22]	GWh	51.32
Capital Investment[23]	Million €	20,164,000
Income tax rate	%	20
Equity	Million €	20,164,000
Expected Tariff[24]	€ Cents/kWh	5.5
Expected VERs price	€/ tCO_2e	9

Table 7. Main financial parameters used for investment analysis

Internal Rate of Return (IRR) of the Ayyildiz Wind Power Plant has been calculated as 6.19 % based on the parameters given above without considering the carbon revenue and assuming that no bank loan is used. Project does not use any ODA or government incentive. Electricity tariff has been used as €5.5 Cent/kWh although this is the maximum amount and floor price is €5.0 Cents/kWh as given in renewable energy law. Annual generation has been taken as 51.32 GWh considering the feasibility study made for the project. Considering carbon revenue, IRR increases to 8.88% and becomes more feasible with the expectation that electricity tariff will increase due to increasing electricity demand of Turkey and project will benefit from increasing price at the market.

Acceptable IRR values for energy investments in Turkey are, given the present global financial crisis and economic uncertainty, are expected at yields in excess of 15% per annum. Even if we include the carbon revenue in the cash flow, equity IRR increases to 8.88 % (for €5.5 cents tariff) which slightly higher than the risk free bond rates. Considering that bond rates are also subject to corporate tax[25], even when we

[21] Generation License

[22] Micrositing Report

[23] Equipment&Subcontractor agreements

[24] Renewable Energy Law

[25] http://www.akportfoy.com.tr/vergi_rehberi/1ekimilkeler.pdf

exclude corporate tax in order to make a more accurate benchmark analysis, IRR increases to 7.01% in the absence of carbon revenue which is still much lower than market values.

Considering the Government bond rates are around 7.00% (after tax deduction) and estimated country risk premiums which are around 6.59% for Turkey[26], it, it can be concluded that expected return on investment for these types of projects should be higher than 13.59% considering that business, currency and project risks are not included. Expectation that the electricity prices will increase is the risk for investors whereas realization of this expectation will increase the premium. Carbon revenue has a significant affect in this respect in terms of decreasing the period for return on investment and risk of investment decision. Considering the rapidly increasing electricity demand of Turkey, electricity tariff should increase to € cents 8/kWh so that project investment becomes reasonable.

Sub-step 2d - Sensitivity Analysis

Sensitivity analysis has been carried out for three main parameters identified;

- Investment Cost
- Operating Cost
- Electricity Sales revenue

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

	% **Fluctuation**						
	-10	**-5**	**-2.5**	**0**	**+2.5**	**+5**	**+10**
Investment Cost	7.46	6.79	6.48	6.19	5.9	5.62	5.19
Operating Cost	6.75	6.47	6.33	6.19	6.04	5.9	5.60
Electricity Income	4.42	5.32	5.76	6.19	6.61	7.02	7.83

Table 8. Sensitivity analysis for Ayyildiz Wind Power Plant Project (without carbon revenue)

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the financial indicators of the project and make the project more attractive for investors. Considering that figures above are based on highest guaranteed price rather than average price, optimistic estimations for yearly generation and that those figures do not reflect the risk for investment, role of carbon income is a significant number to enable the project to proceed and favourable investment and funding decision taken. Based on the above information, it is seen that project is not the most attractive option. Therefore project is considered as additional to the baseline scenario.

Step 3. Barrier analysis

This step is used to determine whether the proposed project activity faces barriers that:

a) Prevent the implementation of this type of proposed project activity; and
b) Do not prevent the implementation of at least one of the alternatives.

[26] http://www.stern.nyu.edu/~adamodar/pdfiles/papers/ERP2009.pdf

The following sub-steps are followed:

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

Establish that there are barriers that would prevent the implementation of the type of proposed project activity from being carried out if the project activity was not registered as VER activity. Such barriers may include, among others:

Investment barriers

The lack of financial incentives is the primary barrier for renewable energy investments in Turkey. The carbon market provides an innovative mechanism enabling an environment to emerge for renewable electricity generation sources. The following barriers apply to renewable energy investments in Turkey:

- *Limited incentives for renewable energy:*

  The Renewable Energy Law permits trading in market prices above the € 5.5 cents/kWh maximum guarantee price. However, since a majority of power plants in Turkey are still owned by the state, EUAS have a dominant influence on the supply and the prices.

  The electricity generation by wind power plants depend on the consistency of wind speed. Therefore, these plants cannot produce, control and sell energy at competitive prices as defined at Electrical Market Financial Balancing Center (PMUM).[27]

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

The above presented barriers are largely specific to wind power projects. They have minimal impact on the alternatives that are included in the baseline scenario of ACM0002, the addition of new thermal power plant.

Wind power plants, once built, must be operated whatever the market price is whereas thermal power plants can be shut down depending on the market price.**Hata! Yer işareti tanımlanmamış.**

Outcome of Step 3:
Thermal power plants are more flexible in terms of operating the plant only in peak hours when the electricity price is high. Whereas the wind power plants do not have this flexibility. Including VER revenue alleviates the identified barriers through increasing the project income and decreasing the risk for return of investment, thus making the investment more reasonable and easier to get funds.

Step 4. Common Practice Analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity

[27] http://www.teias.gov.tr/ist2007/20(2006-2007).xls

According to the TEIAS statistics[28], share of Wind Power Projects in total installed capacity of Turkey is only 1%. Therefore we can conclude that the installation of wind power projects is not a common practice. This can also be observed from the historical data which shows the trend of the installed capacity of power plants in Turkey. Although the thermal plants have shown a rapid growth in parallel with the demand for electricity, increase in wind power projects have been much slower.

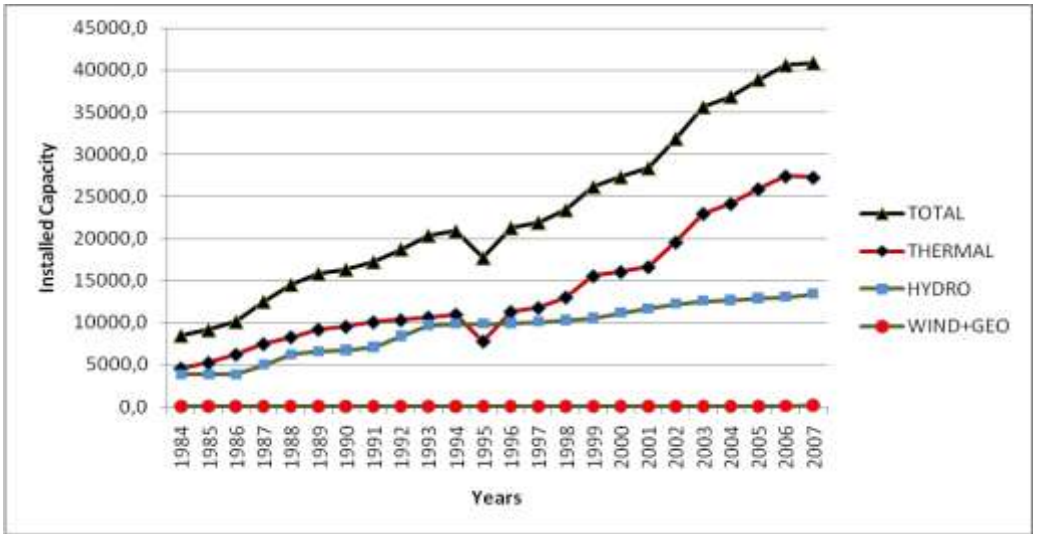


Figure 7. Annual development of Turkey's installed capacity

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

Currently there are 91 projects with licenses totalling 3,274 MW[29]. However, as illustrated in Table 5, there are only 17 wind power projects in operation totalling 433 MW. Except the first a few plants which have been built according to Build-Operate-Transfer system, all recent wind power plants are developed as VER projects.

Outcome of step 4:

Turkey has a economic potential of at least 20,000 MW for wind power plant establishment. However, by early 2009, the portion of the realized potential has just reached to 2% of total feasible potential. On the other, current total installed capacity of wind power plants only constitutes 1% of the Turkey's cumulative installed capacity. Although the share of wind power plants has shown high increase rates in recent years, since it starts from very low bases, the share in overall is still very low compared to thermal power plants. Therefore, the wind power plants are not considered as common practice in Turkey.

[28] http://www.teias.gov.tr/ist2007/1.xls

[29] http://www.epdk.org.tr/lisans/elektrik/yururluk.htm

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission factor has been calculated in a conservative manner as requested by the methodology. Basic assumptions made are;

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

The additionality assessment of the project activity has been demonstrated using the latest version of the 'Tool for assessment and demonstration of additionality'.

According the "Tool to calculate the emission factor for an electricity system", ver. 01.1, the following four methods are applicable to calculate the operating margin (OM):

a) Simple OM,
b) Simple adjusted OM,
c) Dispatch Data Analysis OM and
d) Average OM.

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

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net Electricity delivered to the grid by the Ayyildiz WPP in year y
Source of data used:	Feasibility Report for Ayyildiz WPP
Value applied:	51.3 GWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for emission reduction calculation.
Any comment:	

Data / Parameter:	**$EG_{y, Total}$**
Data unit:	MWh
Description:	Gross Electricity delivered to the grid by power plants in Turkey in year 2007
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/13.xls)
Value applied:	191,558 GWh
Justification of the choice of data or description of measurement methods	Data used for emission reduction calculation (for calculation of OM, Net-to-Gross electricity ratio and share of low-cost must-run sources)

and procedures actually applied :	
Any comment:	

Data / Parameter:	**$EF_{CO2, i, y i}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of fossil fuel type "i" in year "y"
Source of data used:	-For EF of fossil fuels, IPCC values at the lower limit has been used.
Value applied:	**Fuel Source** / **EF(tCO2/Tj)** Coal 89.5 Lignite 90.9 Fuel Oil 75.5 Diesel 72.6 LPG 61.6 Naphta 69.3 Natural Gas 54.3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, IPCC default values at lower limit of 95% confidence interval can be used. Although, the actual emission reduction is expected to be higher due to high EF of fuels consumed in existing power plants, IPCC values have been used for conservativeness as requested by the methodology.
Any comment:	

Data / Parameter:	**$FC_{i, y}$**
Data unit:	Tons or 1000 m^3 for gases
Description:	Amount of fuels consumed by thermal power plants for electricity generation in terms of fossil fuel type i in year y
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/43.xls)
Value applied:	See table 14
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM calculation
Any comment:	

Data / Parameter:	**GE**
Data unit:	%

Description:	Generation efficiency of thermal power plants
Source of data used:	Annex I- Tool to calculate the emission factor for an electricity system
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for BM calculation
Any comment:	

Data / Parameter:	**NCV**
Data unit:	Tj/kt
Description:	Net Calorific Values of Fuel combusted in power plants.
Source of data used:	TEIAS web page (http://www.teias.gov.tr/ist2007/45.xls)
Value applied:	See table 13
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for OM and BM calculation
Any comment:	

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

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

Step 1. Identification of the relevant electrical power system

According to the ‘‘Tool to calculate the emission factor for an electricity system’’, Version 01, a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity, and that can be dispatched without significant transmission constraints. Therefore, in this project activity the project electricity system includes the project site and all power plants attached to the Interconnected Turkish National Grid, which has an installed capacity of 40,835.7MW and gross generation about 191,558.1 by 2007[30,31].

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

Step 2. Select an operating margin method

[30] http://www.teias.gov.tr/ist2007/1.xls

[31] http://www.teias.gov.tr/ist2007/13.xls

Since the fuel consumption data is not available for each power plant, method (d) is eliminated. Also due to insufficient data, methods (b) and (c) are not considered and thus (a) simple OM method is used in calculations. The following table is used for demonstrating the share of low cost/must run resources.

		2007	2006	2005	2004	2003	Average
Total Generation	**[GWh]**	191,558	176,300	161,956	150,698	140,581	164,219
Low-cost / must run	**[GWh]**	36,362	44,465	39,714	46,235	35,480	40,451
Low-cost / must run	**[%]**	19	25	25	31	25	25

Table 8. Breakdown by source of electricity generation for the five most recent years[32]

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

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

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

For this project the *ex-ante* approach is selected. Data for calculating the three year average is obtained from the period 2005 – 2007, the most recent data available at the time of PDD submission to the DOE.

Step 3. Calculating the operating margin emission factor according to the selected method.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must run plants / units. It may be calculated:

- Based on fuel consumption and net electricity generation data of each power plant / unit (Option A), or
- Based on net electricity generation data, the average efficiency of each power unit, and the fuel type(s) used in each power unit (Option B), or
- Based on total net electricity generation data of all power plants serving the system, fuel types, and total fuel consumption of the project electricity system (Option C)

[32] http://www.teias.gov.tr/ist2007/13.xls

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

(1)

where:

$EF_{grid, OM, y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/GWh)
$FC_{i, y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i, y}$	Net calorific value (energy content) of fossil fuel type *i* in year y (GJ / mass or volume unit)
$EF_{CO2, i,}$	CO_2 emission factor of fossil fuel type *i* in year y (tCO_2/GJ)
EGy	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must run power plants / units, in year y (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year y
y	Either the 3 most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

For the calculation of the Simple OM, the amount of fuel consumption ($FC_{i, y}$) and heating values of fuels are taken from website of TEIAS[33,34,35,36], the official source of related data. Fuel consumption values for the relevant years are in table below.

	$FC_{i,y}$ unit [Ton, except for Natural Gas (NG) (1000 m^3)]			
Fuel Type	**2007**	**2006**	**2005**	**Total**
Hard Coal	6,029,143	5,617,863	5,259,058	16,906,064
Lignite	61,223,821	50,583,810	48,319,143	160,126,774

33 http://www.teias.gov.tr/ist2007/42.xls

34 http://www.teias.gov.tr/ist2007/43.xls

35 http://www.teias.gov.tr/ist2007/44.xls

36 http://www.teias.gov.tr/ist2007/45.xls

Fuel Oil	2,250,686	1,746,370	2,005,899	6,002,955
Diesel Oil	50,233	61,501	28,442	140,176
LPG	0	33	12,908	12,941
Naphtha	11,441	13,453	84,481	109,375
Natural Gas	20,457,793	17,034,548	15,756,764	53,249,105

Table 9. Fuel Consumption in thermal power plants

The NCV of the fuels consumed have been calculated using data from the TEIAS web page. The emission factors required for calculation of CO_2 emission coefficient have been obtained through IPCC 2006 guidelines for GHG inventories for fuels. Details of the data used for the calculations are given in Annex 3.

	COEF (tCO_2/kt)	**Consumption (2005 - 2007)** (tons or $1000m^3$)	**Total Emission (2005 - 2007) (tCO_2)**
Coal	1,954	16,906,064	33,032,943
Lignite	601	160,126,774	96,197,334
Fuel Oil	3,026	6,002,955	18,165,198
Diesel Oil	3,112	140,176	436,185
LPG	2,830	12,941	36,623
Naphtha	3,061	109,375	334,828
Natural Gas	2,003	53,249,105	106,643,758
Total Emissions			**254,846,869**

Table 10. Calculation of emission factors for fuels

Net electricity generated and supplied to the grid by thermal plants has been calculated using data obtained from the TEIAS web page[37,38,39,40]. The ratio between gross and net generation has been calculated first, and assuming that the same ratio is valid for thermal plants; gross generation by thermal power plants has been multiplied by this ratio in order to find net generation by thermal plants. The calculation of $EF_{grid,OM,\ y}$ requires the inclusion of electricity imports with an emission factor of 0 tCO_2/GWh. By including the imports in the electricity production this requirement is fulfilled. Summing up this with the imported electricity, total supply excluding low cost / must run sources are determined as given in table below.

37 http://www.teias.gov.tr/ist2007/35(2001-2005).xls

38 http://www.teias.gov.tr/istatistik2007/36(06-07).xls

39 http://www.teias.gov.tr/ist2007/35(2001-2005).xls

40 http://www.teias.gov.tr/istatistik2007/35.xls

Year	Gross Generation	Net Generation	Net/Gross	Gross Gen. Thermal	Net Gen Thermal	Import	Total Supply to the grid
2005	161,956	155,469	0.960	122,242	117,346	636	117,982
2006	176,299	169,543	0.962	131,835	126,783	573	127,356
2007	191,558	183,340	0.957	155,195	148,537	864	149,401
			Total Net Thermal Gen.		**392,665**	**2,073**	**394,739**

Table 11. Gross/Net electricity generation by Turkish Grid

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

$\mathbf{EF}_{grid, OM, y}$ = 254,846,869 tCO_2 / 394,739 GWh
= 646 tCO_2/GWh.

Step 4. Identifying the cohort of the power units to be included in the build margin.

The sample group of power units (m) used to calculate the build margin consists of whichever is larger of:

a) The set of five power units that have been built most recently, and
b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[41].

Option (b) has been chosen to identify this cohort of power units to be included in the build margin, since it is larger (in terms of power generation) than the result of (a).

The list of the most recent capacity additions to the grid and their average and actual generation capacities are available at the TEIAS web page [42,43,44,45,46][47]. For determination of plants that comprise 20% of the system's generation, gross generation in year 2007 which is 191,558.1 GWh has been taken as reference and its 20% has been determined as about 38,311.6 GWh. Since 20% of the most recent year's generation (38,311.6 GWh) falls partly on capacity of a power plant, this plant was fully included in the calculations as requested by the methodological tool applied. Thus, total capacity included in BM calculation has increased to 41,056 GWh which reduces again to 40,519.3 GWh after excluding plants benefitting from VER revenue.

Step 5. Calculate the build margin emission factor

41 If 20% falls on part capacity of a unit, that unit is fully included in the calculation

42 http://www.teias.gov.tr/istat2004/7.xls
43 http://www.teias.gov.tr/istatistik2005/7.xls
44 http://www.teias.gov.tr/ist2006/8.xls
45 http://www.teias.gov.tr/ist2007/8.xls

46 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf

47 http://www.teias.gov.tr/projeksiyon/CAPACITY%20PROJECTION%202008-2017.pdf

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

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

Where:

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

"Tool to Calculate the Emission Factor for an Electricity System" has been used for plant efficiency data although this approach is very conservative. Since tool does not contain any specific data for plants with LPG, Naphta etc. all of the plants consuming liquid fuels have been considered as open cycle plants. Plants using lignite and coal have been assumed as suing subcritical technology, whereas natural gas plants have been assumed as combined cycle plants. The assumptions have been based on TEIAS statistics which gives heating values of fuels consumed in thermal power plants[48,49] and corresponding electricity generation[50, 51] which shows that values used are very conservative compared to actual situation.

Plant efficiency data has For EF values of fuels consumed, IPCC values at lower limit of 95% confidence interval has been used as requested by applied methodology.

	EF CO_2 (tCO2/Tj)	**Generation Efficiency**	**EF (tCO_2/MWh)**
Coal	89.5	39.0%	0.826
Lignite	90.9	39.0%	0.839
Fuel Oil	75.5	39.5%	0.688
Diesel	72.6	39.5%	0.662
LPG	61.6	39.5%	0.561
Naphtha	69.3	39.5%	0.632
Natural Gas	54.3	60.0%	0.326

Table 12. Calculation of emission factor from most recent power plants

[48] http://www.teias.gov.tr/ist2007/45.xls

[49] http://www.teias.gov.tr/ist2007/45.xls

[50] http://www.teias.gov.tr/ist2007/36(06-07).xls

[51] http://www.teias.gov.tr/ist2007/35(2001-2005).xls

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

Fuel Source	Generation (MWh)	Percent Generation	EF	Weighted EF
Coal	1,463	3.6%	0.826	0.03
Lignite	11,482	28.0%	0.839	0.23
Fuel Oil	675	1.6%	0.688	0.01
Diesel oil	2	0.0%	0.662	0.00
LPG	50	0.1%	0.561	0.00
Naphtha	323	0.8%	0.632	0.00
Natural Gas	23,974	58.4%	0.326	0.19
Renewable and wastes	85	0.2%	0.000	0.00
Solid	5	0.0%	0.000	0.00
Total Renewable	2,999	7.3%	0.000	0.00
TOTAL Capacity additions	41,056.3	100.0%		

Table 13. Most recent capacity additions corresponding to 20% by fuel source

From the list of the plants included in BM calculation, those built using VER revenue has been excluded as per the tool.

PROJECT	TYPE	INSTALLED CAPACITY (MW)	GENERATION CAPACITY (GWh)	STANDARD
ANEMON	WPP	30.4	92	GS
BARES	WPP	30.0	105	VER+
DOGAL ENERJI(BURGAZ)	WPP	14.9	48	GS
KARAKURT	WPP	10.8	28	GS
MARE MANASTIR	WPP	39.2	129	GS
KARGILIK	HEPP	23.9	83	VCS
KALEALTI	HEPP	15.0	52	VCS
Total		**164,2**	**537**	

Table 14. List of plants identified as VER projects

Source: http://www.markitenvironmental.com and http://cdmgoldstandard.org

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

$\mathbf{EF}_{\text{grid, BM, y}}$ = 19,350 tCO_2 / (41,056.3-537) GWh
= 478 tCO_2/GWh.

STEP 6 - Calculate the combined margin emission factor

Based on ACM0002, weighted average baseline emission factor is calculated as follows;

$$\mathbf{EF}_{\text{grid, CM, y}} = \mathbf{w}_{\text{OM}} * \mathbf{EF}_{\text{grid, OM, y}} + \mathbf{w}_{\text{BM}} * \mathbf{EF}_{\text{grid, BM, y}} \quad \textbf{(3)}$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh) as calculated from equation (12) above.
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh) as calculated from equation (1) above.
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

The default values of the weights, w_{OM} and $w_{BM,}$ as recommended by the selected methodology are 0.75 and 0.25, respectively. These default values have been used in calculating CM emission factor together without rounding the values of EF_{OM} and EF_{BM}.

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

$\mathbf{EF}_{\text{grid, CM, y}}$ = 0.75 *646 + 0.25 * 478 = **604**

The combined margin emission factor is therefore **604 tCO_2/GWh.** Emission factor will remain same during the first crediting period as recommended by the methodology ACM0002, version 9.

B.6.3 Ex-ante calculation of emission reductions:

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

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

Where:
ERy = Emission reductions in year *y* (tCO_2)
BEy = Baseline emissions in year *y* (tCO_2)

PEy = Project Emissions in year *y* (tCO_2)
LEy = Leakage emissions in year *y* (tCO_2)

Baseline emissions
Baseline emission is calculated according to the formula

$$BE_y = EG_y \times EF_y$$

Where:
EGy = Net electricity delivered to the grid by the project activity in year y excluding transmission losses of the grid.
EFy = Emission factor calculated according to selected methodology

Project emissions

The proposed project activity involves the generation of electricity by a wind power plant therefore project activity does not result in greenhouse gas emissions.The only emission source in the plant is the diesel generator which is used as auxiliary power source when there is no electricity generation in the plant or supply by the grid. According to the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" CO_2 emissions from fossil fuel combustion for process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PEFC,j,y = \sum FCi,j,y \times COEFi,y$$

Where:
$PEFC,j,y$ = Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr);
FCi,j,y = Is the quantity of fuel type i combusted in process j during the year y (mass /volume)
$COEFi,y$ = Is the CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
i = Are the fuel types combusted in process j during the year y

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

$$LE_y = 0$$

As a result: Total Emission Reduction is;

$$ERy = BE\ y - COEFi,y$$

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

Years	Annual estimation of emission reductions in tonnes of CO_2 e
2009 (01/09/2009 – 31/12/2009)	10,332

2010	30,997
2011	30,997
2012	30,997
2013	30,997
2014	30,997
2015	30,997
2016 (01/01/2016 – 30/08/2016)	20,665
Total emission reductions (Tonnes of CO_2 e)	**216,981**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	30,997

Table 15. Estimated emission reduction by the proposed project

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

Monitoring plan has been applied according to the selected methodology(ACM0002). According to the applied methodology, all data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data will be monitored if not indicated otherwise in the tables below. All measurements will be conducted with calibrated measurement equipment according to relevant standards.

B.7.1. Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net Electricity generated and delivered to the grid by the Ayyildiz Wind Power Plant in year y
Source of data to be used:	Metering devices used in power plants, monthly records signed by TEIAS and plants manager and invoices will be used.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimated annual generation forming the basis for emission reduction calculation is 51.32 GWh
Description of measurement methods and procedures to be applied:	Generation data will be recorded by two metering devices continuously. These records will provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the plant manager/electricity technician of the plant will record the reading and sign. This record will form the basis for monthly invoicing.
QA/QC procedures to	Maintenance and calibration of the metering devices will be made by TEIAS

be applied:	periodically. In case of significant different between two devices, maintenance will be done before waiting for periodical maintenance according to regulations of TEIAS.
Any comment:	

Data / Parameter:	**$FC_{i,j,y}$**
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type i combusted in Diesel power generator during the year y
Source of data to be used:	Onsite measurements from equipment working hours. Data can be checked from invoices provided by the plant operator for fuel purchase
Measurement Procedure	Gauges and reading devices on diesel generator
Monitoring Frequency	Continuously
QA/QC procedures to be applied:	Data recorded by the equipment will be cross-checked by the fuel invoices
Any comment:	-

B.7.2. Description of the monitoring plan:

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

In order to demonstrate the emission reduction, only the required data is the net electricity delivered to the grid by the project activity and internal combustion for the auxiliary diesel generator. Data for the carbon content of the diesel fuel will be calculated from TEIAS web page.

Net electricity generation will be measured and recorded by both TEIAS and project owners for billing purposes therefore no new additional protocol will be needed monitoring emission reduction. Power Plant Manager, will be responsible for the electricity generated, gathering all relevant data and keeping the records. He will be informed about VER concepts and mechanisms and how to monitor and collect the data which will be used for emission reduction calculations.

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

The monitoring system organization chart is shown in Figure below, in which the authority and responsibility of project management are defined.

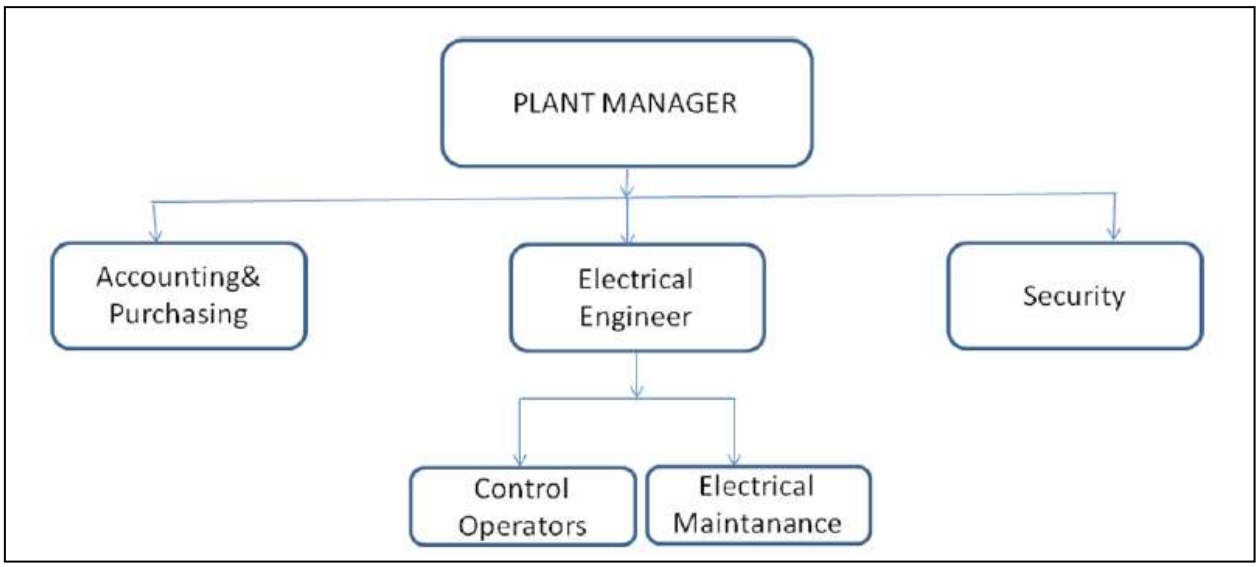
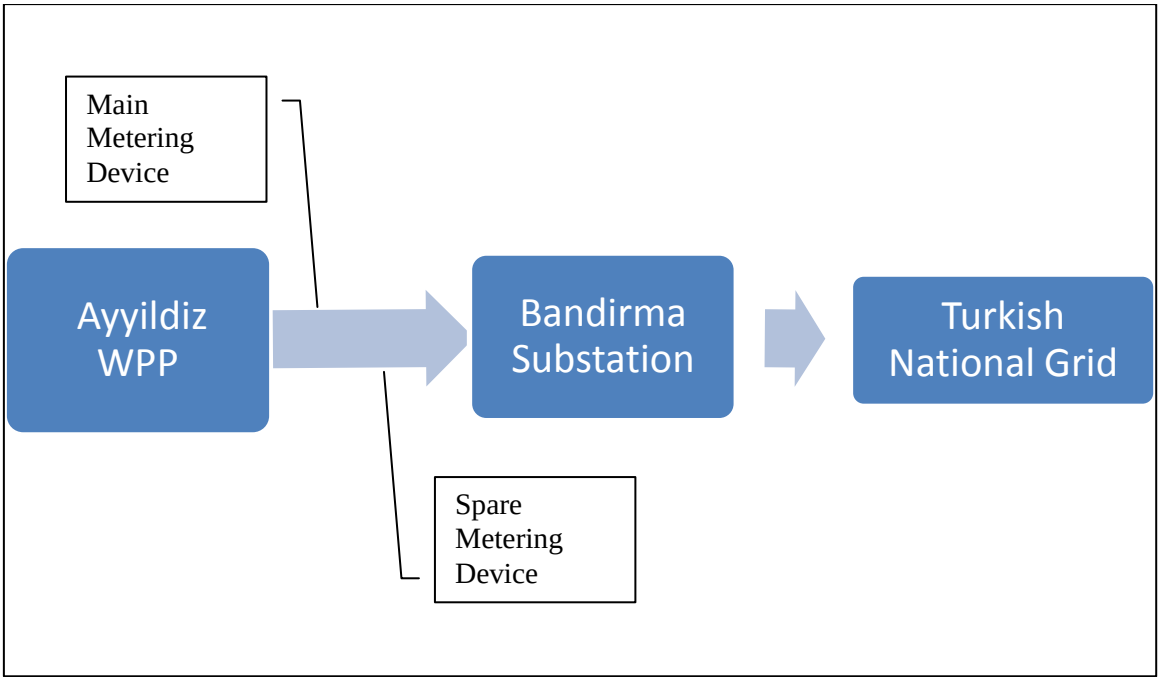


Figure 8. Operational structure of Ayyildiz WPP

VER Team Members is expected to include;

Plant Manager: Overall responsibility of compliance with VER monitoring plan
Electrical Engineer: Responsible for day to day running of plant, recording and monitoring of relevant data and periodic reporting
Accounting Manager: Responsible for keeping data about power sales, invoicing and purchasing.
Global Tan Energy: Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

Installation of meter and data monitoring will be carried out according to the regulations by TEIAS. Two metering devices (one of them used as spare) will be used for monitoring the electricity generated by the power plant. Readings will be done using main metering devices and spare metering device will be used for comparison only. Data from metering devices will be recorded by TEIAS monthly and form the basis for invoicing. In addition to the two metering devices, generation of the Ayyildiz WPP can be cross checked from TEIAS – PMUM web site(http://pmum.teias.gov.tr) which is accessible using a password provided to electricity generation companies. Since the data in PMUM web page will show the net electricity generated less transmission loss, in order to match the data, the figures taken from PMUM web site must be multiplied by transmission loss factor of the grid.



The net electricity fed to the grid will be measured continuously and recorded monthly by the TEIAS and plant staff. For consistency, recorded data will be compared with electricity sale receipts.

Calibration of the metering devices will be made by TEIAS and sealed during first operation of the plant. The meters will be calibrated by TEIAS when there exist an inconsistency between two device.

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

Baseline Study and monitoring methodology completed in 05/06/2009
M.Kemal Demirkol
Global Tan Energy Limited
http://www.gte.uk.com
Telephone: +90 232 465 21 87
Fax: +90 232 465 21 29
E-mail: kemal@gte.uk.com

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

Project implementation date is selected as 05/09/2008 which is the date for turbine purchase agreement. Construction of the project has started on 01/03/2009. Project is expected to be commissioned by 01/09/2009.

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

The expected operational lifetime of the equipments is estimated as at least 20 years according to the documents supplied by the manufacturer.

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

Renewable crediting period is chosen for the project activity.

C.2.1. Renewable crediting period:

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

The crediting period is expected to start in 01/09/2009.

C.2.1.2. Length of the first crediting period:

First crediting period will be valid for 7 years. Crediting period will be renewed 2x7 years.

SECTION D. Environmental impacts

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

EIA assessment for Ayyildiz Wind Power Plant Project has been performed by PRD Planlama, Arastirma, and Gelistirme ve Danismanlik Sti. as defined by the regulations. The report has been approved by Ministry of Environment and Forestry (MoEF) on 18/09/2007.

This report prepared for the project covers all aspects of the project including capacity, interaction with other plants in the vicinity, natural resources used, waste management, social and economical impacts, technology and materials used, current land use in the region, any historical or protected site within the project boundaries, geological assessment of the project site and any communities affected with the project.

There exists no settlement or agricultural activity in the project site. Project site is currently used as grassland for grazing activities by the local community. Grassland area has been expropriated partially for the project however; however it is still available to the local community for grazing activities. Since the 5 turbines and the power house which will be built for electricity generation occupies about 1,000 m^2 land, it will not affect any grazing activity in the region. On the contrary, since the project is allocated for WPP, it will prevent establishment of any other activity like stone mining in the project site and thus help protecting grassland characteristic of the project site.

The report has been evaluated by relevant local government agencies and Ministry of Environment and Forestry (MoEF). After evaluation of the project and comments of local agencies, Ministry of Environment and Forestry has concluded that the project does not have significant environmental effects and approved the "EIA Exemption Letter".

As a electricity generation from renewable resources project, in addition to contributions to local community and sustainable development in the region, project will also contribute to environment and

economic growth internationally since it will provide greenhouse gas emission reduction and create income for many people working in manufacturing of the turbines and validation process of the project.

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

No negative impact of the project activities has been identified. Land use, grazing or agricultural activities will not be affected negatively by the project activity. All necessary permissions including, environmental, health and safety, have been acquired from relevant agencies and all precautions have been applied strictly by Akenerji Elektrik Uretim AS.

Although the project is not on bird migration routes, impact of project on birds will be assessed after operation to ensure that project has no impact on local birds also.

SECTION E. Stakeholders' comments

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

Local Stakeholder meeting of the project was held on September 19th, 2008 in Edincik Municipality Hall, in Bandirma, Balikesir. Stakeholders were invited through invitation letters sent by mail, newspaper announcements and thorough village heads.

Ministry of Environment and Forestry and Ministry of Energy and Natural Resources have been invited as representatives of National Government. In addition to local and national authorities, local, national and international NGOs have been invited and informed about the meeting by mail.

DUYURU

GÖNÜLLÜ ANLAŞMALAR ÇERÇEVESİNDE KARBON TİCARETİ SERTİFİKALANDIRILMASINA YÖNELİK OLARAK, AKENERJİ ELEKTRİK ÜRETİM A.Ş. TARAFINDAN YÜRÜTÜLEN AYYILDIZ RÜZGAR SANTRALİNE İLİŞKİN PAYDAŞLAR TOPLANTISI 19 EYLÜL 2008 TARİHİNDE GERÇEKLEŞTİRİLECEKTİR.
TOPLANTIYA İLİŞKİN DETAYLAR VE TOPLANTI PROGRAMI AŞAĞIDA BİLGİLERİNİZE SUNULMUŞTUR. İLGİLİ KİŞİLERİN TOPLANTIMIZA KATILMALARI BİZLERİ MEMNUN EDECEKTİR.

Paydaşlar Toplantısı:
Tarih :19.09.2008 Cuma
Yer :Edincik Belediye Binası Toplantı Salonu
Cemil Kaya Meydanı Edincik - BANDIRMA

Toplantı Programı:
14:30 - 14:50 Açılış ve Tanıtım (Başkan: Yusuf Günay)
14:50 - 15:10 Proje Tanıtımı (Akenerji: Kemal Atilla)
15:10 - 15:40 İklim Değişikliği, Karbon Ticareti ve Proje (GTE)
15:40 - 16:10 Forum (DSI – ETKB – ÇvOB – AKENERJİ – GTE)
16:10 - 16:30 ÇEVRESEL VE SOSYAL DEĞERLENDİRME LİSTESİ (GTE)

KONUYLA İLGİLİ BİLGİ ALMAK VE KATILIM İÇİN: skm@gte.uk.com ADRESİNE E-POSTA GÖNDEREBİLİR VEYA 0(232) 465 21 87 No'lu TELEFONU ARAYABİLİRSİNİZ.

Figure 6. Newspaper announcement dated on 16th of September for first SC meeting of Ayyildiz WPP

Ayyildiz WP's Local Stakeholder Meeting was held on 19th of September, 2008 in Edincik at Municipality Hall. The meeting has been held between 14:00 and 16:00 and some 70 minutes dedicated to the presentation. Content of the meeting: presentation about the project, climate change and carbon markets.
After opening speech, Mr. Ahmet HATIPOGLU, Project Manager of Ayyildiz WPP introduced the project and gave detailed info. Later, Ms. Sevilay TOPCU, Carbon Trade Project Coordinator of GTE, made a presentation related to climate change, carbon trade and contribution of the project to environment and sustainable development. At the end of presentations, participants' questions have been replied by Mr. Ahmet HATIPOGLU, Ms. Sevilay TOPCU and Mr. Kemal ATILLA, Projects Coordinator of Akenerji and Mr. Brian P de Thorpe Millard from GTE.

Figure 7. Stakeholder Meeting / Presentation by Ahmet HATIPOGLU

Local Stakeholder consultation meeting has been recorded on video and minutes have been noted. Comments have also been requested from government agencies and invitees by letters sent by mail.

E.2. Summary of the comments received:

The comments from stakeholder have been positive in general. Details of the questions and comments raised during the meeting will be submitted together with the PDD during validation. The main concern was related to the located grassland project. Other main issue was about icing of blades which has been replied during the meeting also.

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

AKENERJI ELEKTRIK URETIM AS. has taken into account all comments and in general replied positively to the concerns and comments by the participants. Project owner has declared the intention for use of the project site as a grassland for grazing activities. Since the project activity involves 5 turbines and a power house, it will not cause a significant loss in the overall grassland area. Since the location of turbines were mainly rocky part of the grassland, after completion of the construction, this site will be covered with excavated soil thus the effect of the project in grassland will be negligible. About icing of the blades in winter times and harming the animals during grazing, it has been stated by the project

owners considering the average temperatures of the project site, that there has never been a case where such an event has happened. Also, since in very cold weathers there won't be any grazing activity in the outdoor and animals will be kept in sheds in winter times.

Figure 9. Picture from Ayyildiz WPP construction site

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AKENERJI ELEKTRIK URETIM AS.
Street/P.O.Box:	Miralay Sefik
Building:	15
City:	Taksim
State/Region:	Istanbul
Postcode/ZIP:	
Country:	Turkey
Telephone:	(0090) 212 249 82 82
FAX:	(0090) 212 249 73 55
E-Mail:	info@akenerji.com.tr
URL:	http://www.akenerji.com.tr
Represented by:	
Title:	Project Manager
Salutation:	Mrs.
Last name:	Palabıyık
Middle name	-
First name:	Özlem
Department:	Strategic Planning&Business Development
Personal e-mail:	opalabiyik@akenerji.com.tr

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

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING WAS USED FOR FINANCING THE PROJECT ACTIVITIES.

Annex 3
BASELINE INFORMATION

Data Used in calculation of OM for Turkish Electricity Grid

	NCV (Tj/kt) (1000m^3 for gas)	EF (tCO_2/Tj)	COEF(tCO2/kt)
Coal	21.83	89.5	1,954
Lignite	6.61	90.9	601
Fuel Oil	40.08	75.5	3,026
Diesel Oil	42.86	72.6	3,112
LPG	45.94	61.6	2,830
Naphtha	44.17	69.3	3,061
Natural Gas	36.88	54.3	2,003

Table 16. Values used in calculation of OM [52]

	2005	2006	2007	Total Fuel Consumption 2005-2007	Total Emission 2005-2007
Hard Coal	5,259,058	5,617,863	6,029,143	16,906,064	34,915,268
Lignite	48,319,143	50,583,810	61,223,821	160,126,774	96,197,334
Fuel Oil	2,005,899	1,746,370	2,250,686	6,002,955	18,165,198
Diesel Oil	28,442	61,501	50,233	140,176	436,185
LPG	12,908	33	0	12,941	36,623
Naphtha	84,481	13,453	11,441	109,375	334,828
Natural Gas	15,756,764	17,034,548	20,457,793	53,249,105	106,643,758

Table 17. Amount of fuels used for electricity generation[53,54,]

Year	Gross Generation	Net Generation	Net/Gross	Gross.Gen. Thermal	Net.Gen Thermal	Import	Total
2005	161,956.2	155,469.1	0.960	122,242.3	117,345.9	636	117,982
2006	176,299.8	169,543.1	0.962	131,835.1	126,782.5	573	127,356
2007	191,558.1	183,339.7	0.957	155,195.2	147,274.7	864.3	148,139
Total Net Thermal Gen.					**392,665**	**2,073**	**393,476.5**

[52] 2007 Turkey National GHG Inventory, http://unfccc.int/national_reports/annex_i_ghg_inventories/items/2715.php

[53] http://www.teias.gov.tr/istatistik2005/46.xls

[54] http://www.teias.gov.tr/ist2007/43.xls

Table 18. Net Electricity supply to the grid by thermal plants and imports (GWh)[55]

Data Used in calculation of BM for Turkish Electricity Grid

	NCV	EF $_{CO2}$	Generation Efficiency	EF
	(Tj/kt or m^3 for gas)	(tCO_2/Tj)	%	(tCO_2/MWh)
Coal	21.83	89.5	39.0%	0.826
Lignite	6.61	90.9	39.0%	0.839
Fuel Oil	40.08	75.5	39.5%	0.688
Diesel	42.86	72.6	39.5%	0.662
LPG	45.94	61.6	39.5%	0.561
Naphtha	44.17	69.3	39.5%	0.632
Natural Gas	36.88	54.3	60.0%	0.326

Table 19. Net calorific values, generation efficiency and emission factor data used in calculations

Fuel Source	**Electricity Generated** (MWh)	**EF**	**Share in total generation**
Coal	1,463	0.826	3.6%
Lignite	11,482	0.839	28.0%
Fuel Oil	675	0.688	1.6%
Diesel oil	2	0.662	0.0%
LPG	50	0.561	0.1%
Naphtha	323	0.632	0.8%
Natural Gas	23,974	0.326	58.4%
Renewable and wastes	85	0.826	0.2%
Solid	5	0.839	0.0%
Total Renewable	2,999	0.688	7.3%
TURKEY'S TOTAL	41,056.3		100.0%

Table 20. Most recent capacity additions corresponding to 20%.[56,57,58,59]

55 http://www.teias.gov.tr/ist2007/49.xls

56 http://www.teias.gov.tr/istat2004/7.xls

57 http://www.teias.gov.tr/istatistik2005/7.xls

58 http://www.teias.gov.tr/ist2006/8.xls

59 http://www.teias.gov.tr/ist2007/8.xls

Annex 4

MONITORING INFORMATION

Information about monitoring plan is given in section B.7.2.

[37] http://www.teias.gov.tr/istat2004/7.xls

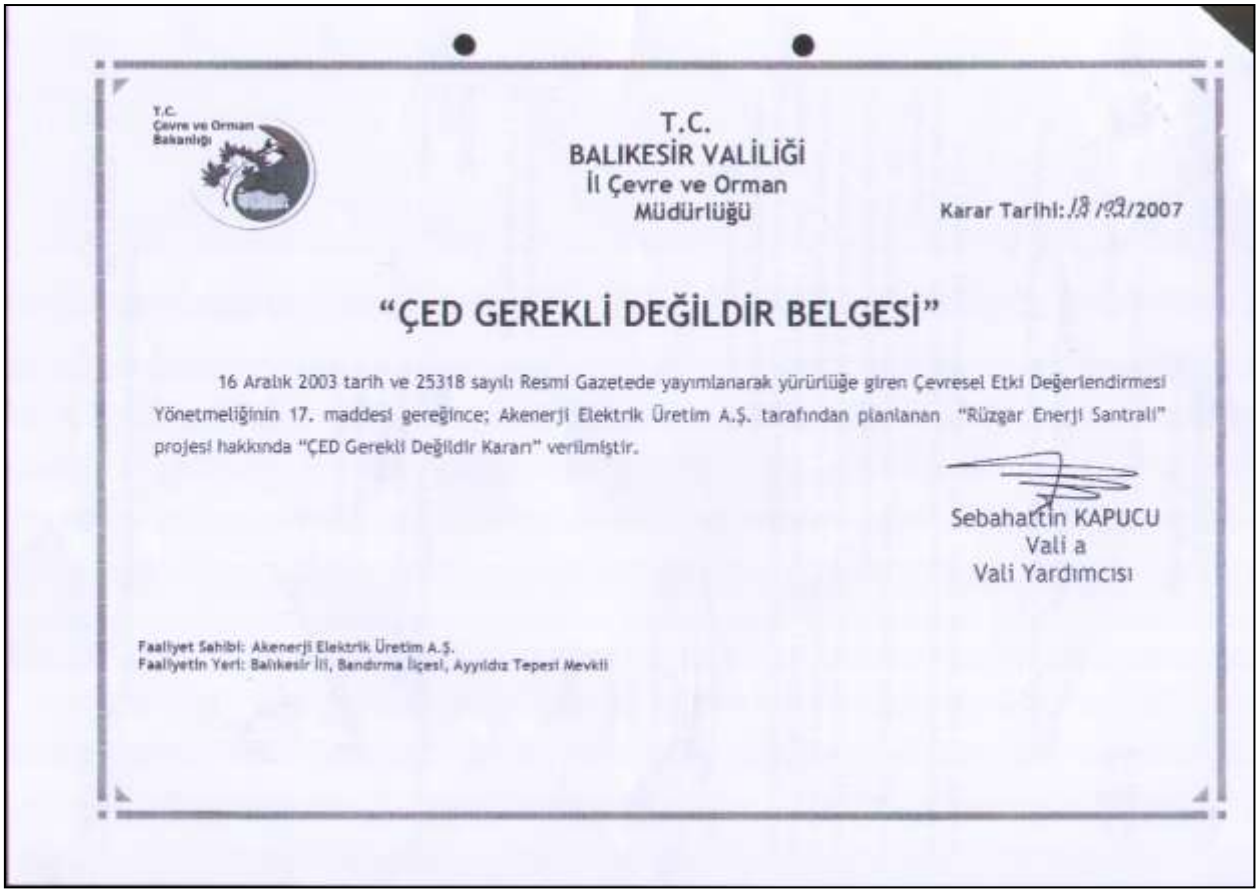
[38] http://www.teias.gov.tr/istatistik2005/7.xls

[39] http://www.teias.gov.tr/ist2006/8.xls

[40] http://www.teias.gov.tr/ist2007/8.xls

Annex 5

EIA EXEMPTION LETTER



T.C.
Çevre ve Orman Bakanlığı

T.C.
BALIKESİR VALİLİĞİ
İl Çevre ve Orman
Müdürlüğü

Karar Tarihi: 18/09/2007

"ÇED GEREKLİ DEĞİLDİR BELGESİ"

16 Aralık 2003 tarih ve 25318 sayılı Resmi Gazetede yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliğinin 17. maddesi gereğince; Akenerji Elektrik Üretim A.Ş. tarafından planlanan "Rüzgar Enerji Santrali" projesi hakkında "ÇED Gerekli Değildir Kararı" verilmiştir.

Sebahattin KAPUCU
Vali a
Vali Yardımcısı

Faaliyet Sahibi: Akenerji Elektrik Üretim A.Ş.
Faaliyetin Yeri: Balıkesir İli, Bandırma İlçesi, Ayyıldız Tepesi Mevkii

Annex 6

GENERATION LICENSE

T.C.
ENERJİ PİYASASI DÜZENLEME KURUMU

EPDK

ÜRETİM LİSANSI

Bu Lisans kapsamındaki üretim tesisi
Yenilenebilir Enerji Kaynağı kullanmaktadır.

Lisans No : EÜ/973-2/739

Tarih : 09/11/2006

Bu Lisans, **Akenerji Elektrik Üretim Anonim Şirketi**'ne, Balıkesir İli, Bandırma İlçesi'nde kurulacak olan **Ayyıldız RES** üretim tesisinde 09/11/2006 tarihinden itibaren 20 yıl süreyle, üretim faaliyeti göstermek üzere 4628 sayılı Elektrik Piyasası Kanunu ve ilgili mevzuat uyarınca Enerji Piyasası Düzenleme Kurulu'nun 09/11/2006 tarihli ve 973-2 sayılı Kararı ile verilmiştir.

Yusuf GÜNAY
Başkan

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

Annex 7
Layout of Ayyildiz WPP