CLEAN DEVELOPMENT MECHANISM

PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

SECTION A. General description of project activity

A.1. Title of the project activity:

Samsun Landfill Gas to Energy Project, Turkey (Hereafter referred to as the "Project")

Version: 4

Date: 13.04.2012

A.2. Description of the project activity:

The Project is a Landfill Gas ("LFG") to Energy Project, developed by "Samsun Avdan Enerji Üretim ve Tic. A.Ş." (hereafter referred to as the "Project owner"), which is a local project developer in the host country. The proposed activity involves the collection and utilization of the LFG with an electricity component with an installed capacity starting with 1.2 MW_e and reaching 4.8 MW_e throughout the investment. The location of the proposed activity is the Samsun landfill site, Turkey.

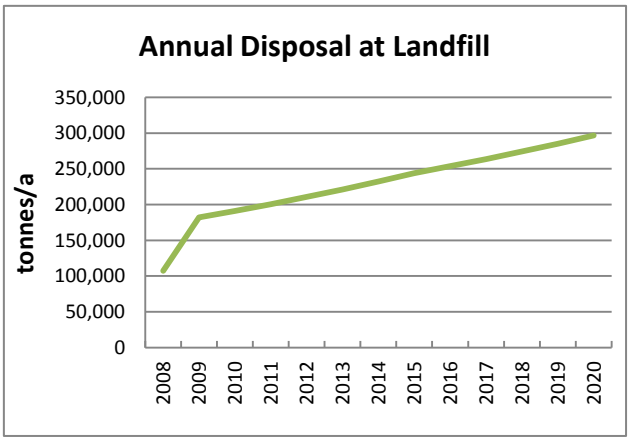


Figure 1. Solid waste disposal at the Project site

The Samsun landfill site is a managed landfill located on a hill 4 km north-east of Samsun city centre. The Samsun city has a population of ca. 520,000[1]. The operator of the landfill is the Samsun municipality. The site is a slope style landfill with basic sealing, drainage, leachate system and collection pound and fenced entrance control. For the time being, the generated LFG is being emitted freely to the atmosphere without any form of venting or flaring.

The old landfill has been filled in 2008 and the new landfill site, where the Project will be situated at, is in use since 2008.

The majority of waste comes from households and non-hazardous industries. This landfill site is expected to be operational until 2028. In 2008, the old disposal site was closed down and the current landfill site began its operations. In 2009, the expected disposed waste amount is 182,500 tonnes[2], corresponding to an average of 500 t/day. This amount is expected to rise in coming years, reaching 364,951 tonnes in 2027 when the landfill site will be filled up and closed. The Project is expected to start its operations on 01.06.2011.

In 2010, the Samsun Metropolitan Municipality opened a tender for a waste-to-energy project on site. This tender did not include landfill site operations management, it only included the right to collect and

[1] Feasibility Study, p.2

[2] Feasibility Study, p.11

utilize the LFG for energy generation. As a result of the tender, the Project Owner has been awarded with the right of extracting landfill gas and power generation on site.

The Project activity aims at collecting the LFG generated on site and using it for electricity generation. The generated electricity will be sold in the host country. The Project will use the LFG from both the already dumped solid waste and the waste that will be disposed in coming years. Therefore, the piping and capacity expansion work will be carried out in parallel to waste disposal amount during the Project lifetime. Although exact timing and installed power of this expansion work depends on the actual LFG generation on site, the Project design as of now foresees 4 phases;

Table 1. Schedule of the Project[3]

Phase	Generation Units Installed	Total Installed Capacity	Year
Phase 1	1 generation unit of 1.2 MW_e	1.2 MW_e	2011
Phase 2	2 generation units of 1. 2 MW_e each	2.4 MW_e	2013
Phase 3	3 generation units of 1. 2 MW_e each	3.6 MW_e	2016
Phase 4	4 generation units of 1. 2 MW_e each	4.8 MW_e	2022

The Project will be constructed at an already existing building (with dimensions of ca. 20m x 20m) at the eastern side of the landfill site, the rights of use of which are transferred to the Project owner by the municipality. This building is large enough for 2 turbines. When the Project is expanded further, a new building next to the existing one will be built by the Project owner.

The Project activity will be located within the already existing landfill site, where the waste is transported from the city and the leachate is collected and stored. The Municipality has leased the building plot within the landfill site to the Project owner, on which the Project owner can build and operate the Project. The landfill itself and the related rights and responsibilities belong to the Municipality. The Project expansions will also be carried out at this same site.

Baseline situation at the site: Prior to the Project, the waste is brought by trucks to the landfill site, weighted at the entrance and afterwards dumped on the landfill site. After a certain period of time, the waste is covered with soil, until which the bad odour creates complaints in the surrounding villages. The leachate is collected and stored in a pond within the landfill site. There is no waste picking activity on the landfill site. The landfill has a couple of venting points, which have become inoperational because of the higher waste levels or broken venting pipes. Some LFG collection piping is installed on site during the landfill construction, which is unusable by the Project because of technical problems. There is no flaring or any other form of methane destruction on site. A treatment facility is in operation and treats the stored leachate. The Samsun Municipality is responsible for leachate management and has assigned a 3rd party for leachate treatment, where the 3rd party is paid by the Samsun Municipality based on the amount of treated leachate. The collection, storage or treatment of the leachate is not included in the Project.

The proposed Project does not involve any operations on site, it will solely install the vertical and horizontal pipes to collect the LFG efficiently and generate power from collected LFG. The layout of the Project is as the following:

[3] Source: Project Owner

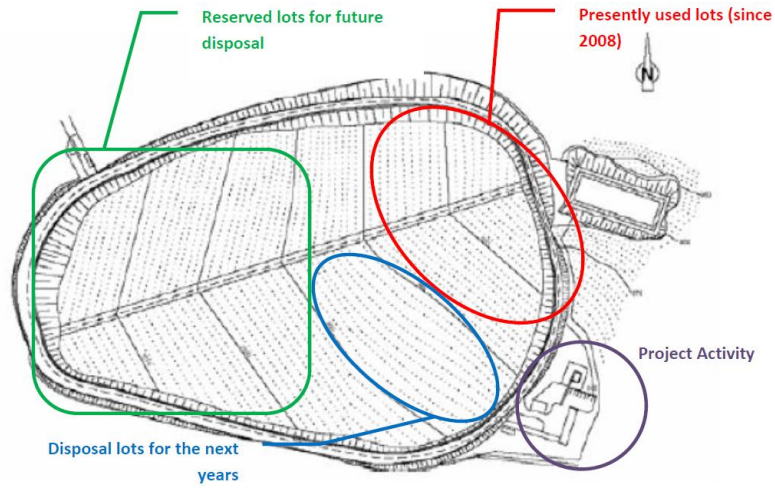


Figure 2. The layout of the landfill site and the Project activity

The structure of the landfill is a classical slope filling with a big dam at the end of the filling area. The waste at the landfill site is being filled and compacted in one big lot. At the sides of the landfill, every 3 m layer of waste is covered by clay. The landfill operations will be continued to be managed by the municipality.

The LFG that could not be combusted in the power generation unit will be flared. This flared gas will be very limited. The purpose of LFG flaring is to dispose of the flammable constituents (particularly methane) safely and to control odour nuisance, health risks and other adverse environmental impacts. The electricity generation will be used to cover the own electricity consumption of the Project and the excess power will be sold to the national electricity grid.

The proposed Project will reduce GHG emissions by:

i. Preventing methane emissions to the atmosphere: Municipal waste decays under normal conditions at the landfill site and this leads to the production of large amounts of potent greenhouse gases. This methane is not being flared. Methane is the largest constituent of LFG and its global warming potential (GWP) is 21 times than CO_2. Most of the LFG produced at the landfill site will be captured and destroyed by the Project.

ii. The recovered methane will be combusted for power generation. The produced electricity will be supplied to the national power grid and substitute the electricity which otherwise would have been generated by the thermal power plants. Thus, it will reduce the fossil fuel consumption and associated CO_2 emissions indirectly.

Figure 3. Current landfill site and the Project's location (at the eastern side)

The expected social and environmental impacts of the proposed Project are:

- It will promote integration of environmental infrastructure (e.g. after-care for landfill sites, etc.),
- The active LFG collection and flaring system will minimize the risk of potential explosions resulting from subsurface gas migration,
- It will dispose of most of the hazardous constituents in the LFG safely.
- It will reduce odour nuisance and health risks (through animals feeding on site etc.),
- It will promote sustainable development by reducing greenhouse gas emissions and their impact on climate change,
- It will present a demonstrative example as a multi-purpose solution for effective and sustainable waste management,
- It will promote energy security and sustainable energy infrastructure,
- It will result in technology and knowhow transfer to the host country.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey (host)	Samsun Avdan Enerji Üretim ve Tic. A.Ş. (private entity)	No
Turkey (host)	Mavi Consultants (private entity)	No

Samsun Avdan Enerji Üretim ve Tic. A.Ş. is the Project owner. Mavi Consultants act as carbon consultants for the Project. Contact details are provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

The host country is Turkey. Turkey has recently ratified the Kyoto Protocol and is an official member as of August 26th, 2009. Turkey has no emission reduction targets under the Kyoto Protocol and cannot host CDM or JI projects either. There is no limitation for Turkey for hosting voluntary emission reduction projects.

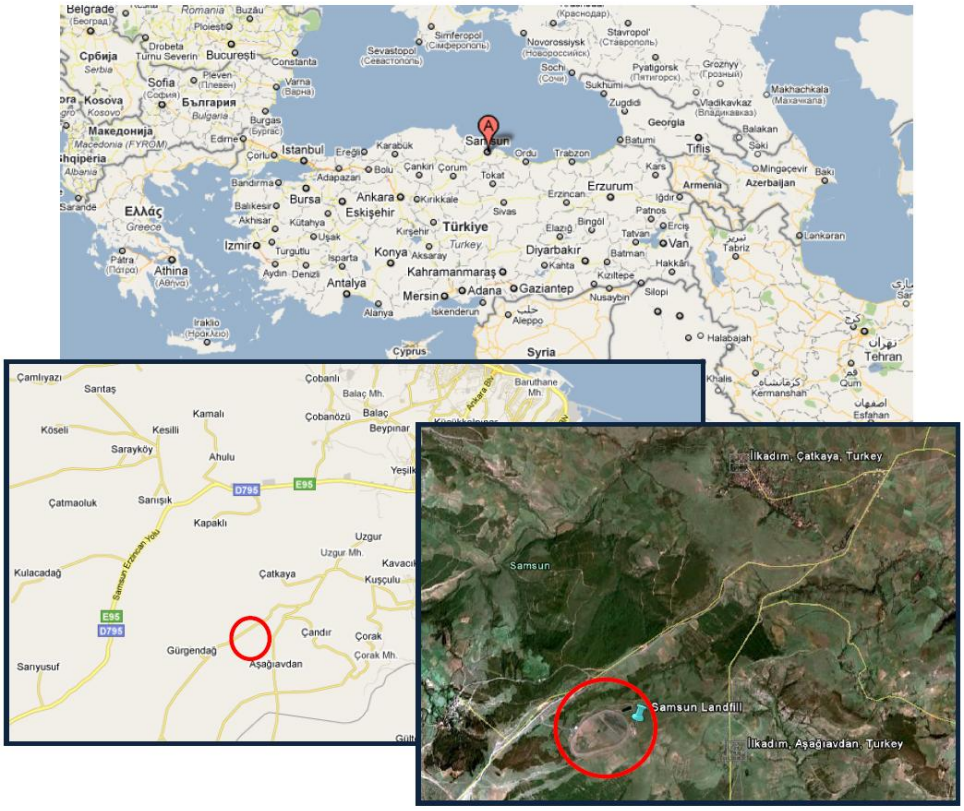
A.4.1.2. Region/State/Province etc.:

Black Sea Region / Samsun Province.

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

The Project is located south-west of Samsun city centre, at an air distance of ca. 8 km. The closest neighbourhoods are Gurgendag and Asagiavdan, both having an air distance of ca. 1 km.

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



The GPS coordinates of the Project activity are as the following:

- Latitude: 41°14'45"N
- Longitude: 36°13'16"E

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

The Project is categorized as:

- Sectoral Category 13, Waste Handling and Disposal; and
- Sectoral Category 1, Energy Industries (Renewable- /nonrenewable sources)

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

The Project mainly consists of the following components:

- LFG collection system
- Flaring unit
- Electricity generation unit
- Switchgear station
- Controlling / measurement equipment

The equipment specifications at the first Phase are as the following:

Table 2. Specifications of the equipment at Phase 1

Equipment	Specifications
Gas Engine	Manufacturer: Deutz Capacity: 1.23 MW_m, 1.2 MW_e Efficiency at full capacity: 40.4% Type: Packaged in container Manufacturer: Jenbacher
Blower	Capacity: 200-1000 m^3/h
Flare	Capacity: 500 m3/h Combustion temperature: 900-1200 °C

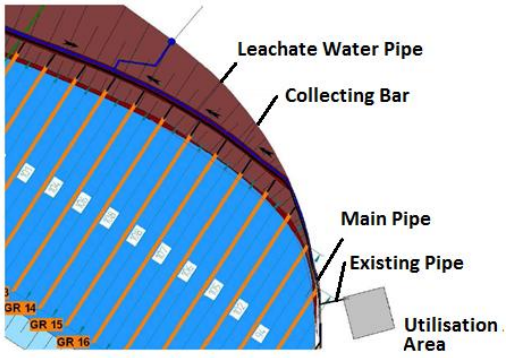


Figure 4. Concept Diagram of the Project
(north-western section from the top)

Landfill Cover and LFG Collection:

The waste will be covered with soil to block methane emissions to the atmosphere to provide sufficient containment and prevent air or rainwater to get into the waste.

The Project aims at efficiently collecting LFG generated at the landfill site by using wells. The construction will be carried out with a slight slope such that the condensate building up in the pipes will flow to the collecting points easily[4].

Electricity Generation:

An adequate booster will provide the LFG necessary for the power generation unit(s). The Project will generate electricity from LFG to cover its own electricity consumption and to feed the rest to the national power grid. The Project will employ a gradual extension of the landfill gas collecting and utilisation system on the basis of the gas generation. Electricity will be generated and transmitted to national grid. Each engine/alternator unit will contain a transformer, switch gear, synchronization system and system protection device. An electrical sub-station will be constructed that will contain all suitable switching gear and metering equipment to facilitate a proper connection to the national grid network. Parallel to the gas production rate, each unit will be operated depending on the need. All engine units will be fitted with an internet-based remote monitoring and controlling feature which allows engines to be monitored, started and stopped from distance.

Flare:

[4] Feasibility Report, p.27

In addition to the power generation equipment, the Project owner will install a flare. This will ensure that the LFG, which could not be combusted in the power generation units, will be destroyed. The flare unit will provide conditions for high temperature combustion to effectively destroy methane with other combustible LFG components and end up with low GHG emissions.

The flare will ***not*** include flame and temperature control. This is because the flared gas amount is very marginal, compared to the methane destroyed by power generation. In future, the Project owner considers installing monitoring equipment at the flare unit.

Project Instrumentation:

The Project will include monitoring instrumentation that will allow for the accurate measurement of captured and destroyed LFG, including the following components:

- Flow meters will be installed to measure and monitor accurately the flow of the LFG through the system. The measurement points will be: the main delivery pipe, the pipe going to the flare and the pipes going to each of the generation units. These flow meters will also be able to accurately measure various parameters such as pressure, temperature and the gas contents (e.g. methane, carbon dioxide and oxygen) at normal conditions (0°, 1 Atm). The measurement sampling intervals of the flow meters will be in agreement with the UNFCCC requirements.
- The measurement system will be able to store the measured data electronically. The control and monitoring system will allow these readings to be obtained remotely.

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

The Project is expected to achieve the following emission reductions:

Table 3. Expected Emission Reductions of the Project

Year	Ex-ante estimation of emission reduction in tCO2e
2011	23,856
2012	35,937
2013	44,505
2014	52,698
2015	60,616
2016	68,342
2017	75,801
2018	48,926
Total estimated reductions	**410,681**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	**58,669**

A.4.5. Public funding of the project activity:

The Project will not receive any ODA finance.

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:

For the emission reductions stemming from LFG capture, the ACM0001 v.11, "Consolidated baseline and monitoring methodology for landfill gas project activities", hereinafter referred to as the methodology, is used. The methodology refers to the following tools:

- "Tool for the demonstration and assessment of additionality"; v.5.2 ("Additionality Tool")
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"; v.4
- "Tool to determine project emissions from flaring gases containing methane"; EB28, Annex 13

For the emission reductions stemming from electricity generation, the ACM0002 v.12.1 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources is used. This methodology refers to the following tool:

- "Tool to calculate the emission factor for an electricity system", v.2.

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

ACM0001 Applicability:

This methodology is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations such as:

(a) The captured gas is flared; and/or

(b) The captured gas is used to produce energy (e.g. electricity/thermal energy). Emission reductions can be claimed for thermal energy generation, only if the LFG displaces use of fossil fuel either in a boiler or in an air heater. For claiming emission reductions for other thermal energy equipment (e.g. kiln), project proponents may submit a revision to this methodology;

(c) The captured gas is used to supply consumers through natural gas distribution network. If emissions reductions are claimed for displacing natural gas, project activities may use approved methodology AM0053.

Since the baseline scenario is the partial or total atmospheric release of LFG and as the Project involves both flaring and electricity generation, options (a) and (b) are satisfied and the methodology is applicable to the Project.

The large scale methodology is used, as the small scale methodology AMS-III.G requires projects to have "aggregate emission reductions of less than or equal to 60 kt CO_2 equivalent annually". Although the average GHG emission reduction of the Project is less than this threshold, in some year(s) it exceeds this limit. Therefore the large scale methodology is used.

The applicability conditions in the relevant tools referred to are satisfied as well.

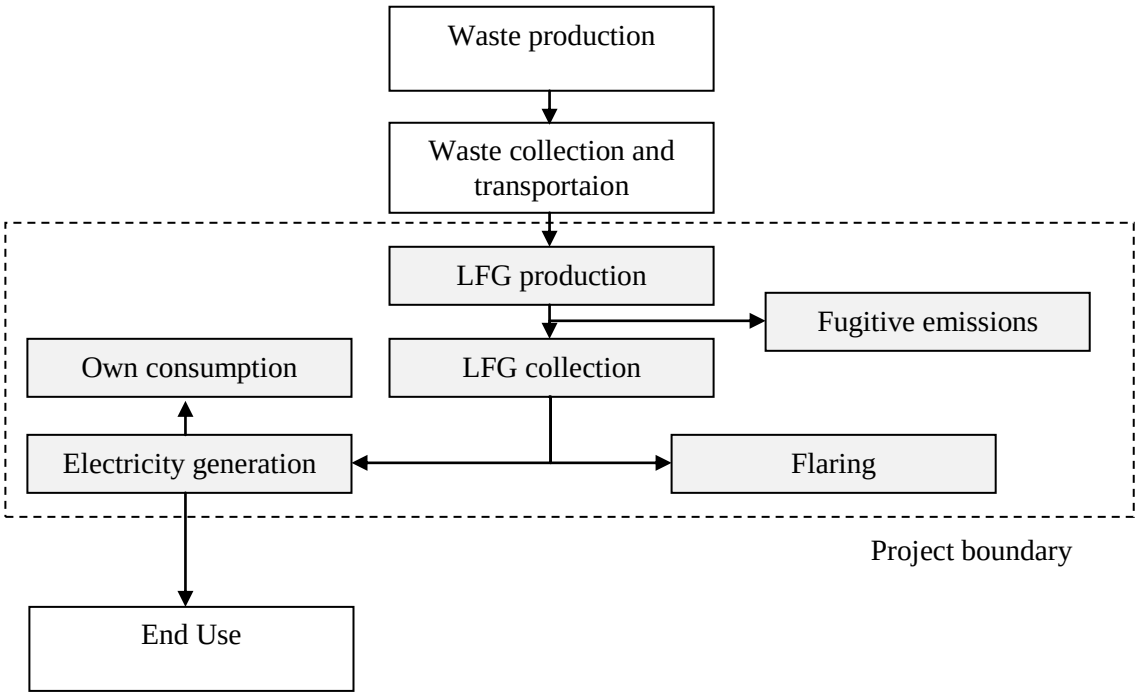
ACM0002 Applicability:

The small scale AMS I.D methodology can be applied if the Project has a maximum capacity of 15 MW_e. The Project will have a total capacity up to 4.8 MW and is therefore eligible for the use of AMS I.D. However, for the sake of conservative approach, the large scale methodology is preferred.

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

According to ACM0001, the project boundary is the site of the Project activity where the gas is captured and destroyed/used. The Project boundary shall include the power generator, which is connected to the grid.

According to ACM0002, the project boundary should encompass the physical, geographical site of the renewable generation source.



The spatial extent of the Project boundary is defined as the Project site and the plants connected to the grid system to which the Project will be connected to.

Table 4. Sources and gases included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Basel	LFG emissions from waste	CO_2	No	It is part of the natural carbon cycle, where the carbon was previously sequestered from the atmosphere.

	degradation	CH_4	Yes	Main source of emissions.
		N_2O	No	N/A
	Emissions from the power grid	CO_2	Yes	Main source of emissions.
		CH_4	No	N/A
		N_2O	No	N/A
Project Activity	LFG capture and flaring	CO_2	No	It is part of the natural carbon cycle, where the carbon was previously sequestered from the atmosphere.
		CH_4	Yes	When flare does not operate, methane emissions are subtracted.
		N_2O	No	N/A
	LFG combustion for power generation	CO_2	No	It is part of the natural carbon cycle, where the carbon was previously sequestered from the atmosphere. Only the net electricity generation will be accounted for ER calculations.
		CH_4	Yes	When generator does not operate, methane emissions are subtracted.
		N_2O	No	N/A
	On-site electricity	CO_2	Yes	Project's own emissions are subtracted.
		CH_4	No	N/A
		N_2O	No	N/A

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

As the ACM0001 suggests, the baseline scenarios shall be identified and assessed according to the Additionality Tool. The ACM0001 further requires certain scenarios to be included among alternatives. These default scenarios are included in Section B.5.

There is no incentive to utilise the LFG to produce thermal energy, since there is no demand for thermal energy in the surroundings of the Project site. The Project is a green field investment, which does not modify or retrofit any existing facility. There is no national regulation which would require the recovery or flaring of the LFG emitted from landfill sites. The relevant environmental legislation does not force municipalities to effectively control LFG emissions from landfills.[5] The tender opened by the Samsun Municipality does not force the Project owner to effectively collect and destroy LFG emissions, it is rather a tender for the rights to use the site for power generation purposes.

The active collection and flaring of LFG is not mandatory at the Project site, however there already is a limited amount of piping for LFG venting to the atmosphere. Piping is not available at the whole site and the main purpose of the installed pipes is to reduce explosion risks. The LFG is not being flared.

The Project owner does not have control over the emissions stemming from the baseline scenario. In this framework, the baseline scenario can be defined as the reduction of LFG emissions from the landfill by methane destruction and substitution of the electricity generated by grid-connected power plants, thereby reducing the overall greenhouse gas emissions.

[5] The most closely related legislation is the Communiqué for Waste Disposal (Official Gazette 27533, 26.03.2010), which limits the disposal of degradable waste at landfill sites to 75% of 2005 disposal amounts, by 2015 (Temporary Article Nr.1). This communiqué does not have any kind of limitation for LFG collection or destruction.

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):

This section utilizes the Additionality Tool, as required by the methodology. In agreement with the ACM0001, when defining alternative scenarios, relevant policies and regulations related to the management of landfill sites are taken into account.

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

Realistic and credible alternatives to the project activity(s) are defined through the following Sub-steps;

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

The Project includes the LFG and electricity generation components; therefore different alternatives to these two components will be described;

Alternatives to Landfill Gas Component	**Alternatives to Power Generation Component**
LFG1: The project activity (i.e. capture of landfill gas and its flaring and/or its use) undertaken without being registered as a CDM project activity.	P1: Power generated from landfill gas undertaken without being registered as CDM project activity.
LFG2: Atmospheric release of the landfill gas or partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns.	P6: Existing and/or new grid-connected power plants.

Based on the barrier and investment analyses, it is clear that the P1 and LFG1 scenarios are not feasible for the Project owner and are therefore not applicable.

The Project being a voluntary initiative, the only plausible baseline scenario is the combination of:

P6: Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"; and,

LFG2: Maintaining the status quo, where LFG is emitted into the atmosphere without conducting any management, destruction or utilization on the landfill site.

The alternative scenario is defined as the combination of both Landfill Gas and Power Generation components, since the Project has both components.

Outcome of Sub-step 1a: Realistic and credible alternative scenarios to the Project activity are identified.

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

For the electricity generation component, the following laws and regulations apply;

Table 5. Laws and Regulations Applicable in the Electricity Market[6]

Legal Framework Concerning Electricity Generation
Electricity Market Balancing and Settlement Regulation • The repealed Electricity Market Balancing And Settlement Regulation published in the Official Gazette No. 25632 dated 03/11/2004
Regulation Concerning Electricity Demand Forecast
Communiqué Regarding Connection to and Use of Transmission and Distribution Systems in the Electricity Market
Communiqué Regarding Preparation of Retail Contract in The Electricity Market
Communiqué Concerning Principles and Procedures for Selection in the Existence of More Than One Application for Generation of Electricity from the Same Source and on the Same Region
Communiqué Regarding Regulation of Market Management Revenue
Regulation on Principles and Procedures for Granting Guarantee of Origin
Electricity Transmission System Supply Reliablity and Quality Regulation
Electricity Market Grid Regulation
Communiqué Regarding The Principles and Procedures of Financial Settlement In The Electricity Market
Electricity Market Import and Export Regulation
Communiqué Regarding Regulatory Accounting Guidelines
Electricity Market Distribution Regulation
Communiqué Regarding the Meters to be used in the Electricity Market
Communiqué Regarding Wind and Solar Measurements
Electricity Market Customer Services Regulation
Electricity Market Eligible Consumer Regulation
Electricity Market License Fees
Electricity Market Tariffs Regulation
Electricity Market Licensing Regulation
Electricity Market Law
Other relevant laws:
Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy (Nr. 5346)
Energy Efficiency Law (Nr. 5627)
Forest Law (Nr. 6831)

For the landfill gas component, the following laws and regulations may apply;

Table 6. Laws and Regulations governing the landfill gas component

Legal Framework Concerning the Environment	
The Environment Law	Packaging Waste Control Regulation
Air Quality Control Regulation	Soil Protection Law

[6] Source: Energy Market Regulatory Authority (http://www.epdk.gov.tr/english/regulations/electricity.htm)

Noise Control Regulation	Air Pollution from Heating Regulation
Water Pollution Control Regulation	Hazardous Chemicals Regulation
Control of Solid Waste Regulation	Waste Batteries Regulation
Environmental Impact Assessment Regulation	Soil Pollution Control Regulation
Medical Waste Regulation	Air Pollution from Vehicles Regulation
Toxic Chemical Substance and Prod Regulation	Medical Waste Control Regulation
Hazardous Waste Regulation	Water Resources Protection from Hazardous Materials Regulation
Waste Oils Control Regulation	Urban Waste Water Treatment Regulation
Industrial Air Pollution Control Regulation	Drinking Water Quality Regulation

The Environment Law[7] does not require a tipping fee for accepting municipal solid waste at the sanitary solid waste disposal sites. There is an "environment tax" and another "waste water surcharge" collected by municipalities from households for waste management activities. There exists no controlling system for monitoring how and for what purposes these taxes and surcharges are used by municipalities. Municipalities in the host country tend to subsidize waste collection and dumping activities from the municipal budgets. Under these circumstances, municipalities or households are not familiar with additional costs of proper waste management. Therefore, waste management is one of the everlasting problems of municipalities and is an unattractive field for private companies.

The "Metropolitan Municipalities Law[8]" sets out the legal framework of solid waste management in metropoles. Being subject to this law, the Samsun Metropolitan Municipality is responsible for the collection, management and proper disposal of municipal waste. Accordingly, it is supposed to build and operate the necessary facilities or let 3rd parties do so. In agreement with this law, a tender can be organized for certain types of goods and services the municipalities purchase. Based on this law, the Municipality has organized a tender and the Project owner has been awarded, at no cost to the Municipality.

The Project is a voluntary investment managed by a special contract between the Samsun Metropolitan Municipality and the Project owner. Therefore the Project has to be in compliance with all relevant legislation. The Project is licensed and permitted by public authorities. All scenarios identified in Sub-step 1a are also valid according to national laws, regulations and communiqués.

For scenario LFG2, the most relevant regulation governing landfill sites is the "Control of Solid Waste Regulation". According to its Article 27, landfill sites are *not* enforced to capture and/or to destroy LFG emissions. This regulation does not set any obligations or penalties but only suggests the reduction of GHG emissions. Therefore, this alternative reflects current practice and is in agreement with current laws and regulations.

For scenario P6, maintaining the status quo, without the realization of the Project activity, is in agreement with the relevant legislation by definition.

[7] The Environmental Law (Nr. 2872), dated to 11.08.1983 is a comprehensive law describing relevant public bodies and their responsibilities, principles of environmental protection, limitations and prohibitions, penalties etc. It is also supported by various specific communiquees and regulations.
(http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=1.5.2872&MevzuatIliski=0&sourceXmlSearch=)

[8] The Metropolitan Municipalities Law (Nr: 5216), Article 7
(http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=1.5.5216&MevzuatIliski=0&sourceXmlSearch=)

Outcome of Sub-step 1b: Realistic and credible alternative scenarios to the Project activity and the Project activity itself are in compliance with mandatory legislation and regulations.

Step 2: Investment analysis

According to the Additionality Tool, this step involves the determination 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 emission reductions.

Sub-step 2a: Determine appropriate analysis method

According to the Additionality Tool, one of three options must selected:

i. Simple cost analysis (where no benefits other than CDM income exist for the project)
ii. Investment comparison analysis (where comparable alternatives to the project exist)
iii. Benchmark analysis

Because the Project will receive additional revenues other than carbon credits, and since there are no comparable investment alternatives to the proposed project, option (iii) benchmark analysis is selected. In this case, the most likely alternative to the Project would be simply not to install flaring and electricity generation equipment on the landfill site.

Outcome of Sub-step 2a: the appropriate analysis method is determined.

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

Given that power generation based on LFG is not a common practice in the host country and different unpredictable risks are involved, this benchmark rate of return should be considered conservatively by taking project risk premium into account. The likelihood of the development of this Project will be determined by analyzing its **Project IRR** based on the scenarios with and without the sales of carbon credits.

IRR is a measure of investment profitability. According to the Additionality Tool, the assessment of the financial performance of the Project with and without carbon revenues shall be carried out according to benchmarks. The chosen benchmark for the Project is the discount rate. This means that the Project would be attractive only if the IRR exceeds the discount rate. The "Guidelines on the Assessment of Investment Analysis" v.3, EB51 ("Guidelines") suggest that the IRR shall be calculated without considering financial expenses such as principal and interest payments. This means that the "Project IRR" shall be calculated.

Explanations to the calculation methodology:

Guidance[9] Nr.	Guidance	Calculation procedure implemented	Conclusion

[9] Only relevant guidance items are included from "Guidelines on the Assessment of Investment Analysis" v.3, EB51

3	"The period of assessment should not be limited to the proposed crediting period of the CDM project activity. ... In general a minimum period of 10 years and a maximum of 20 years will be appropriate."	The actual project activity is not limited in time to the crediting period being requested. The Project has a crediting period of 7 years. Therefore, in agreement with the UNFCCC guidance, a longer investment analysis period shall be selected, which is chosen to be 20 years.	Satisfied
5	"Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, should be added back to net profits for the purpose of calculating the financial indicator"	The calculations do not consider non-cash items (e.g. depreciation, interest expenses etc.). They are included in the financial model of the project only for informational purposes and do not affect the financial indicators. The IRR calculations and their assessment are made with a pre-tax approach.	Satisfied
9	"The cost of financing expenditures (i.e. loan repayments and interest) should not be included in the calculation of project IRR."	Interest and principal repayments are included in the financial model only for informational purposes. They do not affect the financial indicators. The IRR is calculated without taking interest expenses into account.	Satisfied
11	"Due to the impact of loan interest on income tax calculations it is recommended that when a project IRR is calculated to demonstrate additionality a pre-tax benchmark be applied."	The calculations are carried out to obtain the Project IRR. Therefore, the (nominal) pre-tax WACC[10] is selected as the benchmark. For calculating the pre-tax WACC, first the post-tax WACC is calculated and then converted to pre-tax WACC.	Satisfied
12	"Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR."	WACC is selected as the appropriate benchmark.	Satisfied
17	"Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation"	The sensitivity analysis only takes the variables into account, that have an impact on revenues or costs more than 20%.	Satisfied

[10] Weighted average cost of capital (WACC) is the rate that a company is expected to pay on average to all its security holders to finance its assets. The WACC is the minimum return that a company must earn on existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere.

18	"...variations in the sensitivity analysis should at least cover a range of +10% and -10%."	The sensitivity analysis covers a range of -15% and +15%.	Satisfied

Outcome of Sub-step 2b: The benchmark analysis is applied and the approach is explained.

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

The following parameters are used for calculations;

Table 7. Parameters used for Investment Analysis

Parameter	Unit	Figure	Source	Justification
Investment Horizon	years	20	Assumption	The Guidelines suggest a minimum of 10 years and a maximum of 20 years.
Corporate Tax	%	20%	www.invest.gov.tr	This is the official corporate tax rate in the host country.
Interest Rate	%	7	Assumption	This figure is in agreement with historical EURIBOR rates and commercial market conditions.
Discount Rate (Benchmark)	%	12.9%	WACC[11] calculations	Pre-tax WACC is suggested by the Guidelines.
Electricity Price	EUR¢/kWh	6.6	Project Owner's own feasibility	This figure is used in the investment decision.
Carbon Credit Price	EUR/t_{CO2-eq}	7	Assumption	This figure is in line with current market conditions.
Initial Investment	tEUR	1,680	Project Owner's own feasibility	This figure is used in the investment decision.
Operation & Maintenance Costs	tEUR	524-1141	Project Owner's own feasibility	This figure is used in the investment decision.

According to the agreement between the Municipality and the Project owner, the Project owner does *not* receive any revenues from the Municipality. The Project owner will pay a certain share of the Project's proceeds to the municipality, in return of the landfill site usage rights. This share is also included in the feasibility calculations.

Scenario LFG1 & P1: Project <u>without</u> Carbon Credits

Since the Project involves no disposal fee paid by the Municipality, its revenue sources is limited to electricity sales (when VERs are not considered). Based on these data, the Project's IRR is calculated for the case where the Project would have been realized without carbon revenues. This corresponds to the scenario combination LFG1 & P1. The results are the following;

[11] Weighted average cost of capital (WACC) is the rate that a company is expected to pay on average to all its security holders to finance its assets. The WACC is the minimum return that a company must earn on existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere.

Table 8. Financial Performance of the Project without carbon revenues considered

Indicator	Unit	Source	IRR	Benchmark	Result
Results:	%	Calculations	9.8%	12.9%	Unfeasible

In this scenario, the Project IRR calculations are carried out *without* considering carbon credit sales. The calculations conservatively assume that the revenues from electricity sales are obtained without delay (which may not reflect the actual case), that there are no major unforeseen malfunctions or other unforeseen expenses, and that the LFG generation occurs as expected.

The results indicate that without carbon credits, the Project is not feasible. Under these circumstances, the Project would not be attractive for a private investor.

Proposed Project Activity: Project with Carbon Credits

The proposed Project is realized with the additional inflow of revenues from carbon credit sales, the Project's profitability improves considerably;

Table 9. Financial Performance of the Project, with VER revenues considered

Indicator	Unit	Source	IRR	Benchmark	Result
Results:	%	Calculations	17.8%	12.9%	Feasible

In this case, it is observed that the IRR improves considerably with the inclusion of the carbon credit component and thus exceed the benchmarks. The Project IRR reaches investment levels because it exceeds the benchmarks.

Outcome of Sub-step 2c: Financial indicators are calculated and compared.

Sub-step 2d: Sensitivity analysis

The purpose of the sensitivity analysis is to check how much the Project's financial performance depends on main variables of the investment analysis. The Additionality Tool requires including those financial parameters in the analysis, that have 20% or more impact on the results. Two parameters are identified which satisfy this condition;

i. Electricity prices (impact on revenues)
ii. Capital expenditures (impact on costs)
iii. Operation and maintenance expenses (impact on costs)
iv. LFG Collection ratio (impact on revenues)

All three parameters are changed +/- 15% to check how far they affect the Project profitability. The results are as the following;

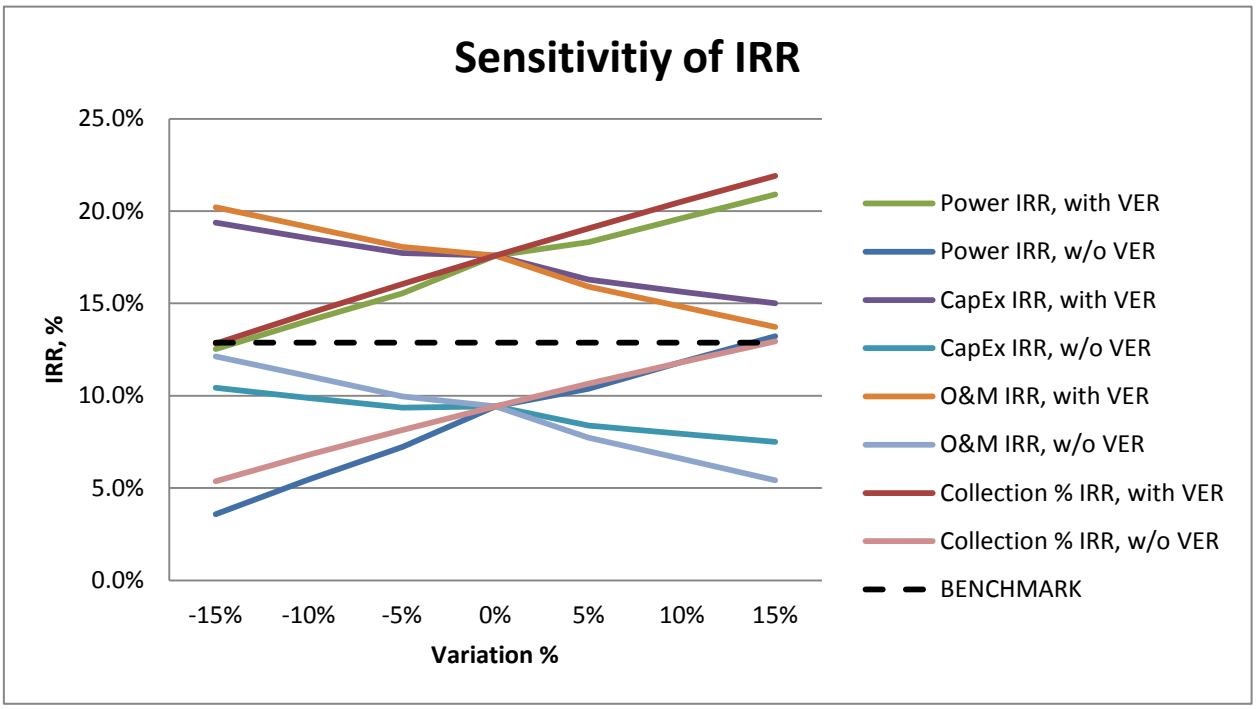


Figure 5. The sensitivity of Project feasibility on varying input parameters

The figure above depicts the reaction of the financial viability of the Project to the most important changing input parameters. With regards to this Figure 5, the following conclusions are obtained:

a) **Impact of electricity prices on Project IRR ("Power IRR"):** There are two Power IRR lines in the figure above, the lower one representing the baseline scenario (LFG1&P1) without carbon revenues, and the upper line representing the proposed Project activity, including carbon revenues. The figure shows that the Project is quite sensitive to electricity prices. It furthermore shows that it is highly unlikely that the Project becomes feasible, even if the electricity prices would pick up significantly. the Project would only be feasible if the electricity price would increase by 15% or more. This is rather unlikely, because the electricity price guaranteed by the law is 7.3 USD cents/kWh, which is approximately 20% lower[12] than the electricity price (6.6 EUR cents/kWh) assumed for the benchmark analysis calculations.

b) **Impact of capital expenditures on Project IRR ("CapEx IRR"):** The figure shows that as CapEx increases the IRR decreases (and vica versa), however in small amounts. This shows that the IRR is less sensitive to CapEx and that it is unlikely the Project becoming feasible, even if CapEx would drop at significant amounts.

c) **Impact of operation and maintenance expenses on Project IRR ("O&M IRR"):** The figure shows that as O&M expenses increase the IRR decreases (and vica versa). It further shows that these running costs have a significant impact on the IRR. The figure also demonstrates that it is unlikely the Project becoming feasible, even if O&M expenses would get 15% lower or more.

[12] As of PDD preparation date, 7.3 USD cents corresponds to 5.2 EUR cents.

d) **Impact of LFG collection ratio ("Collection % IRR"):** The figure shows that the collection ratio of LFG significantly influences the IRR. As the collection ratio increases the IRR also increases considerably (and vice versa). This shows that the IRR is quite sensitive to a higher or lower collection ratio of the generated landfill gas. The Project would exceed the benchmark IRR of 12.9% if the collection ratio of the Project would rise by 15%. However this is rather unlikely since the collection ratio largely depends on parameters like impermeable covering and piping characteristics, which are carefully planned by an experienced team for a collection ratio of 60%.

Conclusion: It is seen that in case the parameters change in positive direction, the Project does not exceed the benchmark threshold.

Outcome of Sub-step 2d: The sensitivity of financial indicators to input parameters is assessed.

Outcome of Step 2: The sensitivity analysis clearly demonstrates that the proposed Project activity is unlikely to be most financially/economically attractive and LFG1 & P1 is not a plausible alternative. According to the Additionality Tool, this satisfies the requirement of Step 2.

Step 3: Barrier analysis

This step is not applied.

Step 4: Common practice analysis

The Project is not common practice and it has not diffused in energy generation industry in the host country. This is demonstrated below;

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

As the geographical scope the host country is selected, because there is no sufficient evidence that suggests landfills in a specific region have considerably different characteristics than other regions or the host country.

The proposed Project activity is an IPP[13] investment by a private company for the purpose of generating electricity from LFG. In Turkey, the permission process starts with obtaining a generation license. In this context, license holders can be defined as companies who have a certain extent of intention for an investment. IPP license holders are particularly similar to the Project activity, as they have the same purpose of generating and selling power to the national grid with similar legal framework. BOT and Autoproducer models cannot be regarded as similar, as they are based on different legal, financial and organizational conditions.

Outcome of Sub-step 4a: Other similar activities are analysed.

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

In the host county, 3 129 municipalities are provided with waste collection services out of 3 225 municipalities in total. The total collected solid waste amounted to 24.36 million tonnes in 2008[14]. 41.3%

[13] Independent Power Producer, generating and selling energy to the grid on commercial basis

[14] Source: Turkish Statistical Institute (http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=6238)

and 9.3% of the collected waste is disposed of in municipality dumps and metropolitan municipality dumps, respectively. 44.9% of the waste is disposed of properly in controlled landfills. The remaining collected waste is dumped in another city, burned or dumped into lakes or rivers. The amount or disposal methods in communities without waste services are unknown.

Table 10. Municipal Solid Waste Indicators of Turkey[14]

Main Waste Indicators of Municipalities, 2008	
Total Number of municipalities	3 225
Number of municipalities receiving municipal waste services	3 129
Rate of population receiving waste services in total population (%)	82
Rate of population receiving waste services in total municipal population (%)	99
Amount of municipal waste collected (thousand tonnes/year)	24 361
Amount of municipal waste per capita (kg/capita-day)	1.15
Main Indicators of Waste Disposal and Recovery Facilities, 2008	
Rate of population served by waste disposal and recovery facilities in total municipal population (%)	47
Rate of population served by waste disposal and recovery facilities in total population (%)	39
Controlled landfill sites	
Number	37
Capacity (thousand tonnes)	390 478
Incineration plants	
Number	2
Capacity (thousand tonnes/year)	44
Composting plants	
Number	4
Capacity (thousand tonnes/year)	551

The following landfill projects have an electricity generation license from EMRA;

Table 11. Similar Project Activities in the Region[15]

Project Owner	**License Type**	**Location**	**Capacity [MW]**	**VER Considered[16]?**	**Description**
ISTAC	Autoproducer[17]	Istanbul	4.0	No	Power generation from LFG (Municipality owned)
Ortadogu Enerji	IPP	Istanbul	13.9	Yes	Power generation from LFG
Ortadogu Enerji	IPP	Istanbul	7.6	Yes	Power generation from LFG
ITC-KA	IPP	Ankara	11.3	Yes	Power generation from LFG

[15] Sources: EMRA (http://www.epdk.gov.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp), Gold Standard Registry (http://goldstandard.apx.com/resources/AccessReports.asp)

[16] Source: The Gold Standard Registry

[17] Autoproducer: Companies who generate energy mainly for their own consumption.

ITC	IPP	Ankara	25	Yes	Power generation from LFG
ITC	IPP	Adana		Yes	Power generation from LFG
Ekolojik Enerji	IPP	Istanbul	1.0	Unknown	Gasification facility for hazardous waste
Aksa Enerji	BOT[18] model	Bursa	1.4	Unknown	Power generation from LFG
CEV	IPP	Gaziantep	5.6	Yes	Power generation from LFG
CEV Marmara	IPP	Bolu	3.3	Yes	Power generation from LFG

The first private power generation facilities which are in operation have been realized under BOT or Autoproducer models. Autoproducers generate electricity primarily for their own electricity consumption, and they are allowed to feed only a fraction of their generation to the grid. The BOT model is not applicable in Turkey anymore, as the existent BOT projects have special contracts with the government and will be handed over to the government after a certain period of time. As BOT and autoproducer power plants are not completely liberal electricity market players and are limited in terms of number and installed capacity, they cannot be considered as common practice or similar projects.

After the "liberalization" of the electricity market, which is still in a transformation period, investors have been allowed to build and operate their own power plants for electricity production and sales to the national grid as IPPs. Since the Project activity is an IPP, it cannot be compared to BOT or Autoproducer projects. Therefore, ISTAC and AKSA projects cannot be regarded as similar activities. The Ekolojik Enerji project deals with hazardous waste and is out of the scope. The remaining projects are similar activities, as they are IPPs that generate power from LFG. They are also carbon projects. There are no other similar project activities which have been realized without the consideration of carbon credits.

Demonstration of additionality

The timeline of the Project is described below;

Table 12. Steps of the Project

Date	Action
02.11.2009	Feasibility study is submitted to the project owner.
04.01.2010	First talks with the carbon consultant about carbon finance
01.06.2010	Publication of the tender by Samsun Metropolitan Municipality
18.06.2010	Tender organisation by Samsun Metropolitan Municipality
28.07.2010	Contract signature date with the Municipality[19].
02.08.2010	Carbon development contract signature date

[18] Build-Operate-Transfer: This model enables parties to have specific, undisclosed contracts with particular exemptions, incentives and other mechanisms. This business model was applicable before the electricity market liberalization and cannot be regarded as a similar activity.

[19] This date corresponds to the date of early consideration, as the carbon revenues is included in this agreement.

21.08.2010	First equipment order signature date[20]
13.09.2010	Mobilisation on site[21]

The regulations in the host country regarding landfill gas capture or destruction are not mandatory and there is a distinct lack of policies promoting efficient collection and destruction of LFG. Landfill site operators are not required to capture or destroy LFG, therefore the GHG emission reductions would not have occurred if the Project would not have been implemented.

The Project has been designed and planned from the beginning by considering carbon credits. The consideration for carbon credits is before the investment decision. The waste-to-energy concept constitutes a very limited portion of the Turkish electricity market and the Project Activity goes beyond of "business as usual" scenario. As a result, the Project is considered to be additional.

Outcome of Sub-step 4b: Other similar options are discussed and the additionality of the Project is demonstrated.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The methodology ACM0001 requires that "Project proponents should provide an ex-ante estimate of emission reductions, by projecting the future GHG emissions of the landfill". For the Project, the ex-ante emissions will be estimated based on a first order decay model. After the operation, the real emission reductions will be monitored ex-post.

Emission Reductions

According to the ACM0001, leakage does not need to be accounted. The emission reduction is the difference between the baseline emissions and project emissions;

$$ER_y = BE_y - PE_y \qquad (1)$$

The explanations of all the parameters used in the formulae below are provided in Annex 3 of this PDD.

Baseline emissions

The baseline emissions prior to the Project implementation consist of:

- The methane emitted to the atmosphere from the landfill; and
- The grid emissions due to electricity generation;

$$BE_y = (MD_{project,y} - MD_{BL,y}) * GWP_{CH4} + EL_{LFG,y} * CEF_{elec,BL,y} \qquad (2)$$

[20] This is the earliest equipment order (pipes for LFG collection) date

[21] This date corresponds to the delivery of the pipes to the site and start of construction preparations

The regulatory methane destruction is calculated as;

$$MD_{BL,y} = MD_{project,y} * AF \quad (3)$$

As the Project does *not* involve thermal power generation or gas supply to any pipeline, according to ACM0001 the methane destruction by the Project is calculated as;

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (4)$$

Methane destroyed by flaring is found as;

$$MD_{flared,y} = (LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4}) \quad (5)$$

The project emissions due to flaring will be calculated by using the "Tool to determine project emissions from flaring gases containing methane" (EB28);

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h}*(1-\eta_{flare,h})*GWP_{CH4}/1000 \quad (6)$$

The LFG generation is calculated using the first order decay method using the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", v.4 (EB41). Accordingly, the methane emissions avoided is found as;

$$BE_{CH4,SWDS,y} = \varphi*(1-f)*GWP_{CH4}*(1-OX)*16/12*F*DOC_f*MCF*\sum\sum W_{j,x}*DOC_j*e^{-kj(y-x)}*(1-e^{-kj}) \quad (7)$$

Baseline emissions due to electricity generation are calculated using the ACM0002 methodology. The Project mainly involves electricity capacity addition, which reduces CO_2 through the substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. ACM0002 offers two options for preparing the baseline calculation:

(a) A combined margin, consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system', or;

(b) The weighted average emissions (in kg CO_{2e}/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option (a) above will be applied for the Project. The combined emission factor $CEF_{elec,BL,y}$ for the Project activity is calculated as a weighted average of Operating Margin and Build Margin emission factors. The operation margin refers to a cohort of power plants that reflect the existing power plants whose *electricity generation* would be affected by the proposed project activity. The build margin refers to a cohort of power plants that reflect the type of power units whose *construction* would be affected by the proposed project activity;

$$CEF_{elec,BL,y} = w_{OM}* EF_{grid,OM,y} + w_{BM}* EF_{grid,BM,y} \quad (8)$$

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

All parameters listed below have been selected according to the associated UNFCCC methodologies that are listed in section B.1;

Data / Parameter:	**$GEN_{i,y}$**
Data unit:	GWh
Description:	The gross electricity generation by fuel type i in year y (2002-2008)
Source of data used:	Turkish Electricity Transmission Company (TEİAŞ) website http://www.teias.gov.tr/istatistik2008/32(75-08).xls
Value applied:	Table 16. Gross and Net Electricity Generation [GWh] in Turkey
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEİAŞ annually publishes official data regarding electricity generation on a fuel type basis.
Any comment:	

Data / Parameter:	**Net Electricity $Generation_y$**
Data unit:	GWh
Description:	The difference between the total quantity of electricity generated by power plants/units and the auxiliary electricity consumption of power plants/units.
Source of data used:	Turkish Electricity Transmission Company (TEİAŞ) website http://www.teias.gov.tr/istatistik2008/32(75-08).xls (2002-2008)
Value applied:	Table 16. Gross and Net Electricity Generation [GWh] in Turkey
Justification of the choice of data or description of measurement methods and procedures actually applied :	TEİAŞ annually publishes official data regarding *total* net electricity generation, but its *breakdown* by fuel type is unavailable.
Any comment:	

Data / Parameter:	**Net Delivery $Ratio_y$**
Data unit:	%
Description:	The ratio of the total Net Electricity Generation to the total Gross Electricity Generation in year y.
Source of data used:	Net Electricity Generation and Gross Electricity Generation data from http://www.teias.gov.tr/istatistik2008/32(75-08).xls http://www.teias.gov.tr/istatistik2008/30(84-08).xls
Value applied:	Table 16. Gross and Net Electricity Generation [GWh] in Turkey
Justification of the choice of data or description of	Electricity delivered to the grid by each power plant/unit is unavailable. The Net Delivery $Ratio_y$ is used for approximating the net electricity amount delivered to the grid by power plants/units except lc-mr sources (GEN_y).

measurement methods and procedures actually applied :	
Any comment:	This is a conservative assumption, since in general thermal power plants consume more energy for auxiliaries than e.g. wind or hydro power plants. This assumption leads to higher net electricity amounts and lower emission reductions.

Data / Parameter:	**GEN_y**
Data unit:	GWh
Description:	The net electricity delivered to the grid in year y, excluding the low cost – must run sources
Source of data used:	Calculation steps (for each year y): 1. Gross electricity generation excluding lc-mr sources = Total gross electricity generation from all sources - total gross electricity generation from lc-mr sources 2. Net electricity generation excluding lc-mr sources = Gross electricity generation except lc-mr sources * Net Delivery Ratio 3. Net electricity delivered to the grid except lc-mr sources = Net electricity generation except lc-mr sources + Imports
Value applied:	Table 16. Gross and Net Electricity Generation [GWh] in Turkey
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of fossil fuel type i in year y
Source of data used:	The lower limits of the 95% confidence interval stated in the "2006 IPCC Guidelines for National Greenhouse Gas Inventories", Volume 2, Chapter 1 (energy) Table 1.4.
Value applied:	Table 24. NCVs and Emission Factors of Fuels
Justification of the choice of data or description of measurement methods and procedures actually applied :	Industry guidelines are used as a result of conservative approach, although the National Inventory Report of Turkey reports higher emission factors.
Any comment:	

Data / Parameter:	**EI_y**
Data unit:	GWh
Description:	Net electricity imports delivered to the grid in year y

Source of data used:	Turkish Electricity Transmission Company (TEİAŞ) website http://www.teias.gov.tr/istatistik2008/30(84-08).xls
Value applied:	Table 16. Gross and Net Electricity Generation [GWh] in Turkey
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the total electricity imported and delivered to the national grid from connected electricity systems (neighbour countries).
Any comment:	

Data / Parameter:	**Electricity Capacity Additions**
Data unit:	-
Description:	Power plants which are most recently taken into operation
Source of data used:	Turkish Electricity Transmission Company (TEİAŞ) Statistics and Capacity Projections (2007-2016, 2008-2017, 2009-2018) http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf, http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf, http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf, http://www.teias.gov.tr/istatistik2005/7.xls, http://www.teias.gov.tr/istat2004/7.xls,
Value applied:	Table 23. Capacity Additions
Justification of the choice of data or description of measurement methods and procedures actually applied :	Average (not firm) generation values are used. This is conservative. Capacity additions between 2004 - 2007 are included.
Any comment:	As the methodology suggests, isolated and retrofitted power plants/units and performance revisions, as well as other carbon projects, are not considered in the sample power plant list.

Data / Parameter:	$\eta_{m,y}$
Data unit:	%
Description:	Average net energy conversion efficiency of power unit m in year y
Source of data used:	UNFCCC methodological tool “Tool to calculate the emission factor for an electricity system” Annex I
Value applied:	Table 26. Electricity Generation of Selected Recent Capacity Additions by Fuel Type
Justification of the choice of data or description of measurement methods and procedures actually applied :	There are no official efficiency values available based on each power plant or each fuel type. Therefore the default IPCC values are used, as listed in the “Tool to calculate the emission factor for an electricity system”.
Any comment:	

Data / Parameter:	**AF**
Data unit:	N/A
Description:	National legislation and mandatory regulations
Source of data used:	The national legislation: "Control of Solid Waste Regulation" Article 27
Value applied:	Equation (3)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The relevant national regulations regarding solid waste disposal do not require any LFG destruction or reduction. Therefore AF is taken as 0.
Any comment:	

Data / Parameter:	**φ**
Data unit:	N/A
Description:	Model correction factor to account for model uncertainties
Source of data used:	"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.
Any comment:	

Data / Parameter:	**OX**
Data unit:	N/A
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.1
Justification of the choice of data or description of	The Project site will be covered with soil, therefore OX=0.1 according to the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**F**
Data unit:	N/A
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	A preliminary sampling carried out on the Project site indicates a methane fraction around 0.6. A default value of 0.5 is recommended by IPCC, therefore 0.5 is used in a conservative manner in order to avoid overestimation of emission reductions.
Any comment:	

Data / Parameter:	**DOC_f**
Data unit:	N/A
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The default value suggested by the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" is used.
Any comment:	

Data / Parameter:	**MCF**
Data unit:	N/A
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	1

Justification of the choice of data or description of measurement methods and procedures actually applied :	The Project site is an anaerobic managed solid waste disposal site with controlled placement of waste and the site will be covered with soil. According to the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", a value of 1 shall be used for such sites.
Any comment:	

Data / Parameter:	**DOC_j**
Data unit:	N/A
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	For different waste types, the fraction of DOC varies;

$W_{j,x}$	**$DOC_{j\ wet}$**
Wood, wood products and straw	43%
Pulp, paper and cardboard (other than sludge)	40%
Food, food waste, sewage sludge, beverages and tobacco	15%
Textiles	24%
Other (non-food) organic putrescible garden and park waste	20%
Glass, plastic, metal, other inert waste	0%

Justification of the choice of data or description of measurement methods and procedures actually applied :	The default DOC values for wet SW are used, in agreement with the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". The waste types which have been reported in the feasibility study have been classified to the most similar waste types listed in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site".
Any comment:	

Data / Parameter:	**k_j**
Data unit:	N/A
Description:	Decay rate for the waste type *j*
Source of data used:	For k_j values: IPCC 2006 Guidelines for National Greenhouse Gas Inventories For climate data (1975-2006 Averages): National General Directorate for Meteorology (http://www.dmi.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?m=SAMSUN ; http://www.dmi.gov.tr/veridegerlendirme/yillik-toplam-yagis-verileri.aspx?m=SAMSUN)

Value applied:	For different waste types, the decay rate varies; $W_{j,x}$ / k_j Wood, wood products and straw: 0.03 Pulp, paper and cardboard (other than sludge): 0.06 Food, food waste, sewage sludge, beverages and tobacco: 0.185 Textiles: 0.06 Other (non-food) organic putrescible garden and park waste: 0.10 Glass, plastic, metal, other inert waste: 0.00
Justification of the choice of data or description of measurement methods and procedures actually applied :	The "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" lists decay rates for different waste types. The selection of appropriate k_j values are made according to a "boreal and temperate" and "wet" climate.
Any comment:	

Data / Parameter:	**ρ_{CH4}**
Data unit:	t/m^3
Description:	Density of methane at normal conditions
Source of data used:	"Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value applied:	0.0007168
Justification of the choice of data or description of measurement methods and procedures actually applied :	The methane density under normal conditions (0° C and 1,013 bar) is constant.
Any comment:	

Data / Parameter:	**GWP_{CH4}**
Data unit:	t_{CH4}/t_{CO2eq}
Description:	Global Warming Potential of methane valid for the commitment period
Source of data used:	"Tool to determine project emissions from flaring gases containing methane"
Value applied:	21
Justification of the choice of data or description of	The default GWP value of 21 is used as suggested by the UNFCCC tool.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**COL**
Data unit:	%
Description:	Collection Ratio of the generated LFG
Source of data used:	Feasibility Study
Value applied:	70%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The collection system which will be installed on the Project site will be able to collect a certain fraction of the total LFG generation. This collection ratio is affected principally by the Project's technical design, therefore the value suggested in the feasibility study is used.
Any comment:	

Data / Parameter:	η_{flare}
Data unit:	N/A
Description:	Flaring efficiency of the flare
Source of data used:	"Tool to determine project emissions from flaring gases containing methane"
Value applied:	90%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The determination of the flare efficiency will be based on "enclosed flares and use of the default value". The flare will be monitored with probes with an adequate frequency; According to "Methodological "Tool to determine project emissions from flaring gases containing methane" (EB 28), a default value of 90% will be used. Continuous monitoring of compliance with manufacturer's specification of flare will be performed. If in a specific hour any of the parameters are out of the limit of manufacturer's specifications, a 50% default value for the flare efficiency will be used for the calculations for this specific hour.
Any comment:	

Data / Parameter:	$BE_{CH4,SWDS,y}$
Data unit:	t_{CO2-eq}
Description:	Methane generation from the landfill in the absence of the project activity at year *y*
Source of data used:	Calculated as per the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value applied:	Equation (7)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Feasibility Study of the Project employs a First Order Decay model, which is not compatible with the UNFCCC "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site". Therefore, this parameter has been calculated in the PDD separately.
Any comment:	

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

The Project's emission reductions stem from the prevention of methane emissions to the atmosphere from the SWDS as well as substitution of electricity by generation of electrical power from the LFG. There are basically two components of the baseline emissions;

i. Landfill gas, and;

ii. Electricity generation.

i. Landfill Gas Component

The Project will make use of flow meters to measure the LFG amounts and characteristics of the total collected LFG ($LFG_{total,y}$), LFG went to flaring ($LFG_{flare,y}$), and LFG went to the generator ($LFG_{electricity,y}$).

In order to calculate the LFG generation of the selected site, the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" suggests the use of the Equation (7). Using the LFG figures, the methane destroyed by the Project is found by using Equation (4), (5) and (6).

For the purpose of calculation of the LFG generation, the First Order Decay model is used, as required. The amount of SW dumped on the Project site is calculated using sophisticated models by the Project owner. The flow of waste amount is found out to be as:

Table 13. Composition and amount of disposed waste on project site[22]

Wj,x	Wood, wood products and straw	Pulp, paper and cardboard (other than sludge)	Food, food waste, sewage sludge, beverages and tobacco	Textiles	Other (non-food) organic putrescible garden and park waste	Glass, plastic, metal, other inert waste
Fraction, %	13.6%	4.9%	41.8%	8.0%	8.0%	23.8%
Year	Tons:	Tons:	Tons:	Tons:	Tons:	Tons:
2008	14,620	5,268	44,881	8,600	8,600	25,531
2009	24,752	8,918	75,985	14,560	14,560	43,225
2010	25,990	9,364	79,784	15,288	15,288	45,386
2011	27,289	9,832	83,773	16,052	16,052	47,656
2012	28,654	10,324	87,962	16,855	16,855	50,038
2013	30,086	10,840	92,360	17,698	17,698	52,540
2014	31,590	11,382	96,978	18,583	18,583	55,167
2015	33,170	11,951	101,827	19,512	19,512	57,926
2016	34,497	12,429	105,900	20,292	20,292	60,243
2017	35,877	12,926	110,136	21,104	21,104	62,652
2018	37,312	13,443	114,542	21,948	21,948	65158
2019	38,804	13,981	119,123	22,826	22,826	67,765
2020	40,356	14,540	123,888	23,739	23,739	70,475
2021	41,567	14,976	127,605	24,451	24,451	72,590
2022	42,814	15,426	131,433	25,185	25,185	74,767
2023	44,099	15,888	135,376	25,940	25,940	77,010
2024	45,422	16,365	139,437	26,719	26,719	79,321
2025	46,784	16,856	143,620	27,520	27,520	81,700
2026	48,188	17,362	147,929	28,346	28,346	84,151
2027	49,633	17,883	152,367	29,196	29,196	86,676

The following main parameters are calculated or used in the model;

Table 14. Main constants used in the calculations

Year	$TMR_{G,y}$	Flare Efficiency	Global warming potential of LFG	Project Emissions from Flaring [tCO_2]	Fraction of methane in LFG, %	Density of methane, t/m^3	Regulatory capture requirement coefficient, %
2011	0	90%	21	0	50%	0.0007168	0
2012	0	90%	21	0	50%	0.0007168	0
2013	0	90%	21	0	50%	0.0007168	0
2014	0	90%	21	0	50%	0.0007168	0
2015	0	90%	21	0	50%	0.0007168	0
2016	0	90%	21	0	50%	0.0007168	0
2017	0	90%	21	0	50%	0.0007168	0
2018	0	90%	21	0	50%	0.0007168	0

[22] The Project owner has carried out waste samplings before the tender to assess the waste and landfill gas specifications . This sampling has been performed on site at different points by experts and is reported, including waste characteristics and composition information. Therefore, the project proponents' own values are used instead of national average waste composition percentages.

Using appropriate decay rates k_j and fractions of degradable organic carbon DOC_j and taking the capacities of the generator and the flare, the Equation (7) results in the LFG generation figures as described in Table 15.

The project emissions from flaring shall be subtracted from the methane destroyed by flaring, using the Equation (6), as explained in the "Tool to determine project emissions from flaring gases containing methane. An enclosed flare will be operated in agreement with its manufacturer's specifications and will be monitored. Accordingly, the $PE_{flare,y}$ over years is given in Table 15.

Using these results, the net methane amount destroyed by flaring is found with the Equation (5) and is listed in Table 15.

These figures for the first and last year of the crediting period are not given for the entire year but only partially depending on the crediting start date of the proposed Project activity. The Project's methane destruction is calculated with the Equation (4) and Equation (3) and the results are reported below;

Table 15. Calculation results: LFG generation, flaring emission and methane destruction of the Project

Year	Total LFG generation on site, as m3 LFG	Maximum collectable LFG [m3]	Methane destroyed by flaring (eligible) [tCO2]	Methane destroyed by electricity generator [tCO2]	Ratio of met. for power gen. / total met. destruction [%]	Project Emissions from Flaring [tCO2]	ER from power substitution, tCO2
2011	5,218,699	1,844,417	0	13,882	100%	0	1,949
2012	6,977,991	4,186,795	0	31,511	100%	0	4,425
2013	8,641,805	5,185,083	0	39,025	100%	0	5,480
2014	10,232,712	6,139,627	0	46,209	100%	0	6,489
2015	11,770,031	7,062,018	0	53,152	100%	0	7,464
2016	13,270,375	7,962,225	0	59,927	100%	0	8,415
2017	14,718,569	8,831,141	0	66,467	100%	0	9,334
2018	16,128,375	9,677,025	0	72,833	100%	0	10,228

ii. Electricity Generation Component

As the Project's electricity generation does not exceed the UNFCCC threshold of 15 MW, the Project is eligible for using the small scale methodologies for electricity generation. According to the "Tool to calculate the emission factor for an electricity system", the missing parameters are the emission factors $EF_{GRID,OM,y}$ and $EF_{GRID,BM,y}$, which shall be calculated in 6 subsequent steps.

STEP 1. Identify the relevant electric power system

Turkey imports electrical power from and exports to neighbour countries[23], which are defined as *connected electricity systems* for the Project. According to the baseline methodology, imports are

[23] Since 2001: Exports to Georgia, Azerbaijan, Iraq, Syria. Imports from Bulgaria, Iran, Turkmenistan, Georgia. Sources: http://www.teias.gov.tr/ist2006/49.xls, http://www.teias.gov.tr/ist2006/47.xls

regarded as a power source delivering electricity to the grid with an OM emission factor of 0 tCO_2, since electricity being imported is purchased from connected electricity systems located in other countries.

STEP 2. Select an operating margin (OM) method

As explained above, the ex-ante combined margin method will be used.

There exists no nuclear power plant in Turkey, and there is no indication that coal or lignite is obviously used as must-run. Hydro, geothermal, wind power plants and other renewables are included as low-cost/must-run resources, hereafter referred as *lc-mr*, which turns out to be 23.4% of the total electricity generation on average between years 2004 and 2008.

Since the share of lc-mr resources is less than 50% on average of the five most recent years and as available data are limited, the simple OM method will be implemented.

Table 16. Gross and Net Electricity Generation [GWh] in Turkey

GENERATION DATA BY SOURCE, Gwh	2004	2005	2006	2007	2008	Avg. Share
Coal	11,998	13,246	14,217	15,136	15,858	8.0%
Lignite	22,450	29,946	32,433	38,295	41,858	18.6%
Fuel Oil	6,690	5,121	4,232	6,470	7,209	3.4%
Diesel oil	7	3	58	13	266	0.0%
LPG	33	34	0	0	0	0.0%
Naphtha & Aphaltite	940	326	50	44	44	0.2%
Natural Gas	62,242	73,445	80,691	95,025	98,685	46.4%
Renewables and wastes	104	122	154	214	220	0.1%
Hydro	46,084	39,561	44,244	35,851	33,270	23.1%
Geothermal & Wind	151	153	221	511	1,009	0.2%
Gross Total	**150,698**	**161,956**	**176,300**	**191,558**	**198,418**	100.0%
Gross Total excluding lc-mr	104,360	122,120	131,681	154,983	163,919	
Net Generation	145,066	155,469	169,543	183,340	189,762	
Net Delivery Ratio	96.3%	96.0%	96.2%	95.7%	95.6%	
Imports	463.5	635.9	573.2	864.3	789.4	
Net Delivered to Grid, exc. lc-mr	*100,923*	*117,864*	*127,208*	*149,198*	*157,558*	

The UNFCCC methodology suggests using local, publicly available data whenever possible. In the lack of local data, industry guidelines shall be used in a conservative manner. 2005-2008 national emissions figure stemming from electricity generation is publicly available and used for OM calculations.

STEP 3. Calculate the operating margin emission factor according to the selected method

According to the "Tool to calculate the emission factor for an electricity system", the OM emission factor, $EF_{GRID,OM,y}$, is found as;

$EF_{GRID,OM,y} = EM_{grid,y} / EG_y$, (9)

Using official CO_2 emissions data instead of calculated figures, the **Operating Margin Emission Factor, $EF_{GRID,OM}$,** is found to be as the following;

Table 17. Calculation of the OM emission factor

Operating Margin EF	2006	2007	2008	Note
CO_2 Emissions, $ktCO_2$ (Official Data)	85,312	100,662	101,473	used
CO_2 Emissions, $ktCO_2$ (Calculation)	82,844	98,099	103,714	not used
Net Electricity Supplied to grid, GWh	127,208	149,198	157,558	
OM Emission Factor in year y, tCO_2/MWh	0.671	0.675	0.644	
Operating Margin EF 2006-2008, tCO_2/MWh	**0.663**			

STEP 4. Identify the cohort of power units to be included in the build margin

In this step, a generation-weighted average emission factor is calculated based on a sample of power plants, which have been taken into operation recently. The sample group of power plants/units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently

(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.

For conducting the calculations, option (b) is selected, because this option results in a larger electricity generation. The data of the most recent commissioned power plants are being published by the Turkish Electricity Transmission Company (TEİAŞ) on an annual basis. For build margin calculations, the power plants/units taken into operation between 2004-2008 are included in the cohort of power units. Performance revisions, modifications, retrofits and dismantlings of power plants or are stand-alone have been excluded from the samples list for the build margin calculations.

Based on these requirements and conditions, the final list of selected power plants is summarized in Annex 3.

STEP 5. Calculate the build margin emission factor

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows;

$$EF_{GRID,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (10).$$

The $EF_{EL,m,y}$ is found as;

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} * 3,6}{\eta_{m,y}} \qquad (11)$$

Power plant-specific data are unavailable in Turkey; therefore CO_2 emissions are calculated based on fuel type consumed in sample power plants/units. Data regarding electricity generation efficiency rates in Turkey are not available for each power plant in the sample list. The "Tool to calculate the emission factor for an electricity system" requires the sample list of recent capacity additions to constitute at least 20% of the system generation. This requirement is met;

Table 18. Generation of Recent Capacity Additions

Generation Sample List	Generation [GWh]
2008 Generation, GWh	191,558
UNFCCC Threshold, % of Generation	20%
UNFCCC Threshold, GWh	38,311.6
Capacity Additions, 2004-2008 GWh	42,929.0

Using the sample list of recently built power plants, the **Build Margin Emission Factor, $EF_{GRID,BM}$**, is found as;

Table 19. CO_2 Emissions of Recent Capacity Additions by Fuel Type

Fuel Type	Generation of New Capacity Additions	Average Efficiency, η	Emission Factor, tCO_2/TJ	CO_2 Emissions, $ktCO_2$
Coal	1,125.0	40.0%	90.8	919
Lignite	11,451.1	40.0%	90.9	9,368
Fuel Oil	1,474.9	46.0%	75.5	871
Diesel oil	0.0	46.0%	72.6	0
LPG	0.0	60.0%	61.6	0
Naphtha & Asphaltite	323.5	46.0%	69.3	175
Natural Gas	25,083.9	60.0%	54.3	8,172
Renewables and wastes	119.0	N/A	0.0	0
Hydro	3,243.3	N/A	0.0	0
Geothermal & Wind	108.4	N/A	0.0	0
Total	**42,929.0**			**19,507**
Build Margin EF 2006-2008, tCO2/MWh	**0.454**			

STEP 6. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated by using Equation (8). The weights are taken as 50% for both factors, as the "Tool to calculate the emission factor for an electricity system" suggests.

CEFelec,y = 0.663 tCO_2/MWh * 50% + 0.454 tCO_2/MWh * 50% = **0.559 tCO_2/MWh**

Project emissions and leakage are not 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, transport). These emissions sources are neglected in agreement with the baseline methodology.

Emission Reductions

The Project facility will consume some of the generated electricity for its own purposes. The remaining power will be supplied to the grid. The methane destruction required by legislation and the project emissions from flaring shall be deducted from the emission reductions. Thus, the emission reductions are found by aggregating:

- Methane destruction by the power generation set,
- Methane destruction by flaring,
- Substitution of baseline grid electricity,
- Project emissions from flaring and regulations forcing methane destruction (negative)

The emission reductions will be eligible for crediting period, where the first and last years are included only partially.

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

The results of the baseline calculations are as follows;

Table 20. Results of the Emission Reduction Calculations

Year	Estimation of project activity emissions (tonnes of CO2 e)	Estimation of baseline emissions (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of overall emission reductions (tonnes of CO2 e)
2011 (partial)	1,553	23,856	0	22,303
2012	0	35,937	0	35,937
2013	0	44,505	0	44,505
2014	0	52,698	0	52,698
2015	0	60,616	0	60,616
2016	0	68,342	0	68,342
2017	0	75,801	0	75,801
2018 (partial)	0	48,926	0	48,926
2019	0	0	0	0
2020	0	0	0	0
2021	0	0	0	0
Total (tonnes of CO2e)	**1,553**	**410,681**	**0**	**409,128**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$PE_{FC,j,y}$
Data unit:	$tCO2_e$
Description:	Project emissions from fossil fuel combustion in process *j* during the year *y*
Source of data to be used:	Calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
Measurement procedures (if any):	This data will be calculated based on the actual fossil fuel consumption by the Project activity as auxiliary fuel.
Monitoring frequency:	Annually.
QA/QC procedures:	The consumption of fossil fuel will be monitored based on the fuel invoices and is therefore of high quality.
Any comment:	

Data / Parameter:	$MG_{PR,y}$
Data unit:	tCH_4
Description:	Amount of methane generated during year *y* of the project activity
Source of data to be used:	Project proponents
Measurement procedures (if any):	Estimated using the actual amount of waste disposed in the landfill as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Monitoring frequency:	Annually.
QA/QC procedures:	The amount of waste disposed is recorded electronically at the landfill site entrance with a weighing machine and is therefore of high quality.
Any comment:	

Data / Parameter:	$LFG_{total,y}$
Data unit:	Nm^3
Description:	Total amount of landfill gas (under normal pressure and temperature) captured in year y
Source of data to be used:	The flow meter readings installed at the LFG pipe
Measurement procedures (if any):	This value is variable over the crediting period.

Monitoring frequency:	Data will be measured continuously with a flow meter by the Project owner. The flow meter will be maintained and calibrated regularly in line with the manufacturer's recommendations. This will ensure that the accuracy of the measurement instrument is maintained.
QA/QC procedures:	Data will be aggregated monthly and yearly. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. The measurement interval will be equal to or more than one sampling each hour.
Any comment:	

Data / Parameter:	**$LFG_{flare,y}$**
Data unit:	Nm^3
Description:	Total amount of landfill gas (under normal conditions of 0° and 1 Atm) flared in year y
Source of data to be used:	The flow meter installed at the pipe feeding the flare
Measurement procedures (if any):	This parameter will be measured by a dedicated measurement device in accordance with UNFCCC and device manufacturer's requirements.
Monitoring frequency:	There will a separate flow meter for each of the flare units, as required by the Methodology. Data will be measured continuously with a flow meter by the Project owner. The flow meter will be maintained and calibrated regularly in line with the manufacturer's recommendations. This will ensure that the accuracy of the measurement instrument is maintained.
QA/QC procedures:	Data will be aggregated monthly and yearly for each flare unit. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. The measurement interval will be equal to or more than one sampling each hour.
Any comment:	

Data / Parameter:	**$LFG_{electricity,y}$**
Data unit:	Nm^3
Description:	Total amount of landfill gas (under normal conditions of 0° and 1 Atm) combusted in the generator unit in year y
Source of data to be used:	The flow meter readings installed at the pipe feeding the generator unit(s)
Measurement procedures (if any):	This parameter will be measured by a dedicated measurement device in accordance with UNFCCC and device manufacturer's requirements.
Monitoring frequency:	There will a separate flow meter for each of the generator units, as required by the Methodology.

	Data will be measured continuously with a flow meter by the Project owner. The flow meter will be maintained and calibrated regularly in line with the manufacturer's recommendations. This will ensure that the accuracy of the measurement instrument is maintained.
QA/QC procedures:	Data will be aggregated monthly and yearly for each generator unit. Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy. The measurement interval will be equal to or more than one sampling each hour.
Any comment:	

Data / Parameter:	w_{CH4}
Data unit:	%
Description:	Methane fraction in the landfill gas
Source of data to be used:	Flow meter , by the Project owner
Measurement procedures (if any):	50%
Monitoring frequency:	Methane content will be measured directly and continuously with a gas analyser by the project owner. The gas analyser will be maintained and calibrated regularly according to the manufacturer's requirements in order to ensure that required level of accuracy is maintained.
QA/QC procedures:	The gas analyser will be subject to a regular maintenance and testing regime to ensure accuracy, therefore the analyser will be calibrated according to the manufacturer's recommendations. A zero check and a typical value check will be performed by comparison with a standard certified gas. The measurement interval will be equal to or more than one sampling each hour.
Any comment:	

Data / Parameter:	$PE_{flare,y}$
Data unit:	t_{CO2-eq}
Description:	Project Emissions from flaring in year *y*
Source of data to be used:	Calculated by project owner
Measurement procedures (if any):	This parameter will be calculated.
Monitoring frequency:	Data will be calculated based on the default values for the flare efficiency ($\eta_{flare,h}$) and the flow meter readings ($FV_{RG,h}$) from the Project Developer according to the "Tool to determine project emissions from flaring gases containing methane".

QA/QC procedures:	Data will be aggregated yearly. Flow meters will be subject to a regular maintenance to ensure accuracy.
Any comment:	

Data / Parameter:	**T_{flare}**
Data unit:	°C
Description:	Temperature in the exhaust gas of the flare
Source of data to be used:	The thermocouple installed at the pipe feeding the flare
Measurement procedures (if any):	This parameter will be measured by a dedicated measurement device in accordance with UNFCCC and device manufacturer's requirements.
Monitoring frequency:	Measurement of the temperature of the stack gas with an N-type thermocouple. Temperatures above 500 °C indicate that the flare is operating.
QA/QC procedures:	The thermocouple should be subject to a regular calibration or replacement every year to ensure accuracy.
Any comment:	

Data / Parameter:	**Operation of the power plant**
Data unit:	h
Description:	Operation of the power plant
Source of data to be used:	Project owner
Measurement procedures (if any):	N/A
Monitoring frequency:	Data will be recorded annually by the project developer to ensure methane destruction is claimed for methane used in electricity plant when it is operational.
QA/QC procedures:	Equipment will be maintained according to the manufacturer's recommendations to assure a good operation.
Any comment:	

Data / Parameter:	**AF**
Data unit:	%
Description:	Regulatory requirements relating landfill gas projects
Source of data to be used:	National laws and regulations.
Measurement	0.

procedures (if any):	No enforced regulations relating to landfill gas recovery or power generation projects.
Monitoring frequency:	This information will be checked yearly.
QA/QC procedures:	In case of a change of the Article 27 of the relevant regulation "Control of Solid Waste Regulation", this change will be included in the monitoring report.
Any comment:	

Data / Parameter:	**$EL_{LFG,y}$**
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used:	PMUM reports. PMUM is the financial settlement centre of TEIAS, which has an online user interface for reporting purposes. PMUM web site can list a detailed overview of electricity generation and consumption figures of power plants, based completely on the measurement device readings carried out by TEIAS personnel.
Measurement procedures (if any):	For calculating expected emission reductions, the "estimated" amount of annual net electricity generation is used.
Monitoring frequency:	Data will be obtained on-line from the PMUM web site by the project owner using its own unique ID and password. The PMUM reports will be then submitted to the DOE for monitoring purposes. The PMUM data are based on measurement device readings carried out on site by TEIAS personnel. Two TEIAS-calibrated and approved measurement devices will be installed, which measure the net electricity supply to the national grid by the Project. The switchgear station on the Project site constitutes the border between the Project and the national electricity grid. Both measurement devices, which continuously monitor and measure the net electricity delivered by the Project to the grid. TEIAS-approved measurement protocols each month will be uploaded to the PMUM web site. The metering device does not measure the net electricity generation but the gross generation and self consumption separately. Their difference gives the net electricity generation, which is going to be listed on a monthly basis for monitoring purposes.
QA/QC procedures:	The measurement devices will be selected in agreement with the relevant regulations, ensuring a certain data storage and measurement quality in terms of accuracy etc. PMUM is owned and operated by the public transmission line operator TEIAS, which purchases the electricity from the project owner. Therefore, PMUM reports offer a conservative, dependable and correct way for monitoring net electricity supplied to the grid.

	There is no sampling involved in monitoring. All data used will be measured, increasing the accountability of the calculated emission reductions. In order to maintain uninterrupted measurement and to prevent technical errors, a back-up measurement device will also be installed, which will continuously measure and store generation and consumption data real-time, parallel to the main measurement device. Before installation, both measurement devices will be calibrated by TEIAS. If a malfunctioning is observed during operation, the measurement device will again be inspected and calibrated by TEIAS. Both measurement devices will be sealed and only accessible by TEIAS personnel. Project staff or any other personnel will have no control over or access to the measurement devices. Measured data will be both kept by the project owner and the PMUM web site for at least 2 years following the crediting period end. The net electricity supplied to the grid will be calculated by subtracting Project's own consumption from gross generation figure. This calculation will be done with a spreadsheet in order to allow easy understanding, transparency and correct computation purposes with minimum human intervention.
Any comment:	The annual emissions reductions will be updated by multiplying the ex-ante calculated baseline emission factor by the PMUM-reported amount of net electricity supplied to the grid. The emission factor will not be updated.

B.7.2. Description of the monitoring plan:

A monitoring plan will be implemented to ensure that the approved monitoring methodology is implemented correctly which enables the determination of avoided emissions in an accurate and transparent way. The plan will incorporate the QA/QC procedures described in B.7.1. The monitoring plan overview can be visualized as below:

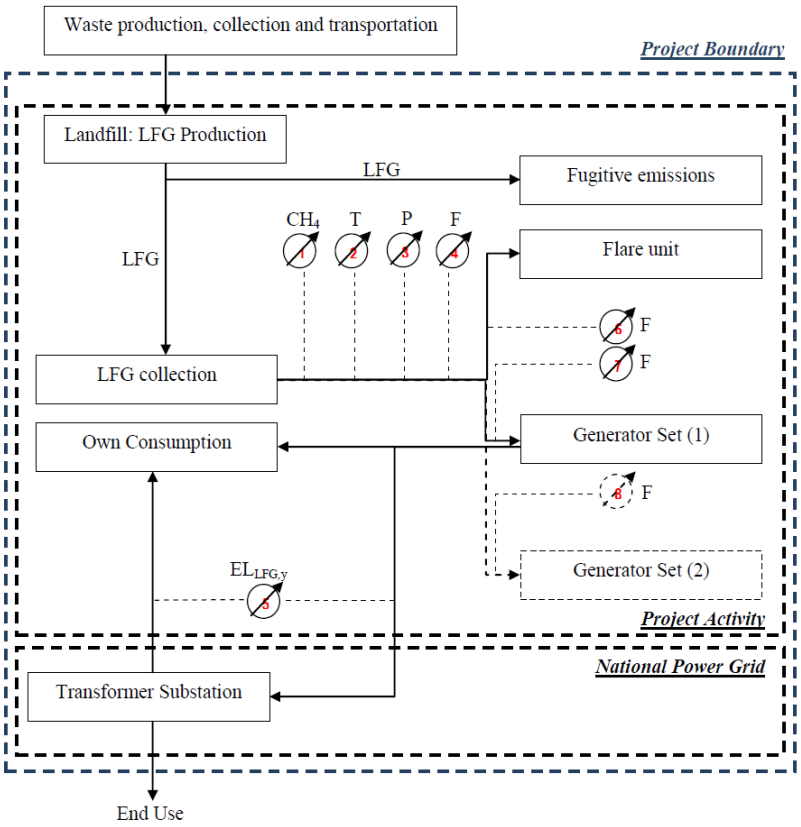


Figure 6. Monitoring System Flowchart

The monitoring instruments to be installed include LFG flow meters, methane meters, pressure and temperature gauges and electricity measurement devices. All the monitoring instruments will meet the relevant accuracy requirements.

Table 21. Summary of the monitoring plan

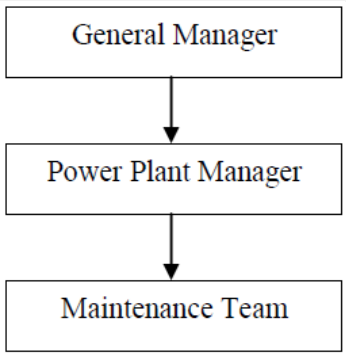
Parameter	Explanation	Measurement Device Number
$w_{CH4,y}$	Methane fraction in the landfill gas	1
T	Temperature	2
P	Pressure	3
$LFG_{total,y}$	Total amount of landfill gas captured at normal temperature and pressure	4
$EL_{LFG,y}$	Net amount of electricity supplied to the grid by the Project	5
$LFG_{flare,y}$	Amount of landfill gas flared at normal temperature and pressure	6
$PE_{flare,y}$	Project emissions from flaring	6
$LFG_{electricity,y}$	Amount of landfill gas combusted in the power plant at normal temperature and pressure	7, 8, ...
Operation of the	Annual operational hours	7,8, ...

power plant		

The monitoring plan mainly involves proper preparation of a spreadsheet and reporting of it. Monitoring will be carried out with the help of a spreadsheet and supporting documentation. All data used for the monitoring plan will be archived electronically and backed up regularly. These data will be kept for the full crediting period and a further two years after the end of the crediting period or the last issuance of carbon credits, whichever occurs later.

Please refer to section B.7.1 for details.

Responsibilities and Management Structure for Monitoring



The responsible person for the monitoring of the Project is the general manager of the Project owner. The Project owner will appoint a project manager who will collect the data. The data will be processed and reported in agreement with the monitoring plan by the general manager. The general manager can assign a carbon consultant for these tasks.

The general manager of the Project owner is responsible for overseeing the implementation of the monitoring procedure. Competency requirements for these tasks will be applied to ensure that the general manager is able to implement and/or supervise this procedure. The general manager will be responsible of the emission reduction calculations and the preparation of necessary documents for verification.

The general manager will appoint the power plant manager for data collection, checking instrumentation, record keeping, data handling and data processing, filing, reporting, organising repair and maintenance of monitoring equipment and ensuring the monitoring plan is adhered to as indicated in the approved PDD. The general manager will ensure that the personnel of the Project owner acquires the skills to carry out these tasks properly through capacity building practices and trainings.

The maintenance staff will receive technical trainings, as well as health and safety trainings to minimise exposure to workplace hazards. At every shift, at least one trained technical personnel will be present. All relevant information such as data files, maintenance and defect records and other monitoring related records will be kept at a designated location in a transparent and organised manner.

The SCADA monitoring system of the Project in general follows the requirements of methodology ACM0001 version 11. The *Figure 6* shows the overview of the monitoring system and the measurement devices.

Data Collection and Management

Remote Monitoring: All important parameters that are needed to determine the avoided emissions will be able to be monitored from the control room of the Project as well as remotely from the company office. The SCADA system will record meter readings at pre-determined intervals, as specified in the CDM monitoring manual. These data will be used to calculate the total emission reductions.

Manual Recording of Data: The general manager will implement a manual data recording system to act as a back-up for the on-line monitoring system. This basic back-up system will consist of regular updating of a spreadsheet manually that includes the main key parameters.

Data Archiving: The electronic monitoring system will periodically archive the readings data. Written documents (e.g. equipment replacement protocols, accident logs, maintenance records, back-ups etc.) will be kept safely. These data will be stored until 2 years after the end of the crediting period. The general manager will implement a document control system that ensures that the correct versions of documents that might be necessary for verification purposes are available whenever needed.

Data corruption: If data in the SCADA system are corrupted or missing during the operational hours (which can be proven by the records of the electricity meters), the missing data can be estimated by the following procedure: the value of that parameter one hour before the error, one hour after the system restart, and the average from the previous 24 hours will be determined and the lowest figure of those will be used. For other cases, any deficiencies in methane flow monitoring data will be rectified by calculation from power generation in a conservative manner.

Maintenance and calibration of meters

All measurement devices will be purchased and maintained as specified in the CDM monitoring manual according to manufacturer specifications. All measurement devices that are used in monitoring will be subject to a quality control procedure that will include regular maintenance and calibration in agreement with legal and/or manufacturer requirements. According to the relevant regulation[24], periodical inspections of "gauges for electric, water, coal gas, natural gas and, current and voltage measuring transformers will be made once in 10 years".
For every calibration, a separate calibration record will be kept that shows the identification number of each measurement device, calibration date, due date for next calibration, calibration service provider etc. Calibration certificates will be kept for every measurement device until two years after the end of the crediting period.

A. Electricity Generation Component

As the project boundary is defined as the national grid of Turkey, the baseline emissions from electricity generation activities in Turkey are calculated and monitored based on national official data. The leakage during crediting period will be negligibly small and will not be monitored, as fossil fuel consumption during construction and operation of the project activity is minimal. Hence, the monitoring plan involves the net electricity generation by the project activity;

- The two measurement instruments are not accessible by the project participant or any other party except TEİAŞ. This prevents any intervention and assures the accuracy and quality of the measurements.
- The measurement instruments in broad terms give two types of data; the total gross electricity generated and the total electricity consumed by the Project activity. The difference of these two data is the net electricity generated. Furthermore, TEİAŞ cuts a certain percentage of the generation to account for transmission losses. The net electricity generation, which is to be

[24] "Measurement and Measuring Tools Inspection Regulation", Date: 24/07/1994, Official Gazette Number: 22000

monitored and to be used for baseline emissions, is the net electricity generation, without the cut, which is the difference of gross electricity generation and self electricity consumption.

- At the end of each monitoring period, the data from the monthly meter readings will be added up to obtain the total monitoring period net electricity generation. This figure will be multiplied with the combined margin emission factor, which has been calculated ex-ante.
- The procedure will be repeated for each month. The sum of emission reductions of each month will give the total offsets achieved by the Project.

Self consumption of the project activity:

Each project activity has a certain amount of self electricity consumption. Similar to energy generation, energy consumption is also recorded and accounted for the invoicing. The electricity consumption of the Project will mostly be covered by the Project's own electricity generation and the remaining power will be the one which will be measured and fed to the transmission line. In cases when the Project's own power generation is not high enough to cover its own consumption, electricity from the grid will be used. This usage will be measured by the two measurement devices. The TEIAS personnel comes on the first days of each succeeding month and takes the readings of the previous month in terms of gross electricity generation and self electricity consumption (beside others) which are then used for invoicing purposes.

Following this reading, the results are transmitted on site to the TEIAS network by the TEIAS personnel electronically without any intervention. Based on this reading, a protocol form is printed out, which lists in detail the energy generation and consumption values in a similar way the PMUM web site lists them, and is then signed by the site manager and the TEIAS personnel. Therefore, self consumption values are recorded, read and treated similar to the generation values. Project participants have no access to the metering devices and the self electricity consumption data is of high quality.

Data Source:

At the first day of each month, a TEIAS personnel comes to the sites and makes a reading regarding the last period from the beginning to the end of the previous month. After making the reading from the metering device, a standard protocol showing the generation and consumption data is signed by the site manager and the TEIAS personnel. Under normal conditions, these figures are used for invoicing purposes.

Based on these monthly protocols, a detailed breakdown of generation and consumption figures is also supplied by the TEIAS Market Financial Clearing Center (PMUM) website. The project participant can access its own consumption and generation data through the web site of PMUM (http://dgpys.teias.gov.tr/dgpys) by using a secured ID and password. After accessing this web site, the project participant is able to call actual and historical data. These data are used by TEIAS for invoicing, and the same data source will be used for the determination of emission reductions.

TEIAS invoices according to the net electricity supply, which takes transmission line losses into account. This means that the invoiced amount of electricity is the difference of gross generation, self consumption and transmission line losses, which is determined by TEIAS every month as a certain percentage.

For emission reductions calculations, however, transmission line losses shall *not* be subtracted; therefore the invoiced amount of energy cannot be used. Instead, $\mathbf{EG_{facility,y}}$ (Annual net electricity amount fed to

the grid by the project activity) will be used, which is the monitoring parameter, is the difference between the Gross Electricity Generation (GEG_y) and project activity's Self Electricity Consumption (SEC_y):

$EG_{facility,y} = GEG_y - SEC_y$

PMUM website publishes monthly GEG_y and SEC_y data in detail, however it does not show $EG_{facility,y}$ separately. Therefore, for each month GEG_y and SEC_y data need to be recorded and their difference has to be calculated on a monthly basis. The annual total net electricity generation is then found by summing up monthly $EG_{facility,y}$ values.

These monthly figures will be used to fill in the Net Electricity Generation Monitoring Plan spreadsheet-table. The scans of monthly report print-outs will be also be supplied as proof to the DOE.

The monthly invoices will also be cross-checked with the PMUM records and monthly protocols to ensure high data quality.

B. LFG Consumption for Electricity Generation

The amount of LFG combusted in the gas engines will be monitored by effectively and conservatively monitoring the methane amount supplied into each of the engine units. The actual emission reductions from the destruction of methane in the combustion units will be calculated such that the risk of overestimation is minimised, and according to the ACM0001 v.11, "Consolidated baseline and monitoring methodology for landfill gas project activities". The readings will be taken and recorded internally by compatible and proper measurement devices automatically with high data quality.

C. LFG Consumption by Flaring

An enclosed flare unit will be installed with a flame detection unit. The project emissions from flaring and emission reductions from the destruction of LFG will be monitored at this point. The readings will be taken and recorded internally by compatible and proper measurement devices automatically with high data quality.

The actual project emissions from flaring will be calculated in a conservative manner using the "Tool to determine project emissions from flaring gases containing methane"; EB28, Annex 13. Please refer to section B.7.1 and B.7.2 for details.

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):

This monitoring methodology and baseline study application was completed on 01/01/2011 by Yagmur Karabulut.

Consultant: Mavi Sürdürülebilir Kalkinma Proje ve Danismanlik Hiz. Ltd. Sti.
Address: Baba Efendi S. 5/2 34357 Akaretler, Istanbul - TURKEY
Telephone: +90 212 3270922
Fax: +90 212 3270925
E-Mail: info@maviconsultants.com
Web: www.maviconsultants.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:

The starting date of a project activity is the earliest date at which either the implementation or construction or real action of a project activity begins[25]. The construction start date of the Project is 13/09/2010. There is no loan agreement signed as of the date of PDD preparation. The main equipment order (generator set) is signed on 29/11/2010. The Project is expected to start its operations on 01.06.2011. Therefore, the starting date of the project activity shall be considered as 13/09/2010.

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

The Project is designed for an operation lifetime of 28 years, according to the contract with the Samsun Municipality.

This is plausible, considering the estimated 8,000 hours/year operating hours of the Project and the suggested equipment lifetime of 150,000 operating hours given in the "Tool to determine the remaining lifetime of equipment", v.1.

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

C.2.1. Renewable crediting period:

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

01/06/2011

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

[25] *CDM Glossary of Terms*, Version 03

C.2.2.2.	Length:

N/A

SECTION D. Environmental impacts

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

The Project activity has been exempted by the Ministry of Forest and Environment from the requirement to carry out an Environmental Impact Assessment. The Project is fully in line with national laws and regulations, including those involving environment, health and safety.

Current practice on the site is a managed landfill with no methane recovery. The Project has several environmental benefits:

- The landfill gas collection system will reduce odour from the landfill,
- The LFG recovery will reduce GHG emissions and help in tackling with global warming,
- It will set a good example for proper waste management with improved health and safety impacts,
- It will minimize explosion and fire risks by decreasing gas accumulation,

It will feed clean energy to the grid, thereby contributing to sustainable energy policies.

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:

N/A

SECTION E. Stakeholders' comments

The Project was acquired by the Project owner with a tender, which was organized by the Samsun Metropolitan Municipality. The Project and its conditions are clearly set with a mutual agreement and the Municipality is satisfied with the Project.

Following the tender, there have been several newspaper announcements about the Project that positively commented on the Project.

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

Since an EIA report was not required by the Ministry of Environment and Forest, the Project is not required to follow an official stakeholder consultation procedure. Instead, various unofficial, informal meetings have been carried out between the project owner and local communities.

E.2. Summary of the comments received:

Some stakeholders are unhappy with the current practice at the landfill site (the baseline scenario). Compared to this baseline situation, stakeholders are supportive towards the Project.

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

Stakeholder did not raise any critical issues which would require the Project design to be revisited.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Samsun Avdan Enerji Üretim ve Tic. A.S.
Street/P.O.Box:	Suleyman Seba C., Besiktas
Building:	BJK Plaza, A Blok, No:77
City:	Istanbul
State/Region:	
Postcode/ZIP:	
Country:	Turkey
Telephone:	+90 212 2581820
FAX:	+90 212 2581240
E-Mail:	erol@arier.com.tr
URL:	
Represented by:	
Title:	Manager
Salutation:	Mr.
Last name:	Iren
Middle name:	
First name:	Erol
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	erol@arier.com.tr

Organization:	Mavi Consultants
Street/P.O.Box:	Baba Efendi S. 5/2 Akaretler 34357
Building:	
City:	Istanbul
State/Region:	
Postfix/ZIP:	
Country:	Turkey
Telephone:	+90 212 3270922
FAX:	+90 212 3270925
E-Mail:	info@maviconsultants.com
URL:	www.maviconsultants.com
Represented by:	
Title:	Managing Partner
Salutation:	Ms.
Last Name:	Çapalov
Middle Name:	
First Name:	Lale
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	lale.capalov@maviconsultants.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public or ODA finance used for the Project.

Annex 3

BASELINE INFORMATION

Table 22. Definition of Parameters Used

Parameter	Definition
$EF_{GRID,OM,y}$	Operating Margin Emission Factor of the grid in year y
$EM_{grid,y}$	Emissions resulting from electricity generation in year y
EG_y	Net electricity delivered to the grid in year y, excluding low cost-must run generation units
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y*
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,i,y}$	Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ)
$\eta_{m,y}$	Average net energy conversion efficiency of power unit *m* in year *y* (%)
m	All power units serving the grid in year *y* except low-cost / must-run power units
ER_y	Emission reductions in year y (tCO2e/yr)
PE_y	Project emissions in year y (tCO2/yr)
BE_y	Baseline emissions in year y (tCO_{2e})
$MD_{project,y}$	The amount of methane that would have been destroyed/combusted during the year, in tonnes of methane (tCH_4) in project scenario
$MD_{BL,y}$	The amount of methane that would have been destroyed/combusted during the year in the absence of the project due to regulatory and/or contractual requirement, in tonnes of methane (tCH_4)
$MD_{flared,y}$	Quantity of methane destroyed by flaring (tCH_4)
$MD_{electricity,y}$	Quantity of methane destroyed by generation of electricity (tCH_4)
$LFG_{flare,y}$	Quantity of landfill gas fed to the flare(s) during the year measured (m^3)
$w_{CH4,y}$	Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m^3 CH_4/ m^3 LFG)
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream y
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h
w_{OM}	Weight of operating margin emission factor
w_{BM}	Weight of build margin emission factor
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y
$EF_{grid,BM,y}$	Build margin emission factor of the grid in year y
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

Table 23. Capacity Additions

Year	Plant	Capacity [MW]	Fuel Considered as	Avg. Generation [GWh]
2004	ANKARA D.G.(BAYMİNA) GR-I-II-III	798.0	Natural Gas	6500.0
2004	ENTEK GR-IV	31.1	Natural Gas	255.7
2004	ATATEKS 2 GM	5.6	Natural Gas	45.0

2004	TANRIVERDİ 4 GM	4.7	Natural Gas	38.7
2004	TEKBOY TEKSTİL 1 GM	2.2	Natural Gas	16.0
2004	GÜL ENERJİ GR-II	12.5	Fuel Oil	96.5
2004	KOMBASSAN KAĞIT GIDA VE TEKS	5.5	Natural Gas	38.1
2004	AYEN OSTİM ENERJİ ÜRETİM	31.1	Natural Gas	264.1
2004	BİS ENERJİ 2 GT	73.0	Natural Gas	602.7
2004	ENERJİ-SA ADANA 1 BT	49.8	Naphtha & Asphaltite	322.9
2004	ŞAHİNLER ENERJİ 1 GM	3.2	Natural Gas	22.2
2004	BESLER GR-2, BT (5,2+7,5)	12.7	Natural Gas	97.7
2004	ÇELİK ENERJİ ÜR.ŞTİ. 2 GM	2.4	Natural Gas	18.6
2004	KOMBASSAN KAĞ. MATBAA GIDA	5.5	Natural Gas	35.7
2004	AYEN OSTİM ENERJİ ÜRETİM(BT)	9.9	Natural Gas	84.0
2004	HABAŞ ALİAĞA GRUP I-II	89.2	Natural Gas	713.9
2004	STANDART PROFİL 3 GM	6.7	Natural Gas	49.2
2004	KARKEY-II 3+3 DGM	54.3	Fuel Oil	369.7
2004	ALTINMARKA GIDA GR I-II-III	3.6	Natural Gas	28.8
2004	ERE(BİR KAPILI HES) GRUP-I	48.5	Hydro	170.6
2004	ELTA ELK(DODURGA) GR-I-II-III-IV	4.1	Hydro	12.3
2004	İSKUR TEKSTİL(SÜLEYMANLI) GR I-II	4.6	Hydro	17.9
2004	BEREKET EN.(Feslek Hes) Gr-1-2	9.5	Hydro	41.0
2005	ÇAN GR I	160.0	Lignite	1040.0
2005	ÇAN GR II	160.0	Lignite	1040.0
2005	ELBİSTAN-B GR I	360.0	Lignite	2340.0
2005	AKÇA ENERJİ GR-III	8.7	Natural Gas	65.4
2005	AYKA TEKSTİL GR-I	5.5	Natural Gas	40.0
2005	BAYDEMİRLER GR IV-V-VI	6.2	Natural Gas	51.4
2005	BOSEN GR-III	50.0	Natural Gas	350.0
2005	ÇUMRA ŞEKER	16.0	Natural Gas	40.0
2005	ETİ MAD.(BAN.ASİT)GR-I	11.5	Renewables and wastes	85.0
2005	EVYAP GR I-II	5.1	Natural Gas	30.0
2005	GRANİSER GRANİT GR-I	5.5	Natural Gas	42.0
2005	HABAŞ ALİAĞA GR III	47.7	Natural Gas	381.6
2005	HABAŞ ALİAĞA GR IV	47.7	Natural Gas	381.6
2005	HABAŞ ALİAĞA GR-V	24.6	Natural Gas	196.8
2005	HAYAT KAĞIT GR-I	7.5	Natural Gas	56.0
2005	İÇDAŞ ÇELİK GR-I	135.0	Coal	1080.0
2005	KAHRAMANMARAŞ KAĞIT GR-I	6.0	Coal	45.0
2005	KORUMA KLOR GR I-II-III	9.6	Natural Gas	77.0
2005	KÜÇÜKÇALIK TEKSTİL GR I-II-III-IV	8.0	Natural Gas	64.0
2005	MERCEDES BENZ TURK GR I-II-III-IV	8.3	Natural Gas	68.0
2005	MODERN ENERJİ GR-III	8.4	Natural Gas	62.9
2005	MODERN ENERJİ GR-II	6.7	Natural Gas	50.4
2005	MOSB GR I-II-III-IV-V-VI-VII	84.8	Natural Gas	434.0
2005	ORS RULMAN	12.4	Natural Gas	99.4

2005	PAK GIDA(Kemalpaşa) GR-I	5.7	Natural Gas	45.0
2005	TEZCAN GALVANİZ GR I-II	3.7	Natural Gas	29.0
2005	YONGAPAN(KAST.ENTG) GR-II	5.2	Natural Gas	32.7
2005	ZEYNEP GİYİM SAN. GR-I	1.2	Natural Gas	9.0
2005	AK ENERJİ(K.paşa) GR- III	40.0	Natural Gas	256.9
2005	AK ENERJİ(K.paşa) GR I-II	87.2	Natural Gas	560.1
2005	ALTEK ALARKO GR I-II	60.1	Natural Gas	420.0
2005	BİS ENERJİ GR VII	43.7	Natural Gas	360.8
2005	CAN ENERJİ GR-I	3.9	Natural Gas	28.0
2005	ÇEBİ ENERJİ BT	21.0	Natural Gas	164.9
2005	ÇEBİ ENERJİ GT	43.4	Natural Gas	340.1
2005	ENTEK ELK.A.Ş.KOÇ ÜNİ.GR I-II	2.3	Natural Gas	19.0
2005	KAREGE GR IV-V	18.1	Natural Gas	141.9
2005	KARKEY(SİLOPİ-4) GR-IV	6.2	Fuel Oil	47.2
2005	KARKEY(SİLOPİ-4) GR-V	6.8	Fuel Oil	51.9
2005	METEM ENERJİ(Hacışıramat) GR I-II	7.8	Natural Gas	58.0
2005	METEM ENERJİ(Peliklik) GR I-II-III	11.7	Natural Gas	89.0
2005	NOREN ENERJİ GR-I	8.7	Natural Gas	70.0
2005	NUH ENERJİ-2 GR I	47.0	Natural Gas	319.7
2005	ZORLU ENERJİ KAYSERİ GR-I-II-III	149.9	Natural Gas	1144.1
2005	ZORLU ENERJİ KAYSERİ GR-IV	38.6	Natural Gas	294.9
2005	ZORLU ENERJİ YALOVA GR I-II	15.9	Natural Gas	122.0
2005	İÇTAŞ ENERJİ(Yukarı Mercan) GR I-II	14.2	Hydro	44.0
2005	MURATLI GR I-II	115.0	Hydro	444.0
2005	BEREKET EN.(DALAMAN) GR XIII-XIV-XV	7.5	Hydro	35.8
2005	YAMULA GRUP I-II	100.0	Hydro	422.0
2005	SUNJÜT(RES) GR I-II	1.2	Geothermal & Wind	2.4
2006	EKOTEN TEKSTİL GR-I	1.9	Natural Gas	14.0
2006	ERAK GİYİM GR-I	1.4	Natural Gas	10.0
2006	ALARKO ALTEK GR-III	21.9	Natural Gas	158.3
2006	AYDIN ÖRME GR-I	7.5	Natural Gas	60.0
2006	NUH ENERJİ-2 GR II	26.1	Natural Gas	180.1
2006	MARMARA ELEKTRİK (Çorlu) GR I	8.7	Natural Gas	63.0
2006	MARMARA PAMUK (Çorlu) GR I	8.7	Natural Gas	63.0
2006	ENTEK (Köseköy) GR IV	47.6	Natural Gas	378.2
2006	ELSE TEKSTİL (Çorlu) GR I - II	3.2	Natural Gas	25.0
2006	SÖNMEZ ELEKTRİK (Çorlu) GR I - II	17.5	Natural Gas	126.0
2006	MENDERES ELEKTRİK GR I	8.0	Geothermal & Wind	56.0
2006	KASTAMONU ENTEGRE (Balıkesir) GR I	7.5	Natural Gas	54.0
2006	BOZ ENERJİ GR I	8.7	Natural Gas	70.0
2006	ADANA ATIK SU ARITMA TESİSİ	0.8	Renewables and wastes	6.0
2006	AMYLUM NİŞASTA (ADANA)	14.3	Natural Gas	34.0
2006	ŞIK MAKAS (Çorlu) GR I	1.6	Natural Gas	13.0
2006	ELBİSTAN B GR III	360.0	Lignite	2340.0

2006	ANTALYA ENERJİ GR I - II - III - IV	34.9	Natural Gas	245.0
2006	HAYAT TEM. VE SAĞLIK GR I - II	15.0	Natural Gas	108.0
2006	EKOLOJİK EN. (Kemerburgaz) GR I	1.0	Renewables and wastes	6.0
2006	EROĞLU GİYİM (Çorlu) GR I	1.2	Natural Gas	9.0
2006	CAM İŞ ELEKTRİK (Mersin) GR I	126.1	Natural Gas	1008.0
2006	ELBİSTAN B GR II	360.0	Lignite	2340.0
2006	YILDIZ ENT. AĞAÇ (Kocaeli) GR I	6.2	Natural Gas	40.0
2006	ÇERKEZKÖY ENERJİ GR I	49.2	Natural Gas	390.0
2006	ENTEK (Köseköy) GR V	37.0	Natural Gas	293.9
2006	ELBİSTAN B GR IV	360.0	Lignite	2340.0
2006	ÇIRAĞAN SARAYI GR I	1.3	Natural Gas	11.0
2006	AKMAYA (Lüleburgaz) GR I	6.9	Natural Gas	50.0
2006	BURGAZ (Lüleburgaz) GR I	6.9	Natural Gas	54.0
2006	SEYHAN I-II	0.3	Hydro	1.7
2006	ŞANLIURFA GR I-II	51.8	Hydro	124.0
2006	BEREKET ENERJİ GÖKYAR HES 3 Grup	11.6	Hydro	43.3
2006	MOLU EN. Zamantı Bahçelik GR I - II	4.2	Hydro	16.7
2006	SU ENERJİ (Balıkesir) GR I - II	4.6	Hydro	20.7
2006	BEREKET EN.(Mentaş Reg) GR I - II	26.6	Hydro	108.7
2006	EKİN (Başaran Hes) (Nazilli)	0.6	Hydro	4.5
2006	ERE(Sugözü rg. Kızıldüz hes) GR I - II	15.4	Hydro	31.6
2006	ERE(AKSU REG.ve ŞAHMALLAR HES) GR I-II	14.0	Hydro	26.7
2006	BEREKET EN.(Mentaş Reg) GR III	13.3	Hydro	54.4
2007	HABAŞ (Aliağa-ilave)	9.1	Natural Gas	72.8
2007	MODERN ENERJİ	5.2	Natural Gas	38.7
2007	ARENKO	0.7	Natural Gas	5.6
2007	ALTINMARKA GIDA	0.1	Natural Gas	0.8
2007	TEKBOY ENERJİ	0.1	Natural Gas	0.7
2007	VELSAN AKRİLİK	0.1	Natural Gas	0.7
2007	Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kadıköy Hast.)(İstanbul/Kadıköy)	0.5	Natural Gas	4.0
2007	Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kozyatağı Hast.)(İstanbul/Kadıköy)	0.6	Natural Gas	5.0
2007	Acıbadem Sağlık Hiz.ve Tic.A.Ş(Nilüfer/BURSA)	1.3	Natural Gas	11.0
2007	AKATEKS Tekstil Sanayi ve Ticaret A.Ş.	1.8	Natural Gas	14.0
2007	FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)(Poliser Tesisi)	2.1	Natural Gas	17.0
2007	FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)(Süetser Tesisi)	2.1	Natural Gas	17.0
2007	FRİTOLAY GIDA SAN.VE TİC. AŞ.	0.5	Natural Gas	4.0
2007	KIVANÇ TEKSTİL SAN.ve TİC.A.Ş.	3.9	Natural Gas	33.0
2007	KİL-SAN KİL SAN.VE TİC. A.Ş	3.2	Natural Gas	25.0
2007	SÜPERBOY BOYA SAN.ve Tic.Ltd.Şti.(Büyükçekmece/İstanbul)	1	Natural Gas	8.0
2007	SWİSS OTEL(Anadolu Japan Turizm A.Ş	1.6	Natural Gas	11.0

	(İstanbul)			
2007	TAV Esenboğa Yatırım Yapım ve İşetme AŞ./ANKARA	3.9	Natural Gas	33.0
2007	NUH ENERJİ-2(Nuh Çim.)	73	Natural Gas	514.0
2007	AKTEKS	0.8	Fuel Oil	5.6
2007	UŞAK ŞEKER (NURİ ŞEKER)	1.7	Lignite	11.1
2007	BOĞAZLIYAN ŞEKER	16.4	Natural Gas	131.2
2007	KARTONSAN	5.0	Natural Gas	40.0
2007	ESKİŞEHİR END.ENERJİ	3.5	Natural Gas	26.8
2007	ESKİŞEHİR ŞEKER (KAZIM TAŞKENT)	2.9	Natural Gas	23.2
2007	İGSAŞ	2.2	Natural Gas	15.2
2007	DESA	0.7	Natural Gas	4.6
2007	DENTAŞ	0.3	Natural Gas	2.3
2007	SÜPER FİLMCİLİK	0.1	Fuel Oil	0.8
2007	ATAER ENERJİ	0.1	Naphtha & Asphaltite	0.6
2007	BİL ENERJİ	0.1	Natural Gas	0.7
2007	BİS Enerji Üretim AŞ.(Bursa)(İlave)	43	Natural Gas	354.8
2007	Aliağa Çakmaktepe Enerji A.Ş.(Aliağa/İZMİR)	34.8	Natural Gas	278.0
2007	BİS Enerji Üretim AŞ.(Bursa)(İlave)	48	Natural Gas	396.1
2007	BOSEN ENERJİ ELEKTRİK AŞ.	142.8	Natural Gas	1071.0
2007	SAYENERJİ ELEKTRİK ÜRETİM AŞ. (Kayseri/OSB)	5.9	Natural Gas	47.0
2007	T ENERJİ ÜRETİM AŞ.(İSTANBUL)	1.6	Natural Gas	13.0
2007	ZORLU EN.Kayseri (İlave 1 GT)	7.2	Natural Gas	55.0
2007	SİİRT	25.6	Fuel Oil	190.0
2007	Mardin Kızıltepe	34.1	Fuel Oil	250.0
2007	KAREN	24.3	Fuel Oil	180.0
2007	İDİL 2 (PS3 A- 2)	24.4	Fuel Oil	180.0
2007	YPM Ener.Yat.AŞ.(Altıntepe Hidro.)(Sivas/Suşehir)	4	Hydro	18.0
2007	YPM Ener.Yat.AŞ.(Beypınar Hidro.)(Sivas/Suşehir)	3.6	Hydro	18.0
2007	YPM Ener.Yat.AŞ.(Konak Hidro.)(Sivas/Suşehir)	4	Hydro	19.0
2007	KURTEKS Tekstil A.Ş./Kahramanmaraş(KARASU HES-Andırın)	2.4	Hydro	19.0
2007	İSKUR TEKSTİL (SÜLEYMANLI HES)	4.6	Hydro	18.0
2007	ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)	6.3	Hydro	27.2
2007	ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)(İlave)	6.3	Hydro	27.2
2008	MB ŞEKER NİŞASTA SAN. A.Ş. (Sultanhanı)	8.8	Natural Gas	60.0
2008	AKSA ENERJİ (Antalya)	183.8	Natural Gas	1290.0
2008	AKSA ENERJİ (Manisa)	52.38	Natural Gas	370.0
2008	ANTALYA ENERJİ (İlave)	17.46	Natural Gas	122.3
2008	ATAÇ İNŞAAT SAN. A.S.B.	5.4	Natural Gas	37.0

	(ANTALYA)			
2008	BAHÇIVAN GIDA(LÜLEBURGAZ)	1.165	Natural Gas	8.0
2008	CAN ENERJİ (Çorlu-TEKİRDAĞ)(İlave)	52.38	Natural Gas	304.2
2008	FOUR SEASONS OTEL (ATİK PASHA TUR.A.Ş.)	1.165	Natural Gas	7.0
2008	FRİTOLAY GIDA SAN. VE TİC. A.Ş. (İlave)	0.06	Natural Gas	4.0
2008	KARKEY (SİLOPİ-5)(154kV)(İlave)	14.78	Fuel Oil	103.2
2008	MELİKE TEKSTİL (GAZİANTEP)	1.584	Natural Gas	11.0
2008	MİSİS APRE TEKSTİL BOYA EN. SAN.	2	Natural Gas	14.0
2008	MODERN ENERJİ (LÜLEBURGAZ)	13.4	Natural Gas	94.1
2008	ORTADOĞU ENERJİ (ODA YERİ)(Eyüp-İst)	2.83	Renewables and wastes	22.0
2008	POLAT TURZ. (POLAT RENAISSANCE İST.OT.)	1.6	Natural Gas	11.0
2008	SARAYKÖY JEOTERMAL(DENİZLİ)	6.85	Geothermal & Wind	50.0
2008	YILDIZ SUNTA (Uzunçiftlik-Köseköy)(Düzeltme)	22.63	Natural Gas	146.5
2008	SÖNMEZ Elektrik (İlave)	8.73	Natural Gas	67.3
2008	AKKÖY ENERJİ (AKKÖY I HES)	101.94	Hydro	408.0
2008	ALP ELEKTRİK (TINAZTEPE) ANTALYA	7.689	Hydro	29.0
2008	CANSU ELEKTRİK (Murgul/ARTVİN)	9.18	Hydro	47.0
2008	DAREN HES ELKT. (SEYRANTEPE BARAJI VE HES)	49.7	Hydro	182.0
2008	DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	25.7	Hydro	69.0
2008	GÖZEDE HES (TEMSA ELEKTRİK) BURSA	2.4	Hydro	10.0
2008	H.G.M. ENERJİ (KEKLİCEK HES) (Yeşilyurt)	8.674	Hydro	18.0
2008	HİDRO KNT.(YUKARI MANAHOZ REG.VE HES)	22.44	Hydro	79.0
2008	İÇ-EN ELK.(ÇALKIŞLA REGÜLATÖRÜ VE HES)	7.66	Hydro	18.0
2008	KALEN ENERJİ (KALEN II REGÜLAT. VE HES)	15.65	Hydro	50.0
2008	MARAŞ ENERJİ (FIRNIS REGÜLATÖRÜ VE HES)	7.22	Hydro	36.0
2008	SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21.04	Hydro	96.0
2008	SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21.58	Hydro	108.0
2008	TORUL	105.6	Hydro	322.0
2008	YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	0.8	Hydro	5.0
Total		**6,394.3**		**42,929.0**

Table 24. NCVs and Emission Factors of Fuels

NCV Calculations [TJ/kt or TJ/mil m^3]	2004	2005	2006	2007	2008	Emission Factor, [tCO_2/TJ]
Hard Coal	15.1	13.6	18.1	18.2	17.9	90.8
Imported Coal	25.5	24.7	24.5	25.0	24.9	90.8
Lignite	7.6	5.9	6.9	6.9	6.8	90.9
Fuel Oil	39.9	40.2	40.2	39.8	39.7	75.5
Diesel Oil	42.4	42.8	42.7	43.1	42.3	72.6
Lpg	45.9	46.0	0.0	0.0	1.0	61.6
Naphta	44.0	44.3	43.9	43.2	44.6	69.3
Natural Gas	36.9	37.3	37.0	36.7	36.6	54.3

Table 25. CO_2 Emissions Breakdown by Fuel Type

CO_2 Emissions, $ktCO_2$	2004	2005	2006	2007	2008
Hard Coal	1,860	2,155	3,758	4,091	3,908
Imported Coal	7,388	7,858	7,424	8,080	8,747
Lignite	23,207	26,057	31,921	38,154	41,161
Fuel Oil	7,242	6,085	5,297	6,771	6,510
Diesel Oil	90	88	190	157	403
Lpg	36	37	0	0	0
Naphta	637	260	41	34	33
Natural Gas	26,687	31,886	34,212	40,811	42,952
Total Calculated	67,145	74,426	82,844	98,099	103,714
Official data supplied to UNFCCC	70,499	**83,680**	**85,312**	**100,662**	**101,473**

Table 26. Electricity Generation of Selected Recent Capacity Additions by Fuel Type

Capacity Additions	2004	2005	2006	2007	2008	Total	Indicative Efficiency
Coal	0.0	1125.0	0.0	0.0	0.0	1125.0	40.0%
Lignite	0.0	4420.0	7020.0	11.1	0.0	11451.1	40.0%
Fuel Oil	466.2	99.1	0.0	806.4	103.2	1474.9	46.0%
Diesel oil	0.0	0.0	0.0	0.0	0.0	0.0	46.0%
LPG	0.0	0.0	0.0	0.0	0.0	0.0	60.0%
Naphtha & Asphaltite	322.9	0.0	0.0	0.6	0.0	323.5	46.0%
Natural Gas	8810.4	6995.4	3457.4	3274.2	2546.5	25083.9	60.0%
Renewables and wastes	0.0	85.0	12.0	0.0	22.0	119.0	N/A
Hydro	241.8	945.8	432.3	146.4	1477.0	3243.3	N/A
Geothermal & Wind	0.0	2.4	56.0	0.0	50.0	108.4	N/A
Total	**9,841.4**	**13,672.7**	**10,977.7**	**4,238.6**	**4,198.7**	**42,929.0**	

Annex 4

MONITORING INFORMATION

A. Methane Destruction Component

The monitoring manual for the methane destruction component is provided in a separate document.

B. Electricity Generation Component

The switchgear station, where the measurement instruments are read periodically by TEİAŞ, is only accessible to trained TEİAŞ staff. On the first days of each successive month, the TEİAŞ staff performs the reading, upon which the invoicing will be based.

There will be two measurement instruments monitoring the generated electricity continuously. Furthermore, a SCADA system on the Project activity site will monitor and store various data including the electricity generation of each wind turbine separately. The project participant is able to monitor the electricity generation data read by the SCADA system as well as the two measurement instruments from a distance; however it has no control over or access to the measurement devices and cannot perform any type of maintenance or calibration.

Energy generation and consumption of the Project is measured and recorded with a single primary metering device and another secondary metering device for high data quality. A TEIAŞ personnel comes each month to the Project site and connects to the primary and secondary metering devices using his own equipment, without any interference from the project participant. This TEIAS personnel takes readings from both devices and compares them. If the difference of both devices is higher than 0.002, then technical precautions described in Section B.7.2. are taken by TEIAS to ensure data quality. Under normal conditions, the digital readings are uploaded by the TEIAS personnel to TEIAS on site and a print-out of the preceding month's generation and consumption summary is signed by both the site engineer and the TEIAS personnel.

The net electricity generated and delivered to the grid can be monitored from TEİAŞ invoices, from the PMUM -Market Financial Settlement Centre- (MFSC) website[26] or the SCADA system. To ensure high quality data, PMUM web site data will be used to calculate the net electricity generation.

A spreadsheet will be prepared and filled in with PMUM data to calculate the emission reductions.

Responsibility:
The methodology requires monitoring of net electricity supply of the Project. Archiving the daily power generation reports, performance report and monthly meter reading is handled by project proponent on regular basis. The data collection on daily basis is done by project O&M staff, who are responsible for preventive maintenance, handling emergency situations and improvement measures under the overall responsibility of project manager on site.

Data Quality:

[26] Link: http://www.teias.gov.tr/mali/maliuz.htm

The generation and consumption data will be used for invoicing purposes. The data is of high quality, because the monthly reports are signed both by the project proponent and by TEİAŞ, the public transmission line operator. Measuring devices will have accuracy better than UNFCCC requirements, thus fulfilling quality conditions.

Monitored Data:

Net Electricity Generation of the Project = Gross Generation of the Project – Consumption of the Project

Gross Generation of the Project and Consumption of the Project will be monitored and recorded to calculate Net Electricity Generation of the Project.

Storage of Data:

Data involving consumption and generation will be kept by PMUM, the market financial settlement centre and users (project proponents included) can access its website with its unique ID and password to be able to see these data. Storage will be done by PMUM for a theoretically unlimited period of time, which ensures UNFCCC criteria.

Calibration of Measuring Devices:

There are two measuring devices, one main and one back-up device to prevent any potential errors which may result from device failures. If two devices show a significant bias, the failing device will be dismantled by TEİAŞ personnel and calibrated by TEİAŞ to ensure high quality. Project proponents have no access to measuring devices in any way and both devices are sealed.

Annex 5

ATTACHMENTS

- - - - -