CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

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Kadahor Weir and Hydroelectric Power Plant with 9.362 MWe installed capacity - Turkey
Version number of document: 01
Date: 24/11/2011

A.2. Description of the small-scale project activity:

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Summary

Kadahor Weir and Hydroelectric Power Plant project (called “the Project” hereinafter) will be developed by ARSİN Enerji İç ve Dış Ticaret A.Ş (ARSİN Energy Internal and External Trade Inc.) at Trabzon Province, Maçka District, on Altıntaş Creek (Altındere), which is in the Blacksea Region. The total installed capacity of the plant is 9.362 MWe. The annual electricity generation of the plant is 23.338 GWh totals. According to calculations based on electricity generation estimates, Kadahor Weir and HEPP project will result in a CO_2 reduction of 12978.214 tons annually due to use of renewable resources. The construction of the project is expected to start on February 2012 and the plant is expected to start the operation on May 2013. Table 1 shows the important milestones of the project.

Table 1: Milestones of the Project

TASK NAME	START	FINISH
Construction phase of Kadahor Weir and HEPP	February 2012	May 2013
Feasibility Study Report submission	April 2010	
Proposal from Other Carbon Credit Consultant Firms	03/02/2010	
Contract with EN-ÇEV, the consultant of carbon credits	July 2010	
Licensing by EMRA	18/08/2011	
Project Introductory File approval	22/04/2011	
Turbine Contract	25/08/2011	
Start up and Testing	April 2013	
Operation Starting Date	May 2013	

The only purpose of Kadahor Weir and Hydroelectric Power Plant is to produce energy. The project designed as a hydroelectric power plant which does not consume water while operating. Water that will be diverted to the transmission channel will be given back to the river with the same quantity and the same quality. To this respect, the proposed design does not consume water while operating.

A weir and water intake structure, sedimentation pool, transmission channel, forebay, penstock and a power plant having 9.362 MW installed power is proposed in the scope of the project.

With the planned activity, the water taken by virtue of Kadahor Weir shall be conveyed to the forebay through the transmission channel to avoid flow fluctuations and then conveyed to the HEPP by means of the penstock. The turbines convert the potential energy of water to mechanical energy. Then, the turbines turn up the generator and the generator can produce electrical energy by converting the mechanical energy; water passed from the turbines in the power station will be released to Maden Creek. The generated electricity will be connected to national interconnected system for public welfare.

Minimum flow which means ecological water demand of creek when diverted to transmission channel; is accepted as 10% of annual average flow rate of Maden Creek. The minimum flow will be released as 0.762 m^3/s for all months. The fish farms which use water of Altındere Creek are present between the weir and the power plant. Therefore, 300 L/s additional flow to minimum flow is decided to be released after weir structure. [1] The released water to creek is continuously measured by an online flow meter at where it is positioned by the 22nd Regional Directorate of DSI[2] and is in conjunction with online system of the DSI. In case of a reduction of water flow below the amount of minimum flow due to seasonal conditions, electricity generation is not allowed.

The proposed project do not cause a biological threat related to die out or decrease in population of any settled or endemic species. The risk is neither for fauna nor for floral species. In order to stimulate the natural flow regime and sustain the fish living, fish passages under the weir structure will be constructed. Besides, fish migration is provided by fish passage which is designed properly to provide the transition of fishes.[3]

The neighborhood sites to the Project are not affected from the noise level of machines during construction of Project owing to the distance between areas. The nearest settlement to the project area is Gürgenağaç location.

Small HEPP projects are among the projects with minimal impact on environment and local people. No environmentally harmful emission is anticipated. After the conversion of potential energy of water to electrical energy the water flow will be maintained without any pollution or chemical/physical alteration. All regulations regarding the protection of air quality will be followed during the construction. Any solid and liquid wastes formed during the construction and operation of the plant will be collected and discharged in accordance with the Regulations of ‘Control of Solid Wastes’ and ‘Control of Water Pollution’.

The ARSİN Enerji İç ve Dış Ticaret A.Ş. was decided to apply to the Gold Standard to go for the Carbon Credits by means of Kadahor Weir and HEPP project and selling them at Voluntary Carbon Market.

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[1] Kadahor HEPP Project Description File, page 103

[2] General Directorate of State Hydraulic Works

[3] Kadahor HEPP, Project Description File, page 5

Contribution to sustainable development

The renewable energy projects represent a clear contribution to the sustainable development since they substitute the consumption of fossil fuels by using the abundant natural resources of the region in an environmentally friendly way.

For the long-lasting of world resources and wellness of human being, a declaration was endorsed by 189 world leaders at the UN in September 2000, which is a commitment to work together to build a safer, more prosperous and equitable world. The Declaration was translated into a roadmap setting out eight time-bound and measurable goals to be reached by 2015, known as the Millennium Development Goals (MDGs).[4]

The Seventh MDG (Millennium Development Goals) proposed by UNDP is about ensuring environmental sustainability. In fact unlike the most of the other MDG targets, its goal is neither quantitative nor time-bounded. Since human well being is related to environmental factors, it is plain that the existence of human being is directly linked to environmental sustainability. As UNDP emphasize that "If forests are lost, soils degraded, fisheries depleted, waters polluted, or the air unbreathable, then achievements in poverty reduction may not be sustainable."[5] Hence, seeking power sources which has minimum adverse effect to environment, with the maximum generation capacity, especially by using renewable sources is crucial in the 21th century. Hydroelectric enterprises that are developed and operated in a m anner that is economically viable, environmentally sensible and socially responsible represent the best concept of sustainable development.

In this chapter, the possible effects of Kadahor Weir and HEPP project will be assessed in the light of the knowledge bases of organization active in development such as UNDP etc.[6] as well as the "Tool for the demonstration and assessment of additionality, version 05.2.1, EB39". The sustainable development matrix is defined within the conceptual and methodological framework of Tools. The scope of this matrix classified as three axes: (i) local/regional/global environment, (ii) social sustainability and development, (iii) economic and technological development.

Before the results from this matrix, the potential sustainable development benefits of Kadahor Weir and HEPP are summarized.

As a m atter of fact, these types of sustainable projects represent a s trategic importance in the developing countries result in generating jobs, reducing resource (petroleum, coal and natural gas) imports, and it's well known that they can contribute to bring the welfare associated with the energy services to the remotes and poorest rural communities.[7] Sustainability considered in three headings as follows:

[4] Retrieved from http://content.undp.org/go/cms-service/download/asset?asset_id=2883030
[5] Chapter 6: Ensuring Environmental Sustainability at the National Level, Global Monitoring Report 2008, pg. 181
[6] GTZ, FAO, SNV, DFID, OXFAM, DANIDA, ODI.
[7] Retrieved from http://www.sica.int/busqueda/Noticias.aspx?IDItem=55899&IDCat=3&IdEnt=117&Idm=2&IdmStyle=2

a) Socio-Economic Sustainability

- This kind of projects will increase local employment of skilled labor for the installation, operation and maintenance of equipment. The project promotes the sustainable economic development which complies with Long-Term Development Strategy of Turkey.[8]
- Improvement of vital conditions of the population, and poverty reduction by increasing the employment is achieved in between project continuation.
- This kind of projects increase the stability of Turkey's electricity generating capacity and installed capacity while substantially reducing the import rate of fossil fuel which is used in coal fired electricity generation.
- By means of using hydroelectric technology, Turkey will reduce its dependency on a dirty and non-renewable commodity such as diesel, coal and natural gas.

b) Environmental Sustainability

- Hydropower is a clean energy source that is emissions free, and there are no GHG emissions that are directly related to the use of hydropower for electricity production. Hydroelectricity having zero emission of GHG, compared with power plants driven by gas, coal or oil, can help retard global warming. Although only 33% of the available hydroelectric potential has been developed, today hydroelectricity prevents the emission of GHG corresponding to the burning of 4,4 million barrels of petroleum per day worldwide.[9]

Reduction of the greenhouse gas emissions for HEPP projects;

When developed with care to footprint size and location, the hydro projects can create sustainable green energy that minimizes impacts to the surrounding environment and nearby communities. Most small sized HEPP projects do not require a large impoundment of water, which is a key reason why such projects are often referred to as environmentally-friendly, or "green power."[10] Since the absence of regulating reservoirs per HEPP, no risk of flooding of green, therefore no decay of trees can be observed. Ultimately, the emission due to this decay is not observed.

c) Technological Sustainability

- By the way of producing electricity and transferring to the national grid, the capacity of generating electricity capacity of Turkey is increased.

[8] T.R Prime Ministry State Planning Organization, 2001, www.dpt.gpv.tr
[9] Retrieved from http://ga.water.usgs.gov/edu/hydroadvantages.html , December, 2010
[10] Hydromax Energy Limited, http://www.hydromaxenergy.com/Green+Power/Green+Power.htm

- This energy self sufficiency, will introduce a low carbon technology and reduce GHG produced by fossil fuels.
- Technology and know-how transfer are in progress during project installation and operation.

Results from the sustainable development matrix:

According to the requirements of the Gold Standard, the project activity must be assessed against a matrix of sustainable development indicators. The contribution of the proposed project activity to sustainable development of the country is based on the local/regional/global environmental sustainability, social sustainability & development and economic & technological development. The environmental, sustainable, economical and technical aspects of the proposed project have been discussed with stakeholders affected by the project and the matrix based on mentioned indicators is presented in Table 2.

Table 2: Sustainable Development Indicators Matrix for the Gold Standard

Component Indicators	Score (-)to (+)
Local/regional/global environment	
1. Air quality (emissions other than GHG) *	+
2. Water quality	0
3. Soil condition (quality and quantity)	0
4. Other pollutants (Total Suspended Particles, odours)	0
5. Biodiversity	0
Social sustainability and development	
6. Employment (job quality)*	+
7. Livelihood of the poor*	+
8. Access to energy services (electricity)	0
9. Human and institutional capacity	+
Economic and technological development	
10. Employment (quantity of employment)*	+
11. Balance of payments (sustainability)*	+
12. Technological self reliance	0

**Added to monitoring plan based on LSC*

To be eligible under the Gold Standard the project must contribute positively to at least two of the three categories and neutral to the third category. All indicators have the same weight. The scores per main category of sustainable development impacts, thus per Environment, Social Development and Economic & Technological Development are added.

Those indicators that are either crucial for an overall positive impact on sustainable development or particularly sensitive to changes in the framework conditions are marked with asterisk and will be monitored.

The indicators that are given in Matrix are described in detail below:

Explanation of the indicators:

1 Air Quality (+): Dust emission will occur during scoop out of materials within excavation work in the preparation phase of the land.[11] In the land preparation and construction activities phase, a controlled operation will be performed and the total emission amount will be 0.22 kg/h according to calculations made on the basis assuming all excavation works will be done at the same time. The flow rate of dust to occur in this case remains below the value of 1kg/h specified under Industrial Air Pollution Control Regulation dated 03.07.2009 w ith no 27277. N o generation of emission will take place in running the project.[12]

2 Water Quality (0): There will not be a significant change in the water quality after Kadahor Weir. Therefore the aquatic ecosystem will not be affected excessively. Since the project is a plant for energy purposes, there is not any water consumption. Daily water will be taken by the regulator and will be regulated daily. De-energized water will be released to the stream again. Life line will be released from Kadahor Weir to the stream bed for the continuation of lively life. Life line to be determined by Directorate of Nature Conservation and Natural Parks will be left in the downstream of regulator for the preservation of natural life with the exception of amounts of agricultural irrigation, drinking water and utility water and other usage rights.[13] In addition a flow meter will be mounted and it w ill be ensured that measurements are sent to Trabzon Provincial Department of Environment and Forestry. The opinion of Directorate of Nature Conservation and Natural Parks on amount of life line to be released to Altıntaş Stream.[14] In order to protect downstream natural life, a life line with discharge quantity to be determined by the Directorate of Nature Conservation and Natural Parks will be left in the downstream of regulator.[15] Although the amount of water to be used in irrigation works by water trucks during construction works cannot be determined precisely, an irrigation that will be enough to keep the top layer of soil of areas 10% humid where excavation works will be conducted or excavation materials will be dumped will be done. It is estimated that an average water consumption/day will be 10 000 lt (10 m^3/day) for this process to be carried out except rainy days. Due to the fact that 10m^3 water to be used in irrigation works in order to prevent dust emission, will vaporize and no waste water production will occur. A man-made domestic grade waste water generation will occur from personnel that will work in construction phase.**[16]**

3 Soil Condition (0): In Kadahor Weir and HEPP project; excavation and earthworks will be performed on t he area on which regulator, settling basin, path of transmission tunnel route, forebay pool, penstock pipe and power house will be built. Stripped vegetal cover soil will be kept separate from excavation materials. Vegetal cover soil will be stripped primarily. It is estimated that 1% of excavation waste will consist of vegetal earth. In this case almost 327 m3 of excavation waste will be vegetal earth. This stripped vegetal earth will be stored separate from

[11] Kadahor Weir and HEPP, Project Description File, page 26
[12] Kadahor Weir and HEPP, Project Description File, page 27
[13] Kadahor Weir and HEPP Project Description File, page 6
[14] Kadahor Weir and HEPP Project Description File, page 17
[15] Kadahor Weir and HEPP Project Description File, page 5
[16] Kadahor Weir and HEPP Project Description File, page 20

excavation waste and will later be used in landscaping of the area and plantal landscaping of recreation areas.[17]

4 Other Pollutants (0): During operation of the hydroelectric power plant, no positive or negative impacts are expected. No hazardous, toxic or flammable materials will be used during excavation and construction. In the context of the hydroelectric power plant, other pollutants are solid waste and noise:

a) Solid Wastes: There will be solid waste production during land preparation and construction phases of Kadahor Weir and HEPP and operation of the plant. The solid wastes to be produced during construction and operation phases were examined individually.[18] Construction wastes: Rough construction wastes are wastes of materials to be used in construction, materials like ready-mixed concrete waste, wooden mould residues, materials of construction that become unusable, wire parts, materials' packages, wooden cylinders on which wires are rolled etc. can be included in this group. The net amounts of said materials cannot be pre-determined.[19] Domestic solid wastes will include recyclable wastes such as food wastes and paper, glass and metal etc. Domestic wastes will be collected but recyclable materials will be stored in a separate place according to Article 18 of Solid Waste Control Regulation. Possible packaging materials will be utilized within the context of Packaging Waste Control Regulation dated 26.06.2007 with no 26562 (Amended: 30.03.2010, 27537 R.G). The provisions of "Solid Waste Control Regulation" will be respected during the term of operation.[20]

b) Noise: The activity which is the subject of the project is not within the scope of Annex-1 and Annex-2 Lists of Regulation on Permits and Licenses to be taken within the scope of Environmental Law and is within the scope of enterprises that are not subject to environment permit and license. Necessary noise calculations, measurements and assessments were done below by taking related provision(s) of "Regulation on Assessment and management of Environmental Noise" that entered to force after being promulgated in Official Gazette dated 04.06.2010 with no 27601 into consideration. During land preparation and construction works phase of the project; noise due to machinery and equipment to be used in excavation, construction, and assembly works will occur.[21]

c) Explosion: There is andesit-basalt rocks existing on the tunnel route, therefore explosion will be used during the construction of the tunnels. Besides, it is expected to use explosion during the studies on the hard rock surfaces and construction of the penstock. However, the necessary permits will be obtained for the explosions and since the explosives will be brought to the area daily; there will not be any storage of explosives. Around 60 to 90 kg explosive are expected to use at one time depending on the type of the rocky ground. It is possible to proceed 3 meters in with this way.[22] The explosion works will be carried out by

[17] Kadahor Weir and HEPP; Project Description File, page 23
[18] Kadahor Weir and HEPP, Project Description File, page 22
[19] Kadahor Weir and HEPP Project Description File, page 22
[20] Kadahor Weir and HEPP Project Description File, page 23
[21] Kadahor Weir and HEPP Project Description File, page 27-28
[22] Kadahor Weir and HEPP Project Description File, page 8

experts.[23] It is also committed that the necessary measures will be taken regarding the traffic safety including the explosions. In case of any corruption because of the explosion; the investor will be responsible and they will cover the expenses.[24]

5 Biodiversity (0): Since the hydro electric power plants uses only the flow speed of the water (river) the quantity of the water will not be affected from the project. The water flow speed of the water will be used to operate the turbines and then the water will be released back to the river. Moreover, since the minimum flow will constantly released between the plant and weir according to the amount that determined by the Directorate of Nature Conservation and Natural Parks [25]; the biodiversity, especially the aquatic life will not be affected negatively from the project. In addition, to not to affect fish negatively a fish passage will be established in the scope of the project. Fish passages enable according to fish species that live in streams to pass the junction on the direction of spring or downstream, and are built on facilities like regulator, reservoir and dams for enabling the continuation of lively life in streams that provide a transmission line for water and aquatic creatures. Fish generally wants to immigrate to upper parts of stream during its reproduction period. Spring section of streams has conditions more appropriate for their reproduction (Water temperature, lack of creatures that would harm eggs etc). Therefore fish passages should be built in structures like reservoirs, regulator and dam that disconnect or weaken water connection.[26] Fish passages for transmission of fish species within the operational area will be built in the regulator plant pursuant to Article 22 of Aquaculture Law with no 1380.[27] Moreover, in the facilities, there will be no negative operation over climatic conditions, flora and fauna.[28]

6 Quality of Employment (+): As is known, MDG TARGET 1.B is achieving full and productive employment and decent work for all, including women and young people. This criterion is parallel to "decent work" standards of the International Labour Organization (ILO)'s. According to this, decent work is characterized by the following components: a) productive work; b) protection of rights; c) adequate pay and d) social coverage. A fifth and sixth essential element would have to be added: e) social dialogue, f) gender equality (especially accepted by the UNDP and UNIFEM).

With the project activities, the creation of many direct and indirect opportunities both locally and nationally may be observed. There is no adverse effect of the positions. All employees will be trained for occupational safety according to local regulations. [29]

7 Livelihood of the Poor (+): Generating electricity from resources that was not used before creates an additional income[30] to the local community, influencing the poverty alleviation, particularly in the rural areas, and accelerates the regional economic development. As a

[23] Kadahor Weir and HEPP Project Description File, page 32
[24] Kadahor Weir and HEPP, Project Description File, page 33
[25] Kadahor Weir and HEPP, Project Description File, page 5
[26] Retrieved from 2aproje.com/balik
[27] Kadahor Weir and HEPP, Project Description File, page 6
[28] Kadahor Weir and HEPP, Project Description File, page 37
[29] Kadahor Weir and HEPP, Project Description File, page 31

measurable effect, the impact on the local economy shall be monitored and reported in form of contracts with and invoices from local subcontractors and businesses (cf. section G of the projects Gold Standard Passport). As it is known village and forest roads is an important component of the welfare of rural populations. When the roads are secure, sufficient, etc. positive multipliers effects are revealed. Current situation is insufficient to meet transportation requirements of rural population. Therefore, Project participant will contribute to village and forest roads rehabilitation.

8 Access to Affordable and Clean Energy Services (0): As a local energy source, hydro power helps to mitigate Turkey's high import dependency and thus improves the access to energy services, especially in the scenarios of import stops or energy price hikes. The International Energy Agency (IEA) criticizes dependency on oil and gas imports and demands for expansion of renewable energy in Turkey. [31] Turkey must base its energy strategy on developing the whole hydroelectric potential as soon as possible. In assessing life cycle costs, hydropower consistently compares favourably with virtually all other forms of generation. Electricity demand will increase greatly during the 21st century, not only because of demographic pressures, but also through an improvement in living standards in Turkey. As the domestic electricity supply improves, it is provided cheaper electricity for consumer usage in long term. Hence, hydro power improves the access to energy services. However, as the improved access to energy services does not affect the local public (as the electricity is delivered to the grid) and cannot be assigned to specific consumers and therefore not be monitored, a conservative score of zero is applied.

9 Human and Institutional Capacity (+) : Project development will promote the use of renewable energies in the region. It will require widespread education and skills improvement, as the local people will be incorporated in the development and maintenance of the project. The local public is intensively involved in the development and decision-making regarding the plant within the stakeholder consultation process, representing a new kind of institution as part of the development of a Turkish energy project. One measurable effect on human capacity is the improved skills of plant staff. Education and trainings are part of the monitoring. One measurable effect on human capacity is the improved skills of plant staff. Education and trainings are part of the monitoring as described in (cf. section G of the projects Gold Standard Passport)

10 Quantitative Employment and Income Generation (+): Installation of the hydroelectric power plant will provide employment to local people. The time estimated for the completion of the facilities is approximately 2 years. The lifespan of the project, following the completion of the facilities is estimated to be approximately 49 years. In the scope of Kadahor Weir and HES project, 20 persons consisting predominantly of unqualified staff are planned to be employed at the construction phase, totally 50 employees. While at operation phase about 8 persons being predominantly qualified staff are planned to be employed at the power plant for maintenance and control works. [32]

Indirect and induced effects as well as direct effects should be taken into account on employment. Direct effects are jobs created in construction and operation periods under the

[31] Kadahor Weir and HEPP, Project Description File, page 4
[32] Kadahor Weir and HEPP, Project Description File, page 13

management of Project. Indirect effects are manufacturing and service jobs created in associated industries that supply intermediate goods for construction of HEPP and transportation. Induced effects are retail and wholesale jobs created when new workers in construction, manufacturing, and service industries spend their earnings on other products in the economy.

11 Balance of Payments and Investment (+): Turkey’s chronic current account deficit has become a major issue facing the economy. The primary cause is high trade deficit. The part of this deficit is taken root from oil and natural gases imported. It is widely accepted that Turkey is oil and natural gases importing developing country. The interaction between oil prices/amounts and current account imbalances is strong. The current account balance at the same time is the difference between a nation’s total (private and public) savings and total investment. Turkey’s national savings rate should be increased in order to better manage the current economic problems and place the growth of the Turkish economy on a more stable and sustained path. In order to raise national savings rate, import substitute investments have to promoted in energy sector.

The project and its role in strengthening the sustainable sector of electricity generation in Turkey tend to contribute to mitigation of import dependency. With 70 percent of total primary energy supply in the last years and a growing trend this is an important issue for Turkish energy policy. Electricity generation from renewable sources is completely independent from any imports and thus does not have any negative effects on the balance of payments. The positive effect of this project to this indicator will be monitored by calculation of avoided natural gas and liquid fuel import amount for electricity production. The share of electricity generation from natural gas and liquid petroleum fuels, total natural gas and liquid petroleum fuels amounts used for electricity production and electricity production amount of natural gas and liquid petroleum fuels will be taken from official statistics.

12 Technology Transfer and Technological Self-reliance (0): As the project developer is a Turkish company using the returns from the GS VER project to enable the realization of the hydroelectric power plant, the Turkish capabilities, competencies and self reliance regarding the introduction of innovative technologies are strengthened. The project developer considers the investment into and the operation of a new technology in Turkey as a contribution to technological self reliance due to the gathered experience with the proposed project.

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 country)	ARSİN Enerji İç ve Dış. Tic. A.Ş. (private company)	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

ARSİN Enerji İç ve Dış. Tic. A.Ş.is the owner of the generation license for the project activity. Full contact information for the project participants is provided in Annex 1.

EN-ÇEV Enerji Çevre Yatırımları ve Danışmanlığı Ltd. Şti. is the carbon consultant for this project.

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

A.4. Technical description of the small-scale project activity:

Technical description of the small-scale project activity is classified as four sub-chapter (i) location (ii) type and category (ies) and technology/measure (iii) the amount of emission reductions over the chosen crediting period (iv) confirmation.

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party (ies):

<<
Turkey

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

The Black Sea Region/ Province of Trabzon/ Maçka District

A.4.1.3. City/Town/Community etc:

Project is located in the Province of Trabzon, Maçka District, Coşandere Village, on Altıntaş Creek (Altındere).

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity:

The closest settlement area to the weir site is Coşandere Village which is about 300 m south of weir structure. The weir structure will be located at the northern east to the Kınalıköprü Village.[33]

On 1/25000 scaled map, the Project area lays on Trabzon G43-a4 numbered sheets.

[33] Kadahor Weir and HEPP, Project Description File, page 27

Table 3: Coordinates of the Project Area

Unit	Point No	Geographic - Decimal Degree	
		Latitude	Longitude
Weir	1	40.77025100	39.60706846
	2	40.77028244	39.60691352
	3	40.77032959	39.60668526
Transmission Channel	1	40.77123447	39.60643162
	2	40.79798511	39.61426398
Penstock	1	40.79798045	39.61429274
	2	40.79776211	39.61594413
Power house	1	40.79784648	39.61596898
	2	40.79781227	39.61620112
	3	40.79763775	39.61615494
	4	40.79767007	39.61592278

The figure below shows the location of Trabzon Province on Turkey map and the project site.

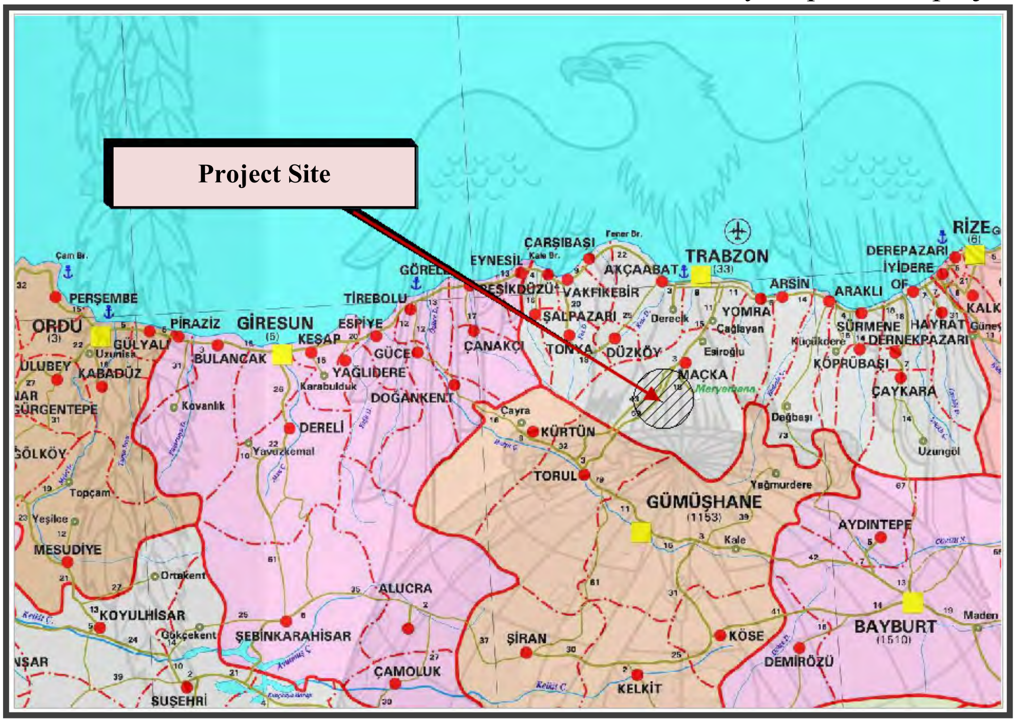

Figure 1: Identification of the Project area on Turkey map

Figure 2: General Layout of the Project area- Satellite View

Figure 3: General Layout of the Project area- Satellite View

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

According to the latest Gold Standard VER Manual for Project Developers 15, the Project falls into the type A.1. - Renewable Energy. According to Appendix B of the UNFCC's published "Simplified Modalities and Procedures for Small-Scale Clean Development Mechanism Project Activities", category of this project activity is AMS-I.D: Grid Connected Renewable Electricity Generation.

The hydroelectric technology of proposed project uses the natural flow of water from a river to produce electricity. It has no associated large dam or reservoir. The proposed project was designed as; a portion of the river's flow is diverted to a powerhouse before the water is returned to its natural watercourse. The water reaches the powerhouse through a tunnel or penstock, which drops from the intake. Once the water reaches the powerhouse, it is at a very high pressure and is directed into a turbine before it is fed back into the river. The power generated is connected to a local power grid through a high voltage transmission line. The environmental footprint of HEPPs without dams is typically considered lower-impact when compared to large scale hydroelectric facilities that have large water storage dams. There is no a lteration of downstream flows, since all diverted water is returned to the stream below the powerhouse. Further, with no l arge dam to alter the river's flow, the design attempts to mitigate the environmental concerns traditionally associated with commercial dam-based hydroelectric projects.

Technical Details

Table 4: Components of the project and their characteristics

UNITS	CHARACTERISTICS
Weir	• thalweg elevation: 469 m • height from thalweg: 6 m • crest elevation: 476.75 m • average flow: 4.33 m^3/s
Water intake structure	• base elevation: 472 m • width (centre leg included): 7 m • length: 14.15 m
Sedimentation basin	• length: 40 m • width: 10 m • water depth: 4 m
Transmission tunnel (closed conduit)	• length tunnel: 3100 m • diameter: 3,6 m • inner diameter: 3 m • depth/diameter: 85% • slope: 0,0006 • project flow: 12 m^3/s
Forebay	• length: 35 m • width: 15 m • average water depth: 473.09 m • active capacity: 1080 m^3

Penstock	• diameter: 1,6 m • wall thickness: 8 mm (min.), 9.5 mm (ave.), 11 mm (max.) • length: 170 m • maximum velocity: 5.97 m/s
Hydropower plant	• installed capacity: 9.392 MW • tail water elevation: 380 m • project flow: 12 m^3/s

Kadahor Weir will be located 475 m elevation of Altıntaş Creek Stream with a precipitation area of 253 km^2. The purpose of the Project is to turbined the water of the Altıntaş Creek and to produce energy by using the current condition. Kadahor power plant will be planned at the 380 m elevation. The water released back to Maden Creek which is the tributary of Altıntaş Creek. The Project has a 95 m gross head, 92.522 m net head, and 12 m^3/s flow rate. At the upstream of the weir structure, a ponding area will be formed which will regulate the coming flow. The ponding area will fill the floodplain which designated by Hydraulic State Works.[34] At the left side of the weir structure, a scouring sluice is planned to be constructed with the dimensions 2mx2m. Furthermore, at the right side of the weir structure, a fish passage will be constructed to permit the passage of fishes living in the Creek.[35] There will be settling tank (length =40 m and width = 10 m) at the cont of the water taking structure. There will be a transmission structure with 3100 m length with a horseshoe section, after the settling tank.

The forebay width is 15 m and the length is 35 m. There will be a valve chamber between forebay and penstock. There will be a penstock with 1.6 m diameter after valve chamber to transport water to hydroelectric power plant that energy will be produced. The length of penstock of Kadahor HEPP is 170 m. The only purpose of Kadahor HEPP is to produce energy. The Altıntaş Creek water will be transported to Plant through transmission channel and it will be turbined in the plant in order to produce energy, then released back to Maden Creek with 380 m tail water degree. It is planned to produce total 23.338 GWh annually with 9.362 MW installed capacity.

The water right quantity that will be identified by State Water Works will be different from life water quantity. The quantity will be identified by State Water Works and water flowing at the same quantity will be provided to the river. The flow rate of this water after regulator will be always evaluated by a flow meter for natural life. If there is decrease, necessary water will be provided again.

The completion time of the project -total construction time- will be nearly 2 years and the economic life of the project, after the construction completed, is expected as 49 years.

[34] Kadahor Weir and HEPP, Feasibility Study, page 6-5
[35] Kadahor Weir and HEPP, Feasibility Study, page 6-5

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Table 5: Estimated amount of overall emission reductions by years

Year	Annual estimation of emission reductions in tonnes of tCO2-eq
May-Dec 2012	8652.14274
2013	12978.2441
2014	12978.2441
2015	12978.2441
2016	12978.2441
2017	12978.2441
2018	12978.2441
Jan-April 2019	4326.07137
Total number of crediting years	**7**
Total emission reductions (tonnes of CO2-eq)	**90847.49876**
Annual average over the crediting period of estimated reductions (tonnes of CO2-eq)	12978.2441

A.4.4. Public funding of the small-scale project activity:

The project does not obtain public funding. Please see Annex 2 for relevant document. The total project cost of the project activity is 22,539,102.69 USD[36] and 24,441,189.89 USD (including VAT). The Project will be financed partly by Private investing company's own equity and the rest is planned to be realised by bank loan.

A.4.5. Confirmation that the small-scale project activity is not a de-bundled component of a large scale project activity:

As highlighted in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a de bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- o With the same project participants;
- o In the same project category and technology/measure;
- o Registered within the previous 2 years; and
- o Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

[36] Kadahor Weir and HEPP, Feasibility Study, Table 9-8, (1USD = 1.4098TL)

There are two project in the same category, which's project boundary are within 1 km of the each other. The projects are Arısu Weir and HEPP and Kadahor Weir and HEPP which are individual projects since Kadahor Weir and HEPP is owned by ARSİN Enerji İç ve Dış Ticaret A.Ş and Arısu Weir and HEPP is owned by Ustaoğlu Elektrik Üretim A.Ş. as is seen from the electricity production licences.[37]

Arısu Weir and HEPP has a production licence no. EÜ/1904-51/1359 and Kadahor Weir and HEPP has a production licence no. EÜ/3382-2/2042[38]. The production licenses were obtained from EMRA and the characteristics of proposed project such as; the investor firm, installed capacity, duration of licence, possible coordinates of project units, estimated number of turbines etc are stated within the production licence. The two independent licences specify that the projects cannot combine to each other and hence, are not a de-bundled component of each other. The Arısu Transmission structure derivates the water from Maden Creek and release it to Altıntaş Creek after Arısu Power Plant. The Kadahor Water Taking Structure is at the downstream of Arısu Power Plant on the Altıntas Creek.

Furthermore, the investment decisions, feasibility studies and project description files of the projects are independent. Hence, the projects are not a debundled component of a large scale project activity. Thereby, according to the "Guidelines on Assessment of Debundling for SSC Project Activities, ver. 03", the proposed project is eligible to use the simplified modalities and procedures for small-scale CDM project activities. The project activity will follow the regular CDM modalities and procedures.

SECTION B. Application of a baseline and monitoring methodology

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

Applied approved baseline and monitoring methodology:

• AMS-I.D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17" EB 54

Used tools:

• "Tool for the demonstration and assessment of additionality, version 05.2.1" EB 39.
• "Tool to calculate the emission factor for an electricity system, version 02.2.1" EB 63.

[37] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilenuretim.asp
[38] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilenuretim.asp

B.2 Justification of the choice of the project category:

Methodology AMS-I.D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17" is applicable to the proposed project activity because it fulfils the required criteria:

- The project comprises renewable energy generation by means of hydro power.
- It is a grid-connected electricity generation project.
- The installed capacity of the proposed project activity is 9.362 MW which is lower than 15 MW.

The project activity will not have a capacity extension at any year of the crediting period. Hence the project activity will remain under the limits of the small-scale project activity types with 9.362 MW installed capacity. Further, the project activity results in a new ponding up to the weir structure to regulate the coming flow. Hence, the condition "the project activity results in a new reservoir and the power density is greater than $4W/m^2$" is satisfied to apply the methodology AMS-I.D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17''.

B.3. Description of the project boundary:

The physical, geographical site of the renewable generation source delineates the project boundary according to the methodology AMS-I.D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17". The project site and the power plants which are connected to the Turkish National Grid are included within the project boundary.

B.4. Description of baseline and its development:

In respect of approved small scale methodology AMS-I.D "Grid Connected Renewable Electricity Generation, version 17", the baseline scenario is that the 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 into the grid.

Since the proposed project activity is " the installation of a new grid-connected renewable power plant/unit ", the baseline scenario is defined as the consolidation of electricity delivered to the grid by the project activity and electricity generated by the operation of grid-connected power plants in Turkey and electricity produced by the new generation sources as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system, ver. 02.2.1".

Installed electricity generation capacity in Turkey has reached 44761,2 megawatts (MW) as of 2009. Fossil fuels account for 65,5% of the total installed capacity and hydro, geothermal, and wind account for the remaining 32,5%.[39]

[39] Retrieved from http://www.teias.gov.tr/istatistik2009/1.xls

Table 6: Breakdown of installed capacity of Turkish grid, 2009[40]

Primary Energy Source	MW	% of Installed Capacity, 2009
Thermal	29339.1	65.5
Hydro	14553.3	32.5
Geothermal	77.2	0.2
Wind	791.6	1.8
TOTAL	**44761.2**	**100**

Based on the above can be concluded that hydro power constitutes the lower share of the total electricity generation capacity of Turkey.

Electricity demand of Turkey has been growing continuously since the last decade due to the rapid growth in economy. In 2008, the electricity demand was 198,085 GWh which corresponds to an increase of 4.3% compared to the previous year. The increase or decrease rates for electricity are presented in Table 7 below.

Table 7: The energy demand and increase rates between years 2000-2009[41]

Year	Energy Demand (GWh)	% increase
2000	128276	8.3
2001	126871	-1.1
2002	132553	4.5
2003	141151	6.5
2004	150018	6.3
2005	160794	7.2
2006	174637	8.6
2007	190000	8.8
2008	198085	4.3
2009	194079	-2.0

Even if the energy demand has decreased from 2008 to 2009, it must be noted that it is because of the fact that a significant economic crisis has occurred in 2008 and the energy consumptions decreased accordingly. Nonetheless, the energy demand is again expected to increase when we consider the capacity projection of TEIAS[42] (Refer to Figure 4 of this report).

In recent years, an upward trend has taken place in the consumption of natural gas in Turkey for both domestic and industrial use. The numerical increase in natural gas power plants aims to meet the growing energy demands of industries. Therefore, the share of hydroelectric power has

[40] Retrieved from http://www.teias.gov.tr/istatistik2009/7.xls
[41] Retrieved from http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf, page 4
[42] Retrieved from http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf

dropped while the share of thermal energy has increased in overall energy generation.[43] Nevertheless, the European Union places great emphasis on green power in energy policies (hydroelectric, wind, solar, and biomass energies).[44] Thus, it is important to harmonize the energy policy and relevant legislation in Turkey with European energy policy. Consequently, the weight of hydroelectric power in overall generation needs to be increased.

Turkey, who intends to sustain its development, has tent to manage its energy supply-demand balance by the way of developing and constructing high capacity coal and natural gas power plants. The large natural resource availability, especially the abundance of economically accessible lignite and the governmental agreements on purchasing natural gas and accordingly developing infrastructure works promote the development of thermal power plants. In the absence of the proposed project activity, the same amount of electricity is required to be supplied by either the current power plants or by increasing the number of thermal power plants thus increasing GHG emissions.

According to the methodology AMS-I.D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17" the baseline is the kWh produced by the renewable generating unit multiplied by an emission factor.

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)
$EG_{BL,y}$ = Energy baseline in year y (kWh)
EF_{CO2} = CO_2 Emission Factor in year y (t CO_2e/kWh)

Emission factor can be calculated in a transparent and conservative manner as a combined margin (CM), 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, version 02.2.1".

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 small-scale CDM project activity:

As required in the Gold Standard "Voluntary Emission Reductions Manuel for Project Developers", the project additionality is demonstrated through use of the "Tool for the demonstration and assessment of additionality, version 05.2.1".

[43] Retrieved from http://www.dsi.gov.tr/english/service/enerjie.htm
[44] Retrieved from http://www.thegreenpowergroup.org/policy.cfm?loc=eu

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

Realistic and credible alternatives to the project activity that can be a part of the baseline scenario are defined through the following steps:

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

The alternatives to the proposed project activity are listed in Table 8 below.

Table 8: Alternatives to the project activity

Alternative A	Proposed project developed without the VER revenues
Alternative B	Same amount of electricity produced by other facilities not under the control of project participant (No action from the investors)
Alternative C	Construction of a thermal power plant with the same installed capacity or the same annual power output.

Alternative A which is the implementation of the project without carbon revenue is not financially attractive as discussed in investment analysis section below. Alternative B is the baseline scenario and implementation of the proposed project as a VER activity would be additional to this scenario. Alternative B does not seem as a realistic option due to expected energy demand increase in Turkey. Energy demand of Turkey is expected to expand at an average of %6,3- %7 until 2018[45]. In addition, the figure 3 be low shows the energy demand projection (conservative scenario) between 2010 and 2019 prepared by TEİAS. Based on this fact, the electric generation in Turkey should be increased anyway in accordance with the expected energy demand. Therefore, no action alternative is not a plausible option and HEPPs should be constructed in order to generate clean energy where applicable. [46]

[45] E. Kavukçuoğlu, Türkiye Elektrik Enerjisi Piyasası 2010-2011, Deloitte Turkey
[46] Electrical Energy Production Planning Study on Turkey 2005-2010, TEİAŞ, www.teias.gov.tr

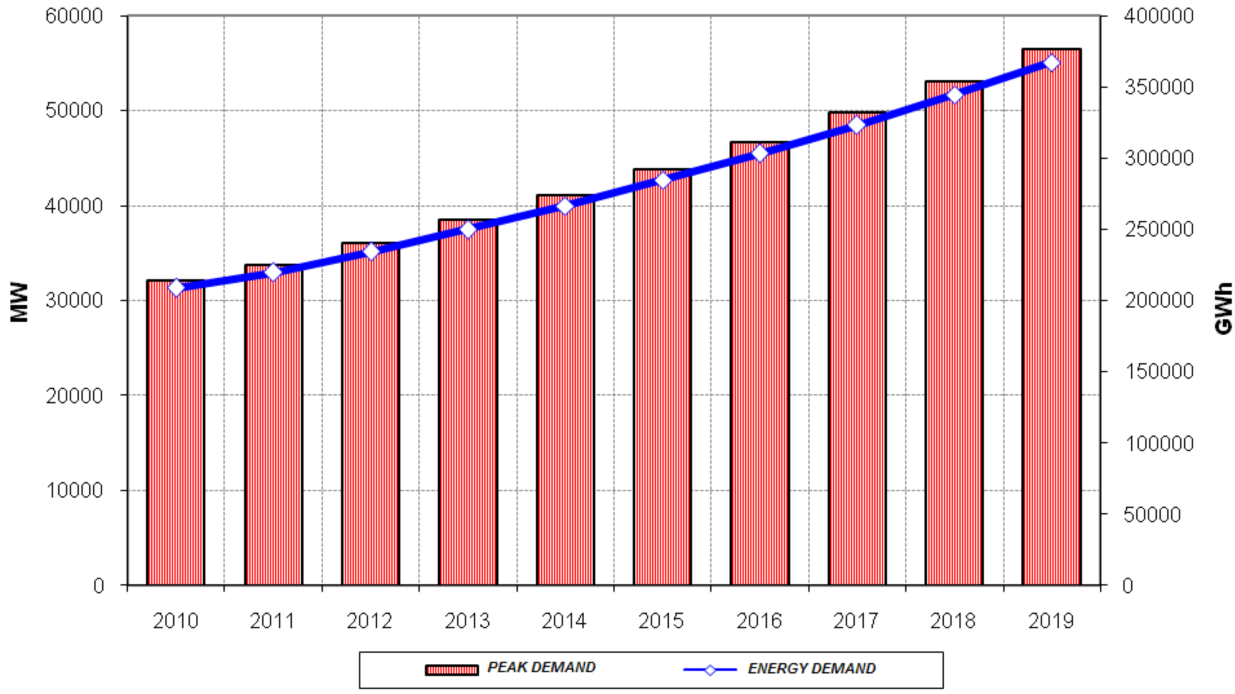

Figure 4: The energy demand projection between 2010 and 2019(low demand)[47]

The last alternative, Alternative C, is considered as a significant alternative to the project activity. Since the share of thermal plants in the installed capacity of Turkey is considerably high which corresponds 29339,1 M W of total 44761,2 MW installed capacity according to 2009 Turkish electrical statistics taken from TEIAS(Turkish Electricity Transmission Company).[48]

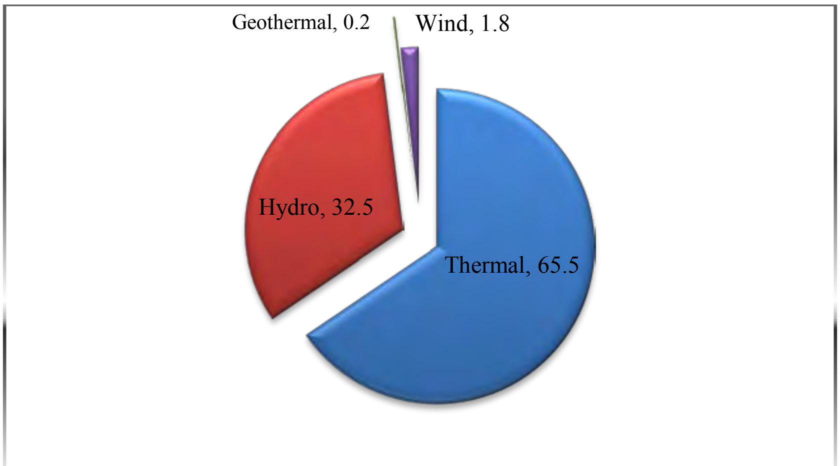

Figure 5: The distribution of installed capacity of Turkey by primary energy sources in 2009[49]

[47] Retrieved from http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf, Page 13
[48] Retrieved from http://www.teias.gov.tr/istatistik2009/7.xls
[49] Retrieved from http://www.teias.gov.tr/istatistik2009/7.xls

Outcome of Step 1a

Three alternatives are considered for the proposed project. However due to the increasing electricity demand in Turkey, Alternative B, which is the continuation of the current situation is an unrealistic option. Therefore, Alternatives A and C are the two alternatives to be evaluated.

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

The following applicable mandatory laws and regulations have been identified:

1. Electricity Market Law [Law Number: 4628 Ratification Date: 20.02.2001 Enactment Date: 03.03.2001][50]
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electricity Energy [Law Number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005][51]
3. Environment Law [Law Number: 2872 Ratification Date: 09.08.1983 Enactment Date: 11.08.1983][52]
4. Energy Efficiency Law [Law Number 5627, Enactment Date 02/05/2007] [53]
5. Forest Law [Law Number 6831, Enactment Date 31/08/1956][54]

All the alternatives to the project outlined in Step 1a above are in compliance with applicable laws and regulations.

Outcome of Step 1b

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

Step 2- INVESTMENT ANALYSIS

The investment analysis for Kadahor Weir and Hydroelectric Power Plant project in this Step 2 will be evaluated the following the four sub-steps:

i. Determine appropriate analysis method;
ii. Apply analysis method;
iii. Calculation and comparison of financial indicators;
iv. Sensitivity analysis.

[50] Retrieved from http://www.epdk.gov.tr/english/regulations/electricity.htm
[51] Retrieved from http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyReources.pdf
[52] Retrieved from http://rega.basbakanlik.gov.tr
[53] Retrieved from http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc
[54] Retrieved from http://web.ogm.gov.tr/birimler/merkez/kadastro/Dokumanlar/KD1/Mevzuat/6831%20ORMAN%20KANUNU.pdf

Sub-step 2a - Determine appropriate analysis method

The "Tool for the demonstration and assessment of additionality, ver 05.2.1" EB 39, Annex 10, lists three possible analysis methods;

- Option I. Simple cost analysis;
- Option II. Investment comparison analysis; and
- Option III. Benchmark analysis.

Since the financial and economic benefits generated by the proposed project activity by the way of the sales of electricity other than carbon revenues, Option I cannot be used.

Option II is only applicable to projects where alternatives should be similar investment projects in terms of electricity production capacity. Between Option II and Option III, benchmark analysis method (Option III) is preferred as the investment analysis method for the proposed project.

Besides, the benchmark analysis (option III) as a suitable method for this Project type and decision making context will be used to analyze. Compared with other method (the simple cost analysis and investment comparison analysis) currently in use, the proposed method can be seen as the best option. Because of financial and economic benefits, option I cannot be used. Comparing to the option II, the benchmark analysis is provided with a realistic viewpoint relatively to be able to assess the project for economic viability and financial sustainability. There is no doubt that each method has its own advantages.

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

To select or calculate a benchmark with reliable and valid is very difficult in due to the market volatility (government bond rates etc.), its changes over time and project type has its own characteristics (supply, demand, price etc.).

Institutional capacity is necessary for these calculations. In this regard, the recognized and accepted widely the calculations (indicators) of international institutions (WB, IMF, UNCTAD, IFF etc.) can be used as benchmark**.**

- Equity IRR used by the World Bank (Sustainable Development Departments Turkey Country Unit) is 15% for small hydro[55]. This accepted benchmark IRR provides a more accurate and conservative view of the investment analysis effort. Eventually the applying benchmark will be 15% for comparison with the equity IRR in this investment analysis of the Kadahor Weir and HEPP project.

- As is known, there are also benchmarks for other countries in the "Guidelines on t he assessment of investment analysis, ver 05", EB 62, A nnex 5. When it is considered, the highest and the lowest benchmarks are %18 and %10.5 in turn among the lots of countries. In

[55] Retrieved from World bank-Project Appraisal Document on a IBRD Loan and a Proposed Loan from Clean Technology Fund to TKSB an TB with the Guarantee of Turkey (Report No: 46808-TR, dated May 1, 2009)

this Tool, the benchmark IRR (The expected return on equity) is composed of four elements: (a) a risk free rate of return; (b) an equity risk premium; (c) a risk premium for the host country; and (d) an adjustment factor to reflect the risk of projects in different sectoral scopes. All values are expressed in real terms. Equity IRR used by the World Bank is parallel to the range of IRR in Tool.

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

The internal rate of return (IRR) calculation is a convenient technique for Kadahor Weir and HEPP project in benchmark analysis. As it is known, IRR is a percentage figure that describes the yield or return on an investment over a multiyear period. For a given series of cash flows, the IRR is the discount rate that results in a net present value (NPV) of zero.

All the main parameters of project and other relevant financial items used in the equity IRR calculation is taken from the feasibility report of Kadahor Weir and HEPP and legal norms. The VAT amount of project can be identified by taking the 20% of all project cost unit by unit in Turkey. The VAT is deducted from taxes. Therefore, it should be added to the cash flow for netting as per Turkish regulations. However, the corporate taxes are not including for IRR calculation in line with the Gold Standard standards. .

Table 9: Main parameters used for investments analysis[56]

No	Parameters	Unit	Value
1	Installed Capacity	MW	9.362
2	Firm energy	GWh/year	0.664
3	Secondary energy	GWh/year	22.674
4	Total electricity generation	GWh/year	23.338
5	Project cost (excluded VAT)[57]	USD	22,539,102.69
6	Project cost (included VAT)[58]	USD	24,411,189.89
7	Investment cost	USD	25,504,823.03
8	Annual total revenue	USD/ year	2,205,008.94
9	Corporate tax rate	%	20
10	VAT	%	18
11	Expected VERs price	€/ tCO_{2-eq}	5

1 USD = 1.4098 TL, 1 EURO=2 TL[59]

We have been considered main parameters and items above the table for the cash inflow and cash outflow of the Project:

(i) The cash outflow and costs (investment costs & operation costs)

[56] Kadahor Weir and HEPP, Feasibility Study Report, Table 9.6
[57] Kadahor Weir and HEPP, Feasibility Study Report, Table 9.8
[58] For detailed VAT calculations, please see IRR Excel sheet.
[59] USD: Kadahor Weir and HEPP, Feasibility Study Report, page (9-1), Euro: Retrieved from the average exchange rate of Central Bank of Turkey for year 2009 wrt conducted Feasibility Study

Costs can be classified into two categories: Investment costs and operational costs. State Hydraulic Works (DSI) unit prices is used (except electromechanical equipments) in the feasibility report of Kadahor Weir and HEPP. Total investment cost of Kadahor Weir and Hydroelectric Power Plant is 25,504,823.03 USD and is itemized as follows;

Table 10: Total Project Costs and Investment Costs of Kadahor HEPP

	Total (USD)	Total (TL)
Derivation Works	65,256.82	46,288
Weir	1,717,040.53	1,217,932
Sedimentation Basin	530,844.68	376,539
Transmission Channel	15,012,218.65	10,648,474
Headpond	840,122.38	595,916
Penstock	815,676.44	578,576
Powerhouse	748,926.64	531,229
Roads	296,058.00	210,000
Permanent project site construction	70,700.06	50,149
CIVIL WORKS	20,096,844.21	14,255,103
Electro mechanical Equipments	2,153,210.38	3,035,596
Transmission Line	111,717.97	157,500
TOTAL FACILITIES COST	22,361,772.57	17,448,199
Expropriation	177,330.12	250,000
PROJECT COST	22,539,102.69	17,698,199
VAT	1,872,087.20	2,639,269
TOTAL PROJECT COST	**24,411,189.89**	**20,337,568**
Interest during construction	1,093,633	1,541,804
TOTAL INVESTMENT COST	**25,504,823.03**	**21,879,273.33**

While it is not considered value add tax in the feasibility report, we included VAT within the Project costs. There is an important point in the calculation of VAT. Electromechanical equipment cost is exempt from VAT. Therefore, the cost of electro mechanical equipment - 2,153,210.38 USD- is subtracted from the project cost and then multiplied by %18. As per the VAT Law (no: 3067, date: 25/10/1984), VAT is taken as %18 of the amount of cost.

Considering the yearly distribution of costs, the electromechanical equipment cost is occurred only in the second year. In this framework, the first year of VAT is determined as 954,409.21 USD, second year is 917,678 USD.

Operational costs

While system usage fee is not considered in the feasibility report, we included system usage fee within the operational costs in the line with EMRA legislation.[60] The other figures (wages, other

[60] Retrieved from http://www.epdk.gov.tr/web/elektrik-piyasası-dairesi/iletim/-tarifesi1

current consumptions, etc.) are taken from the feasibility report as 449,134 USD[61] (operation and maintenance).

(ii) The cash inflow or income stream

The income earned by yearly generation of electricity is preferred as the highest amount in a conservative manner. The feasibility study covers the different unit price ($/KWh) to calculate the income flow during the operation period.[62] The unit price of electricity to multiply by amount of electricity generation to find the income.

The IRR calculations based on the income which is calculated by the electricity unit price 13.32TLkr/KWh[63] as per the average wholesale price of electricity justified by EMRA date: 10/12/2009, no 2339 and published in the Official Gazette date: 19/12/2009, no: 27437.

1 USD = 1.4098 TL, 1 EURO = 2 TL[64]

Annual generation is taken as 23.338 GWh/year.

Correspondingly; the annual income will be 2,205,008.94 USD. It is assumed constant selling price of electricity during the 47 years of operation.[65]

(iii) Earnings before Interest, Depreciation (EBITD)

This gross earnings figures are stated in the excel sheet.

(iv) Depreciation

Depreciation related to the project, which has been deducted in estimating gross earnings on which tax is calculated, added back to net profits in line with the suggestion in "Tool for the demonstration and assessment of additionality".

(v) Interest Expenses and Financial structure

The Project will be financed partly by Private investing company's own equity and the rest is planned to be realised by bank loan. Interest expenses are applied with respect to expected credit conditions on the year of feasibility study applied.

(vi) Net Earnings

Net Earnings = Tax Base – Tax Amount

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[61] Kadahor Weir and HEPP, Feasibility Study Report, Table 8.2
[62] Kadahor Weir and HEPP, Feasibility Report, page 9-1
[63] Kadahor Weir and HEPP, Feasibility Report, page 9-1
[64] USD: Kadahor Weir and HEPP, Feasibility Study Report, page (9-1), Euro: Retrieved from the average exchange rate of Central Bank of Turkey for year 2009 wrt conducted Feasibility Study

(vii) Deduction of input VAT

Project participant has the right to deduct input VAT of project cost.

(viii) Net Cash Flow

Net Earnings + Depreciation + Deduction of Input VAT

(ix) Net present value (NPV), Equity IRR

On the other hand, for a given series of net cash flows (the difference between the present value of cash inflows and cash outflows), Equity IRR of the Kadahor Weir and Hydroelectric Power Plant 8.25 % is the discount rate that results in an NPV of zero which is based on the parameters given above without considering the carbon revenue.

It is also assumed 47 years of operation with no r esidual value of the Kadahor Weir and Hydroelectric Power Plant. Hence, the salvage value is 0. However, in reality, the lifetimes of hydroelectric power plants (75-100 years) are more than 47 years and salvage value > 0. In here, it is not considered to this point in analysis. When we consider to today's technology, high capital stock will be transferred from Project to the public. So, this salvage value can be seen positive impact on community (public utility) in terms of sustainability development matrix.

(x) Project IRR, VER income and the Benchmark

As is mentioned above, equity IRR has been calculated as 8.25 % without considering the carbon revenue. When benchmark IRR is taken as 15%, the Project is not financially attractive.

When we include the carbon revenues in the cash flows, equity IRR increases to nearly 8.75%. The IRR even with VERs remains lower than the benchmark of 15%.

Sub-step 2d: SENSITIVITY ANALYSIS

Sensitivity analysis used to determine how different values of independent variables will impact dependent variables under a given set of assumptions.

This subchapter can cover a diversity of complexities and difficulties that may arise in an investment analysis, including issues of electricity generation, electricity price, and corporate tax and other financial burdens, electricity demands etc.

The aim is to bring to the attention of persons concerned a number of issues that are known in cash flows circles and IRR calculations.
Independent variables and accepted affecting IRR as a dependent variable is assessed below.

(i) The cash inflow or income stream

- Constant selling price of electricity during the 47 years of operation

Independent variables affecting pricing: The price level in the market is mostly determined by the Government as the main driver. Due to slow progress in market liberalization, there may not be change in this situation in short and medium term. It is generally expected that as public sector borrowing requirement (PSBR) is rise, pressure on the level of electricity price is increase. After the global crises, Turkish Government the maneuvering ability within the budget is very limited. Moreover, significant opposition from consumers (household, industry etc.) may meet the increasing electricity price. So, price movement may remain flat in the coming years.

On the other hand, privatization of the important parts of Turkey's Electricity Distribution Industry has carried out recently. The privatization of electricity distribution companies will aid the fight against illegal electricity usage in Turkey**.** The rate of illegal electricity usage in Turkey increased from 14.4 percent to 17.7 percent from 2008 to 2009, recent data from the Turkish Electricity Distribution Company (TEDAŞ) has shown. Therefore, increased energy costs to consumers and public fall. As the rate of illegal electricity usage decrease, institutional structure of market, transparency is strengthening. Right price signals lead to efficient choices among existing alternatives for consumer, producer, Government.

- Constant annual generation of electricity (23.338 GWh/year) during the 47 years of operation

Independent variables affecting generation: We consider to the two independent variables. First are the climatic conditions and **catastrophic risks.** As it is known, the estimated electricity generation based on historical hydrological data. Big deviation can be seen in the context of global climate change. So, these effects on generation may be negative or positive. Both of them are risks of Project. Second is the constituted water usage agreement between Project participant and DSI (The State Water Supply Administration). According to the agreement, DSI can always pump from the Creek for agricultural irrigation and fresh water. This means decreasing generation and income for the project.

- It is assumed that annual generation (100%) will be sold during the 47 years of operation. It is not considered the demand conditions of electricity market. Besides, there is no export competence in the scope of license and the Project is derived from vast market potential (EU etc.).

Independent variables affecting the demands: To assess the predictions for demands of using more realistic assumptions, it is needed to develop a framework of multi dimensional analysis. For instance, growth scenarios, a short and long run the price and income elasticity of demand for electricity etc. are main subjects.[66] There is no doubt that it is not possible to handle the dimensions with all its aspects. We only underline importance of GDP and industrial (especially manufacturing) sector in the demand context.

[66] The price elasticity of demand is, by definition, the percentage change in demand that is caused by a one per cent change in price. This definition is also validated for the income elasticity.

In Turkey, growth rate is an important variable which affected the electricity consumption positively in the long term.[67] Export-led growth as model is valid in Turkey.[68] The growth performance predominantly depends on global demand and falling global demand could have a major impact. Industry (especially manufacturing) with input-output connections is also the key sector in terms of growth performance and constituted more than 40% of total Turkey electrical consumption. So the electricity demand conditions of domestic market are drastically affected by the global economy cycles. On the other hand the largest elasticity is found in industry. Household demand for electricity is much less elastic than industrial energy use. After the first ten years, income stream of Project will be able to fluctuations.

(ii) The cash outflow and costs

- **Investment costs:** Construction costs calculations based on DSI unit prices.

Independent variables affecting investment costs: Especially important differences between predicted construction costs and realized construction costs can be revealed in unfavor and favor of Project.

- **Operational costs:** Constant annual wages during the 47 years of operation is assumed.

In other words, it is not considered possible reel wage increases and decreases. Indeed real wages that have been adjusted for inflation is more than predicted (constant) level in order to prosperity over time. Besides, system use fees are calculated according to the tariffs of the EMRA. Independent variables affecting operational costs: the possible changes of wages, and other current expenses, the fiscal liabilities (especially levied by the local administration) are not considered in baseline analysis.

Despite possible limitations – especially in absence of compound effects and probability distribution – this sensitivity analysis provides a general outlook of the investment analysis effort. A range of 10% fluctuations in parameters; cost and income were analyzed in sensitivity analysis.

Please note that; the income has two variables; amount of electricity generated and unit price of electricity.[69] Therefore, income can be a p arameter just by the way of variation in these 2 variables, which means that the increase in income can be a result of either increase in amount of electricity generated or increase in unit price of electricity. The decrease in income can be a result of either decrease in amount of electricity generated or decrease in unit price of electricity.

Table 11: Sensitivity Analysis for Kadahor Weir and Hydroelectric Power Plant (without carbon revenue)

[67] KAPUSUZOGLU, Ayhan and KARAN, Mehmet Baha (2010), "An Analysis of the Co-integration and Causality Relationship between Electricity Consumption and Gross Domestic Product (GDP) in the Developing Countries: An Empirical Study of Turkey", *Business and Economics Research Journal, Volume* 1, Number 3.

[68] BİLGİN, Cevat and SAHBAZ, Ahmet (2009): "Türkiye'de Büyüme ve İhracat Arasındaki Nedensellik İlişkileri", published in *Gaziantep Üniversitesi Sosyal Bilimler Dergisi*, Vol. 8, No. 1 (2009): pp. 177-198. This paper is to investigate the relations between export and growth for Turkey by using 1987-2006 monthly data. According to the test results, export-led growth is verified for the specified period.

[69] income = electricity generated (KWh) x unit price of electricity (USD/KWh)

Parameter	Variation	IRR
Cost	increased 10%	6,96%
	decreased 10%	9,84%
Income	increased 10%	9,68%
	decreased 10%	6,85%
Electricity generation	increased 10%	9,68%
	decreased 10%	6,85%
Amount of electricity generated	increased 10%	9,68%
	decreased 10%	6,85%

Table 12: The estimated IRR related to the analysis under the three scenarios

	IRR
Base (average) Case	8.25%
Best Case	9.84%
Worst Case	6.85%

It may be seen from the sensitivity analysis that considering the base (average) case and worst case, the 49 years project IRR value for the proposed project activity is less than the benchmark IRR (%15).

Outcome of Step 2:

The investment and sensitivity analysis shows that the VER revenues will improve the project IRR and make the project more attractive for investors. Considering that figures above do not precisely reflect the investment risk (systematic and unsystematic risks) the role of the carbon income is significant to enable the project to proceed and for a favourable investment decision taken. Based on the analysis and information above, it is concluded that investing in the project is not the most attractive option considering the alternative investment opportunities. Therefore, Project can be considered as additional to the baseline scenario.

Step 3: Barrier analysis

The barrier analysis step has not been applied for the proposed project.

Step 4: Common practice analysis

This section includes the analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region.

The following Sub-steps discuss the existing common practice.

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

At the moment, 796 licenses for hydro power plants are issued by EPDK[70], the "Electricity Market Regulation Agency". 422 of the HEPPs are small-scale projects which have installed power in-between 1 MW and 15MW (included). 10 of these small scaled HEPPs are owned by EÜAŞ. The 297 of these 412 HEPPs are in construction stage.[71] The 91 of these 412 are operating. Recently, there are accumulated installed capacities of HEPPs those are under construction in Turkey. Based on the EMRA data, for small scale HEPPs, the operating ones are accounted less than 22 % of the total number of licensed small scale HEPPs in Turkey. According to Figure 6 below, it is observed that thermal power plants have shown a rapid growth in parallel with the demand for electricity whereas hydroelectric power generation has grown at a far slower rate. Furthermore, the percentage of Turkey's total installed capacity is examined in the Figure 7 below.

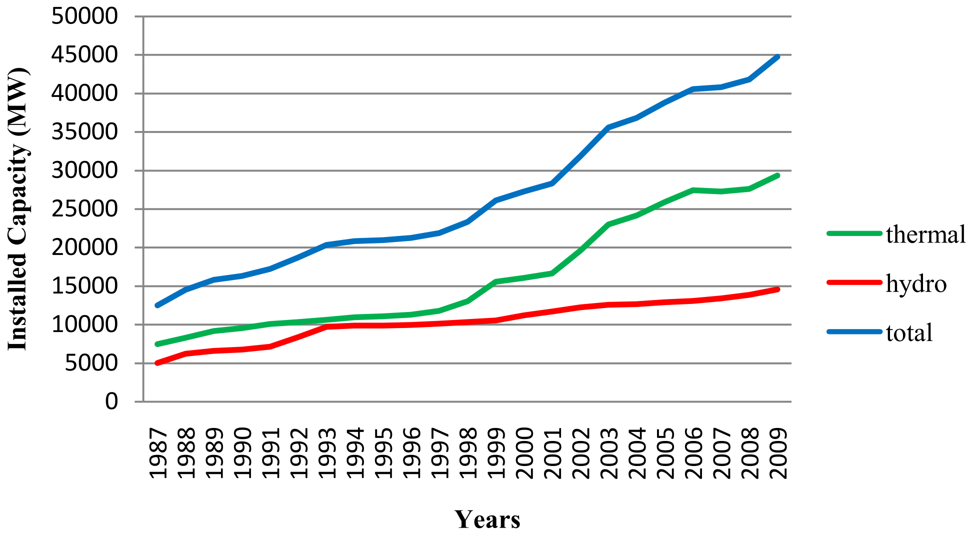

Figure 6: Annual development of Turkey's Installed Capacity[72]

[70] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp
[71] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/proje/yenilenebilir.xls
[72] Retrieved from http://www.teias.gov.tr/istatistik2009/1.xls

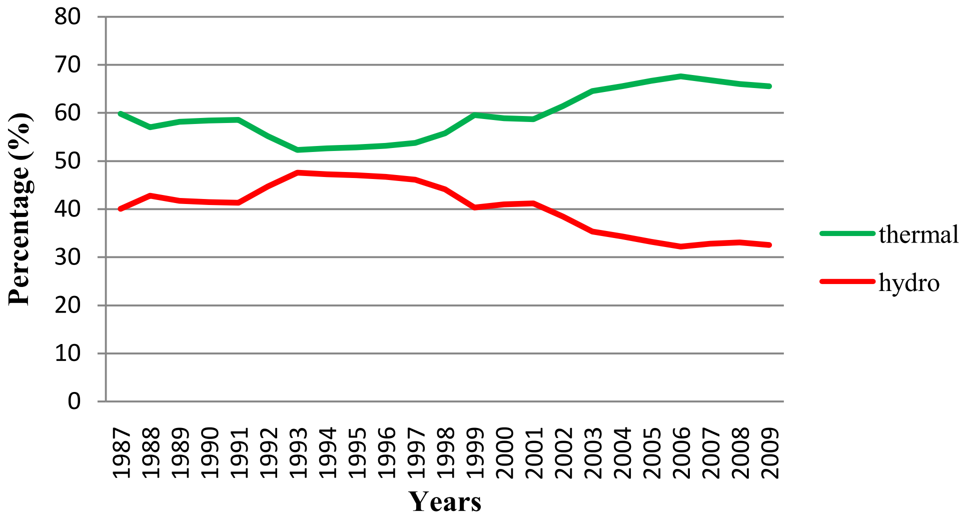

Figure 7: Annual development of Turkey's Thermal and Hydro Power[73]

In the light of completion ratio of HEPPs, the below identifies that the condition of project development which was updated at September 2010 by EMRA and arranged in accordance with relevant factors;

Table 13: Number of HEPP facilities licensed to private production companies and completed over a certain completion ratio[74]

Status	Number of HEPP project
Small scale HEPP project licensed	412
Small scale HEPP licensed and ongoing construction	297
Small scales operating	91
Licensed but not operating (under construction or do not start construction yet)	321
(80-100) % completion of projects	18
(60-80)% completion of the project	14
(40-60)% completion of project	22
(20-40)% completion of project	34
(0-20)% completion of project	151

The table above shows that, 32 of the HEPP projects were completed with a ratio higher than 60 percent, which means that only (32/321*100) 9.9% of the HEPPs under construction could achieve a higher completion ratio than 60 pe rcent. Therefore, it r esults in that the electricity generation from HEPP business is not a common practice.

[73] Retrieved from http://www.teias.gov.tr/istatistik2008/1.xls
[74] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/proje/yenilenebilir.xls

As a part of its energy policy, Turkey started a liberalization process in its electricity market in 90's. Formerly, all energy plants but especially the HEPPs have been built and operated by the State. The liberalization process commenced with electricity production although is not completed yet, however full privatization of state-owned distribution assets is completed..

Participation of private sector in the electricity generation from hydro-electrical power plant market is a new concept in Turkey. Since, the increasing energy demand cannot be afforded by the State in consequence of the high investment and operation cost of required additional power plants, the State started to outsource the construction of those plants through licenses at 2001. The aim is to face the growing demand for electricity and provide the capital to realize hydro investment. Until the renewable energy law was enacted in 2001, the companies had not been responsible for the whole process (planning and financing of the project, choosing the technology and operating of HEPPs) and not taken all the risks.

According to the table below, the contribution of renewable energy produced by private production companies to Turkey's total renewable energy production is 20.5% in 2009.

Table 14: Annual development of Turkey's installed capacity produced by private companies and the share of Renewable Energy capacity development by private companies to Turkey's installed capacity.[75]

		2006	2007	2008	2009
Installed Capacity by Private Production comp (MW)	Thermal	10321.7	10688.8	11208.9	13421.0
	Hydro+Geothermal+Wind	1374.5	1624.3	2181.5	3168.7
	Total	11696.2	12313.1	13390.4	16589.7
	The percentage of renewable energy resourced installed capacity in total installed capacity (%)	11.8	13.2	16.3	19.1
Total Installed Capacity of Turkey (MW)	Thermal	27420.2	27271.6	27595.0	29339.1
	Hydro+Geothermal+Wind	13144.6	13564.1	14222.2	15422.1
	Total	40564.8	40835.7	41817.2	44761.2
	The percentage of renewable energy resourced installed capacity in total installed capacity (%)	32.4	33.2	34.0	34.5
	The percentage of renewable energy resourced installed capacity of private production companies to Turkey's total installed capacity	10.5	12.0	15.3	20.5

Thus, most of the private companies in Turkey have little experience and know-how on the management and operation of HEPPs - also renewable energy sources -. Moreover, the private companies that invest in HEPPs in Turkey are generally active in other sectors like textile,

[75] Retrieved from http://www.teias.gov.tr/istatistik2009/6.xls

cement etc. [76] The low ratio of private companies in the power generation sector proves that HEPP project implementation by private companies is not a common practice for Turkey.

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

Since the Altıntaş Creek is a tributary of Değirmendere Stream, the hydro electrical power plants on the Değirmendere river basin will be examined within the scope of common practice.

The Figure 11 s hows the 10 HEPPs from aerial view point of the basin. The HEPPs were tabulated below with respect to owner, certain status, licensing date, installed capacities and completion rate in accordance with "Tool for the demonstration and assessment of additionality, ver. 05.2.1" which emphasizes that the diffusion of similar activities to the region should be discussed and defines similar activities as relying on similar technology, similar scale, in a similar environment, investment climate, similar opportunity to access technology and financing etc. Therefore, the first three HEPP will not be mentioned since, they are large scale projects and Atasu HEPP had a dam, as well. Furthermore, Maçka I and Maçka II Weirs indicated in the Feasibility Report[77] were repealed and did not mentioned in the table below. At the official web sites[78], there is no information regarding Derin HEPP and the privatization of Larhan HEPP is not finished yet. Hence, the table is prepared as below with the inclusion of HEPPs related to common practice.

Table 15: The HEPP projects planned to implemented on the Değirmendere River Basin in Trabzon [79]

Name of the HEPP	Company Name	Status	Licensing date	Capacity (MW)	Completion* (%)
Atasu Dam and HEPP	General Directorate of State Hydraulic Works (DSI)	Water holding - no production	-	45	Fully constructed
Saman Weir and HEPP	Atlas En. El. Prod. Inc.	Licensed	11.2.2009	29.054	4.6
Cevher HEPP	Ozcevher En. El. Pro. Inc.	Licensed	27.9.2007	16.375	100
Sukenarı HEPP	BGT Mavi Energy End. Trad. Inc.	Licensed	11.11.2010	6.5	3.3
Kadahor HEPP	**Arsin Enerji İç ve Dış Tic A.Ş.**	**Licensed**	**18.08.2011**	**9.362**	**-**
Köprüyani HEPP	Hetas Hacisalihoglu En. Trade Inc. .	Licensed	20.6.2007	10	22.2

[76] Retrieved from http://e-imo.imo.org.tr/Portal/Web/new/uploads/file/menu/HESRapor.pdf
[77] Kadahor Weir and HEPP, Feasibility Report, page 1-3
[78] Retrieved from http://www.eie.gov.tr/HES/index.aspx and http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp, http://www2.epdk.org.tr/lisans/elektrik/proje/yenilenebilir.xls
[79] Planned by the information retrieved from http://www.eie.gov.tr/HES/index.aspx and http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp, http://www2.epdk.org.tr/lisans/elektrik/proje/yenilenebilir.xls

Arısu HEPP	Ustaoglu El. Prod. Inc.	Licensed	25.12.2008	3.3	48.7

* *Condition in July 2011*

There are 4 other projects in which the proposed project is included with no completion ratio, have not been finished and have not generated electricity yet. The Kadahor HEPP were started to be constructed however; any certain completion ratio did not submitted to EMRA in July, 2011.

The project at the upstream, Arısu Weir and HEPP will be developed by Ustaoğlu Electricity Production Inc. and expected to benefitting from VER revenues. The application of Arısu HEPP to GS Foundation can be confirmed by GS official web site. The proposed project owner, Arsin Enerji İç ve Dış Tic. A.Ş. expects to be benefitting from VER revenues by means of Kadahor HEPP.

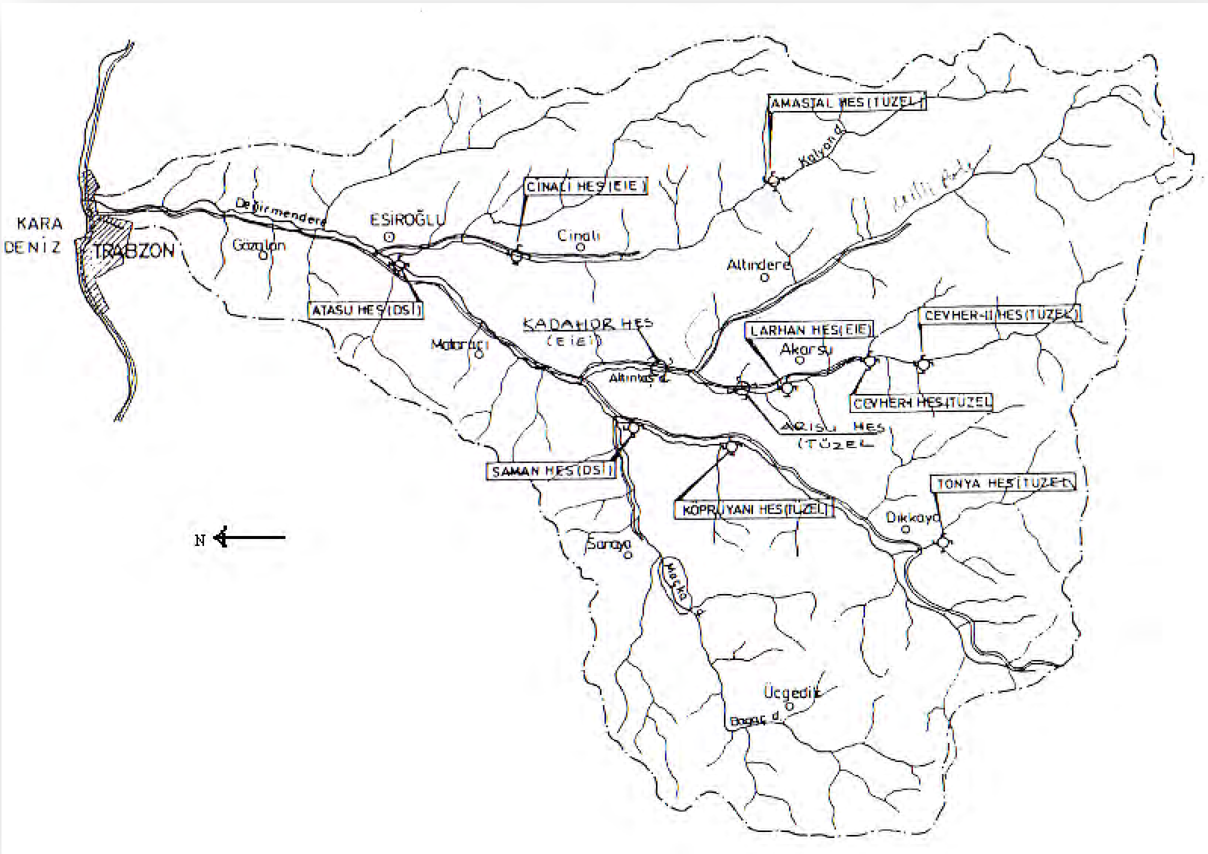

Figure 8: HEPP project on the Değirmendere river basin.[80] **(*The license of Cevher II HEPP was terminated by EMRA.* [81])**

[80] Planned by the information retrieved from http://www.eie.gov.tr/HES/index.aspx and http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/verilentesistipi.asp, http://www2.epdk.org.tr/lisans/elektrik/proje/yenilenebilir.xls

[81] Retrieved from http://www2.epdk.org.tr/lisans/elektrik/lisansdatabase/sonaerdirilen.asp

Depending upon the lower completeness ratio of HEPP project owned by private sector, it is ensue that most of the private companies in Turkey have little experience and know-how on the management and operation of HEPPs - also renewable energy sources -. Moreover, the private companies that invest in HEPPs in Turkey are generally active in other sectors like textile, cement etc. [82] The low ratio of private companies in the power generation sector proves that HEPP project implementation by private companies is not a common practice for Turkey.

Outcome of common practice analysis:

As a result, the low rate of completion of the projects, the low contribution privately held hydro projects and also the implementation of the same type of projects in the same region with VER revenues confirm that the barriers elaborated above decrease or limit the investments to HEPPs and other renewable energy sourced power plants. This in turn shows that the electricity generation from HEPP business is not a common practice in Turkey. Therefore Step 4 is satisfied and the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The emission reductions resulting from the proposed project are calculated according to AMS.I. D "Approved Small Scale Methodology for Grid Connected Renewable Electricity Generation, version 17".

Baseline emissions are multiplications of net electricity supplied to grid by project activity and CO_2 emission factor. Emission factor has been calculated in a conservative way as requested by the methodology. Basic assumptions made are;

- Based on selection of ex-ante option, emission factor remains same over the crediting period,
- Emission factor of fuels sources is retrieved from IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventory.

The Additionality Assessment of the project activity has been demonstrated using the latest version of the, "Tool for the demonstration and assessment of additionality, ver. 05.2.1".

According to the ''Tool to calculate the emission factor for an electricity system, ver. 02.2.1'', in calculating the operating margin ($EF_{grid, OM, y}$), project developers have the option to select from four potential methods:

(a) Simple OM, or

[82] Retrieved from http://e-imo.imo.org.tr/Portal/Web/new/uploads/file/menu/HESRapor.pdf

(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Options (b) and (c) are not preferred due to the scarcity of data for Turkey. Option (d) is not preferred since low-cost/must run resources do not constitute more than 50% of total grid generation. As described in the tool, the Simple OM (a) can only be used if low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on l ong-term averages for hydroelectricity production. Low-cost/must run resources consist of hydro, geothermal, wind, low-cost biomass, nuclear and solar which are used for power plants with low marginal generation costs or power plants and dispatched independently of the daily or the seasonal load of grid. There is no indication that coal is used as a must-run and no nuclear energy plants are located in Turkey. The following table shows the share of low-cost/must-run production for the last 5 years. The low-cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years, 21,09%. Therefore the requirements for the use of the Simple OM calculations (option a) are satisfied.

Table 16: Total electricity generation and from low-cost/must run resources (2005-2009). [83]

Electricity Gene. (GWh) / Year	**2005**	**2006**	**2007**	**2008**	**2009**
Thermal Total	122242.30	131835.10	155196.17	164139.30	156923.44
Hydro+Geothermal+Wind Total	39713.90	44464.70	36361.92	34278.70	37889.47
Turkey's Total	161956.20	176299.80	191558.09	198418.00	194812.92
Share of low-cost/must-run production	24.52	25.22	18.98	17.28	19.45
Average share (%)	**21.09**				

Ex-ante option is chosen to calculate the simple OM. The calculations based on ex-ante option to determine CO_2 Emission are expressed in B.6.3, step 3.

Furthermore, the capacity addition is composed of the set of power units in the electricity system added to the Turkey's capacity between 2006 and 2009. Since the generation is not sufficiently large to meet the 20% of total generation at 2009 as requested in the methodology, the capacity generations of 7 plants with latest starting date to operation at 2005 should be added to the set of power units. After this addition, the capacity addition is used to calculate the build margin emission factor. (see B.6.3, annex 3)

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

Data / Parameter:	**EGy**
Data unit:	GWh
Description:	Net electricity generated and delivered to the grid by all power sources

[83] Retrieved from http://www.teias.gov.tr/istatistik2009/37(06-09).xls and http://www.teias.gov.tr/istatistik2009/36(01-05).xls

	serving the system, excluding low-cost/must-run units/plants, in year y
Source of data used:	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey's gross electricity generation of primary energy sources between1975-2009, Annual development of electricity generation-consumption-losses in Turkey between 1984-2009. http://www.teias.gov.tr/istatistik2009/32(75-09).xls http://www.teias.gov.tr/istatistik2009/30(84-09).xls
Value applied:	Table 12,Table 13,Table 15
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ''Turkish Statistics Law and Official Statistics Program'' TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Any comment:	

Data / Parameter:	**$EG_{y\ ,\ Kadahor}$**
Data unit:	GWh
Description:	Net Electricity delivered to the grid by Kadahor HEPP in year y
Source of data used:	Kadahor Weir and HEPP, Project Description File
Value applied:	23.338
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for emission reduction estimation
Any comment:	

Data / Parameter:	**$EF_{grid,\ OM\ simple,\ y}$**
Data unit:	T CO_2/MWh
Description:	Simple operating margin CO_2 emission factor in year y
Source of data used:	Calculated by formula (1)
Value applied:	0.6555 by Table 16

Justification of the choice of data or description of measurement methods and procedures actually applied :	The used data in formula is taken from justified sources as is seen from other tables in part B.6.2 of this PDD.
Any comment:	

Data / Parameter:	**$FC_{i,y}$**
Data unit:	m^3 / tons (m^3 for gaseous fuels)
Description:	Amount of fossil fuel consumed in the project electricity system by generation sources in year *y*
Source of data used:	TEIAS (Turkish Electricity Transmission Company) Fuels consumed in thermal power plants in Turkey by the electric utilities for year y http://www.teias.gov.tr/istatistik2009/44.xls
Value applied:	Table 14
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Any comment:	

Data / Parameter:	**Heat Value**
Data unit:	TJ
Description:	Amount of heat produced by the consumption of a unit quantity of fuel types consumed in thermal power plants
Source of data used:	TEIAS (Turkish Electricity Transmission Company) Heating values of fuels consumed in thermal plants in Turkey by the electricity utilities (2009) http://www.teias.gov.tr/istatistik2009/46.xls for 2009 data
Value applied:	Table 14
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available. Heat value is divided by FC to determine NCV.(The formula is taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1 of Volume 2,Box 1.1)
Any comment:	1J = 0.238846 cal.

Data / Parameter:	**NCV** $_{i, y}$
Data unit:	GJ/tonnes
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	TEIAS (Turkish Electricity Transmission Company) Heating values of fuels consumed in thermal plants in Turkey by the electricity utilities (2009) http://www.teias.gov.tr/istatistik2009/46.xls for 2009 data
Value applied:	Table 14
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ''Turkish Statistics Law and Official Statistics Program'' TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.
Any comment:	In order to convert the data source units to the required units; 1J = 0.2389 cal. and the density of natural gas is considered to be 0.695kg/m^3

Data / Parameter:	**EF** $_{C02,i,y}$
Data unit:	T CO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 and Annex 1 for sub-bituminous of Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventory http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm
Value applied:	Table 14, Table 18, Table 19
Justification of the choice of data or description of measurement methods and procedures actually applied :	There is no information on the fuel specific default emission factor in Turkey, hence, IPCC values has been used as referred in the ''Tool to calculate the emission factor for an electricity system, version 02.2.1''.
Any comment:	

Data / Parameter:	**EF** $_{grid, BM, y}$
Data unit:	tCO2/MWh
Description:	Build margin CO_2 emission factor in year y
Source of data used:	Calculated by equation 3 at Table 20
Value applied:	0.45668971
Justification of the choice of data or	Calculated *ex-ante* and comprised capacity addition of power plants between years 2005-2009 according to the "Tool to calculate emission

description of measurement methods and procedures actually applied :	factor for an electricity system, version 02.2.1”
Any comment:	

Data / Parameter:	**EF $_{EL, m, y}$**
Data unit:	tCO_2e/MWh
Description:	CO_2 emission factor of power unit *m* in year *y*
Source of data used:	Calculated by equation 4 Table 19
Value applied:	Table 19, Table 20
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated *ex-ante* according to the “Tool to calculate emission factor for an electricity system” version 02.2.1, EB 63 Annex 19.
Any comment:	

Data / Parameter:	**$\eta_{m, y}$**
Data unit:	-
Description:	Average net energy conversion efficiency of power unit m in year y
Source of data used:	Tool to calculate the emission factor for an electricity system, ver. 02, Annex 1 (after 2000)
Value applied:	Table 17, Table 19
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since there is no current efficiency values of power units in Turkey, the efficiency values o are retrieved from Tool, ver. 02.2.1, Annex 1.
Any comment:	

Data / Parameter:	**EG $_{m, y}$**
Data unit:	GWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *m*, in year *y*
Source of data used:	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey’s gross electricity generation of primary

	energy sources between 1975-2009 http://www.teias.gov.tr/istatistik2009/32 (75-09).xls
Value applied:	Table 20
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available. The electricity generation from all different sources included in capacity addition used in the equation 3.
Any comment:	

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2e/MWh
Description:	Combined margin CO_2 emission factor in year *y*
Source of data used:	Calculated data applied to the equation 5
Value applied:	0.556098
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated *ex-ante* according to the “Tool to calculate emission factor for an electricity system, version 02.2.1”, EB 63 Annex 19.
Any comment:	

Data / Parameter:	**Electricity Imports**
Data unit:	GWh
Description:	Electricity transfers from connected electricity systems to the project electricity system by years (2007-2009)
Source of data used:	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey’s gross electricity generation-imports-exports and demand http://www.teias.gov.tr/istatistik2009/23.xls
Value applied:	Table 15
Justification of the choice of data or description of measurement methods and procedures actually	According to ‘‘Turkish Statistics Law and Official Statistics Program’’ TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available.

applied :	
Any comment:	

Data / Parameter:	**Capacity additions**
Data unit:	Name of the plant; Installed capacity (MW); Fuel type; Generation (GWh);
Description:	Capacity additions to the grid that comprises 20% of the total generation (2005-2009)
Source of data used:	TEIAS (Turkish Electricity Transmission Company) Generation units put into operation in 2005;2006;2007;2008;2009 Capacity Projection Report 2010-2019, Annex-2, for 2009 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf Capacity Projection Report 2009-2018, Annex-2, for 2008 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf Capacity Projection Report 2008-2017, Annex-2, for 2007 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2008.pdf Capacity Projection Report 2007-2016, Annex-2, for 2006 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202007.pdf Capacity Projection Report 2006-2015, Annex-2, for 2005 http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202006.pdf
Value applied:	Table 20, Annex 3; Table 24-Table 29
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ''Turkish Statistics Law and Official Statistics Program'' TEIAS, Turkish Electricity Transmission Company is the official source for the related data, hence providing the most up-to-date and accurate information available. Since the summation of capacity additions between 2006 and 2009 are not sufficiently large, the capacity generation of 7 plants with latest starting date to operation at 2005 should be added to meet the %20 of total generation at 2009.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

In respect of approved small scale methodology AMS-I.D "Grid Connected Renewable Electricity Generation, version 17", the baseline scenario is defined as the consolidation of electricity delivered to the grid by the project activity and electricity generated by the operation of grid-connected power plants in Turkey and electricity produced by the new generation sources as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system, version 02.2.1".

The emission factor is determined as follows; a combined margin (CM), combining the operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system, version 02.2.1" by seven steps;

Step 1: Identification of the relevant electricity system

According to the "Tool to calculate the emission factor for an electricity system, ver. 02.2.1" , a *project electricity system* should be defined by spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Hence, the *project electricity system* comprises of the Kadahor HEPP project and all power plants attached to the Interconnected Turkish National Grid.

A *connected electricity system*, e.g. national or international is defined as electricity that is connected by transmission lines to the project electricity system. For the case of the project "the project electricity system" and "the connected system" are the same. As also confirmed by TEIAS (Turkish Electricity Transmission Company Inc.), the Turkish transmission system is interconnected.[84] There is an independent regional grid system neither in Trabzon nor in the Eastern Black Sea Region. Hence, the connected electricity system comprises of the Kadahor HEPP and all power plants connected to the Interconnected Turkish National Grid.

In addition to this, since DNA in the host country did not publish a delineation of the project electricity system and connected electricity system, the suggested criteria at "Tool to calculate the emission factor for an electricity system, ver. 02.2.1" shall be examined. The following criteria can be used to determine the existence of significant transmission constraints:

1. The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.
2. In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 pe rcent between the systems during 60 percent or more of the hours of the year;

Since there is no published data on capacity usage of transmission lines, the first criterion "The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year." could not be proved.

Besides, in Turkey, no spot electricity market is available, as suggested in the second criterion. Hence, this criterion is not viable as well.

As suggested in "Tool to calculate the emission factor for an electricity system, ver. 02.2.1", "if these criteria do not result in a clear grid boundary, use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial / regional / national)." However, there are no layered dispatch systems in the host country-Turkey. As a result the national grid was used as the project electricity system. Hence, the estimation of OM (Operating Margin) and

[84] Türkiye Elektrik Enerjisi 10 Yıllık Üretim Kapasite Projeksiyonu (2010-2019), TEIAS, page 4

BM (Built Margin) are based on the definition of the Turkish electricity network as one single interconnected system.

Electricity transfers from connected electricity systems to the project electricity system are defined as *electricity imports* and electricity transfers to connected electricity systems are defined as *electricity exports*.

For the purpose of determining the build margin emission factor, the spatial extend is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable significant increases in imported electricity.

For the purpose of determining the operating margin emission factor, 0 t CO_{2-eq} / MWh is used as the CO_2 emission factor for net electricity imports ($EF_{grid, import, y}$) from a connected electricity system within the same host country. Electricity exports should not be subtracted from the electricity generation data used for calculating and monitoring the electricity.

Step 2: Choose whether to include off-grid power plants in the project electricity system

According to the ‘‘Tool to calculate the emission factor for an electricity system, ver. 02.2.1” project participants may choose between the following two options to calculate the operating margin and build margin emission factors.

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

For the proposed project, Option I is selected and only grid power plants are included in the calculation.

Step 3: Selection of an operating margin (OM) method

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

According to the ‘‘Tool to calculate the emission factor for an electricity system, ver. 02.2.1’’, in calculating the operating margin ($EF_{grid, OM, y}$), project developers have the option to select from four potential methods:

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

Options (b) and (c) are not preferred due to the scarcity of data for Turkey. Option (d) is not preferred since low-cost/must run resources do not constitute more than 50% of total grid generation. As described in the tool, the Simple OM (a) can only be used if low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.
Low-cost/must run resources include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation which are defined as power plants with low marginal generation costs or power plants and dispatched independently of the daily or the seasonal load of grid. There is no indication that coal is used as a must-run and no nuclear energy plants are located in Turkey. The following table shows the share of low-cost/must-run production for the last 5 years. The low-cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years, 21.09%. Therefore the requirements for the use of the Simple OM calculations (option a) are satisfied.

Table 17: Total electricity generation and from low-cost/must run resources (2005-2009). [85]

Electricity Generation (GWh) / Year	2005	2006	2007	2008	2009
Thermal Total	122242.30	131835.10	155196.17	164139.30	156923.44
Hydro + Geothermal + Wind Total	39713.90	44464.70	36361.92	34278.70	37889.47
Turkey's Total	161956.20	176299.80	191558.09	198418.00	194812.92
Share of low-cost/must-run production	24.52	25.22	18.98	17.28	19.45
Average share (%)	**21.09**				

According to the ''Tool to calculate the emission factor for an electricity system, ver. 02.2.1'' it is allowed to select one of the options below;

- ***Ex ante option:*** If the *ex-ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

- ***Ex post option:*** For *ex post* option, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. The year, in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

For this proposed project the ex-ante option is selected. Data for calculating the three year average is obtained from the period 2007 - 2009 which are the most recent data available at the time of preparation of the GS VER PDD.

[85] Retrieved from http://www.teias.gov.tr/istatistik2009/37(06-09).xls and http://www.teias.gov.tr/istatistik2009/36(01-05).xls

Step 4: Calculation of the operating margin emission factor according to the selected method.

The simple OM may be calculated by using;

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if; (1) no ne cessary data for option (A), (2) only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known, (3) off-grid power plants are not included in the calculation.

For the project in question, ***Option B*** is preferred since,

- Electricity generation and CO_2 data for individual power units are not available.
- Only renewable power generation are considered as low cost/must run resources.
- Off-grid power plants are not included in calculations.
- The fuel consumption of different fuel type data for power plants/ units are available in the official source, TEIAS.

Under Option B, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must run power plants / units, and based on fuel type(s), and total fuel consumption of the project electricity system, and OM simple is determined as follows;

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y} \qquad (1)$$

Where:

$EF_{grid,\ OM\ simple,\ y}$ = Simple operating margin CO_2 emission factor in year y (t CO_2/MWh)

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

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

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

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh)

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

y = the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) on data vintage in step 3.

The subscript *m* refers to the power plants/units delivering electricity to the grip, **not including Low-cost / must-run power plants/units, and including electricity imports to the grid -** electricity imports should be treated as one power plant *m* -.

In order to calculate the OM emission factor, CO_2 emission value is calculated using the equation as below since the 2010 data is not available;

$$\sum_i (FC_{i,y} \; x \; NCV_{i,y} \; x \; EF_{CO2_{i,y}}) \quad (2)$$

Table 18: Heat Values, FC, NCV and EF_{CO2} values of each fuel source in 2009

Fuel Type	FC (tones)[86]	Heat Value (MJ)[87]	NCV (MJ/kg=GJ/tones)[88]	EF_{CO2} (Kg/TJ = tones/ GJ)[89]
Sub-Bituminous Coal	6621177	146982896224	22.19891	92800
Lignite	63620518	408574172080	6.42205	90900
Fuel-Oil	1594321	63429039558	39.78436	75500
Diesel-Oil	180857	7657666742	42.34100	72600
LPG	111	5154689	46.43864	61600
Naphtha	8077	352288669	43.61628	69300
Natural Gas[90]	20978040	779336254324	37.15010	54300

The values of 2007 and 2008 can be found in Annex 3 in a tabular form.

[86] Retrieved from http://www.teias.gov.tr/istatistik2009/44.xls
[87] Retrieved from http://www.teias.gov.tr/istatistik2009/46.xls
[88] The formula is taken from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1 of Volume 2,Box 1.1
[89] 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1 of Volume 2,Table 1.4
[90] Density of natural gas is taken as 0.695kg/m^3

In order to calculate the OM, the net electricity generated and delivered to the grid by all sources excluding the low-cost/must run resources is required. However, net generation national data is only available for total of power sources. Due to this fact, the internal consumption ratio is used to identify the net electricity generation by thermal sources. The difference of low-cost/must-run generation and supplied to grid amount is the generation by thermal sources. The internal consumption of thermal plants is determined by means of ratio. The thermal generation excluding internal consumption gives the net generation excluding low-cost/must-run as is followed by Table 15. After addition of import electricity, the EGy is determined.

Table 19: Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (GWh)[91]

Electricity Generation (GWh)	Supplied to grid	Low-cost/ must -run	Thermal	Internal consumption (%)	Internal consumption of thermal	Net generation (-) low-cost/ must-run	Import	**EG y (GWh)**
2007	184204.0	36361.92	155196.17	4.3	6673.4353	148522.73	864.3	**149387.035**
2008	190551.3	34278.7	164139.3	4.4	7222.1292	156917.17	789.4	**157706.571**
2009	187431.3	37889.47	156923.44	4.2	6590.7845	150332.66	812	**151144.656**

Table 20: Electricity Weighted $EF_{grid, OMsimple, y}$ (tCO_2/MWh)

	2007	**2008**	**2009**
	EF grid, OM simple, y, i (tCO_2/MWh)		
Sub-Bituminous Coal	0.08026	0.08201	0.09024
Lignite	0.25541	0.26100	0.24572
Fuel Oil	0.04532	0.04128	0.03168
Diesel Oil	0.00105	0.00256	0.00368
LPG	0	0	0
Naphtha	0.00023	0.00021	0.00016
Natural Gas	0.27319	0.27235	0.27998
Total	0.65547	0.65941	0.65147
3-year generation weighted average (tCO2/MWh)	**0.655506201**		

$$\mathbf{EF_{grid, OM\ simple, y, i} = 0.\ 6555\ tCO2/MWh}$$

[91] Retrieved from http://www.teias.gov.tr/istatistik2009/32(75-09).xls and http://www.teias.gov.tr/istatistik2009/30(84-09).xls

Step 5: Identifying the group of power units to be included in the build margin

In terms of vintage data, the “Tool to Calculate the Emission Factor for an Electricity System, ver. 02.2.1”, provides two options to be chosen.

As per “Tool to calculate the emission factor for an electricity system, ver. 02.2.1”, in terms of vintage data, option 1 was chosen. Option 1 states that; for the first crediting period, the BM emission factor ex-ante based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the BM emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for the renewable of the crediting period to the DOE. For the third crediting period, the BM emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
The list of the power plants is defined under Annex 3, Table 24- Table 29 of this PDD.

The sample group of power unit ***m*** used to calculate the build margin should be determined as per the procedure in the tool.

a) The 5 most recent power units, excluding CDM projects ($SET_{5\text{-units}}$) shall be identified and annual electricity generation of “$AEG_{set\text{-}5units}$” shall be determined.
b) The annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} in MWh) shall be determined. The set of power units, excluding power units registered to CDM project starting with power units that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} ($SET_{\geq 20\%}$) and their annual electricity generation ($AEG_{SET\geq 20\%}$ in MWh)
c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid.
If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

For every set of 5 power units added to the generation capacity of Turkey, the selected sets have a lower annual electricity generation than $AEG_{SET\geq 20\%.}$ Since the date of activation of power units in 2009 are not publicly available and the electricity generations of all combination of 5 units were calculated a smaller value than $AEG_{SET\geq 20\%.}$.
Then, $SET_{sample} = SET_{\geq 20\%}$

The selected set of power units ($SET_{\geq 20\%}$) which comprise 20% of AEG_{total} is the capacity addition is selected from year 2006 to 2009 with addition of seven plants from the year 2005. Power plants registered as CDM projects should be excluded from the set.

The build margin emissions 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:

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

(3)

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

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

$EF_{EL, m, y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in Step 4 (a) for the simple OM, using options A1, A2 or A3, using for *y* the most recent historical year for which power generation data is available, and using for *m* the power units included in the build margin.

Option A2 is preferred because plant specific fuel consumption data is not available for Turkey. The calculation of the CO_2 emission factor for each power unit m ($EF_{EL,m,y}$) is shown below.

$$EF_{EL,my} = \frac{EF_{CO_2,m,i,y} \times 3.6}{\eta_{m,y}}$$

(4)

Where:

$EF_{EL,m, y}$ = CO_2 emission factor of the 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)

$n_{m,y}$ = Average net energy conversion efficiency of power unit *m* in year *y* (ratio)

y = the relevant year as per the data vintage chosen in Step 3

Table 21: Average net energy conversion efficiency by energy sources (%)[92]

Average Net Energy Conversion Efficiency by Energy Sources (%)						
Sub-Bituminous Coal	Lignite	Fuel-oil	Diesel-oil	LPG	Naphtha	Natural Gas
0.390	0.390	0.395	0.395	0.395	0.395	0.600

Table 22: Average CO_2 emission factor by fuel types (tCO_2/Tj)

EF CO_2 (t CO_2/ GJ) [93]						
Sub-Bituminous Coal	Lignite	Fuel-oil	Diesel-oil	LPG	Naphtha	Natural Gas
0,0873	0,0909	0,0755	0,0726	0,0616	0,0693	0,0543

Table 23: $EF_{EL, m, y}$ Calculation

Fuel Type	EF CO_2 (tCO_2/Gj)	η Generation Efficiency (%)	$EF_{EL,m,y}$ (tCO_2/MWh)
Sub-Bituminous Coal	0.093	0.390	**0.8566**
Lignite	0.091	0.390	**0.8391**
Fuel Oil	0.076	0.395	**0.6881**
Diesel Oil	0.073	0.395	**0.6617**
LPG	0.062	0.395	**0.5614**
Naphtha	0.069	0.395	**0.6316**
Natural Gas	0.054	0.600	**0.3258**

The multiplication of emission factor and electricity generation of capacity addition by source is the amount of emission by source which is divided by total capacity addition between year 2005-2009 which comprises 20% of total generation, excluding projects registered to CDM, gives the build margin CO_2 emission factor (see equ. 3). Table 20 shows the data applied.

Table 24: BM calculation by capacity addition

Fuel Type	Electricity generation Capacity addition (GWh)	EF,EL,m,y (tCO_2/MWh)	Emission by source
Sub-bituminous Coal	3,993.33	0,9354	3420.7479
Lignite	7,023.00	0,9977	5892.8372
Fuel-oil	1,651.49	0,7744	1136.3924
Diesel Oil	21.20	0,9504	14.027423
LPG		0,4928	0
Naphtha	578.60	0,5544	365.4408
Natural Gas	19,535.96	0,4250	6364.8141

[92] For detailed information please look at part B.6.2
[93] Retrieved from http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm, for more detail please look at B.6.2

Wind	2,006.91	0	0.00
Geothermal	69.80	0	0
Hydro	4,343.15	0	0.00
Renewable+Waste	220.02	0	0.00
Total	39,756.45		17,194.26
Excluding VER projects generation	2.106,69		
Total EG m,y	**37,649.76**		

$$\mathbf{EF_{grid,BM,y}} = 17{,}194.26 / 37{,}649.76 = \mathbf{0.4567\ tCO_2/MWh}$$

Step 6: Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor**,** $EF_{grid,CM,y}$, is based on the following methods;

a) Weighted average CM
b) Simplified CM

The weighted average CM method is preferred to calculate.

a) Weighted average CM method:
The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad (5)$$

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of the operating margin emission factor (%)
w_{BM} = Weighting of the build margin emission factor (%)

"Tool to calculate the emission factor for an electricity system, ver. 02.2.1" states that;
The following default values should be used for $\mathbf{w_{OM}}$ and $\mathbf{w_{BM}}$:

• Wind and solar power generation project activities: $\mathbf{w_{OM}}$ = 0.75 and $\mathbf{w_{BM}}$ = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

• All other projects: $\mathbf{w_{OM}}$ = 0.5 and $\mathbf{w_{BM}}$ = 0.5 for the first crediting period, and $\mathbf{w_{OM}}$ = 0.25 and $\mathbf{w_{BM}}$ = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Since the proposed project is HEPP, the weighs for the operating margin and build margin emission factors are 0.50 and 0.50 respectively.

$$\mathbf{EF}_{\mathbf{grid, CM}} = (0.6555 \; x \; 0.50) + (0.4567 \; x \; 0.50) = \mathbf{0.556098 \; tCO_2/ \; MWh}$$

Project emissions (PE_y)

Project emission is calculated as per "ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources, ver. 12.1"
For most renewable power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant.

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (6)$$

The formula indicated total project emission where:

PE_y = Project emissions in year y (tCO2e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO2/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

$PE_{FF,y}$ and $PE_{GP,y}$ are both irrelevant with the project activity and therefore assumed "0", as the proposed project activity is a new grid-connected run-of-river hydro power plant.

The project will have some internal electricity consumption and this internal electricity consumption of the power house will be met from the project's own electricity generation. When there is no generation, the electricity need will be provided from generators.

Furthermore, "ACM0002, ver. 12.1" suggests that project proponents shall account for CH_4 and CO_2 emissions for the reservoir. Although the project does not have a reservoir and result in only a small lake which is attached to the regulator of the facility, the proposed calculations were run to prove the fact that the project's emissions can be assumed "0".

The Project emissions due to reservoir are calculated with the formula;

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000} \qquad (7)$$

where:

$PE_{HP,y}$ = Emission from reservoir expressed as tCO_2e/year

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year y (CO_2e /MWh)

TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

If the power density (PD) of the hydro power plant is above 10 W / m^2, PE y is 0.

The power density of the Project activity is calculated as equation below:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad (8)$$

where:

PD = Power density of the project activity, in W/m^2

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full. (m^2)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m_2). For new reservoirs, this value is zero.

Cap_{PJ} = 9 362 000 W

Cap_{BL} = 0 (Justification: The project is a new hydro power plant)

Since the proposed project does not have reservoir structure, the area of weir structure is accounted.

$A_{PL} = A_{weir\ structure} = 1000\ m^2$ [94] (area may cause CH_4 and CO_2 emission)
$A_{BL} = 0$ (Justification: The project is a new hydro power plant)

Therefore;

PD = (9 362 000 – 0) / (0 – 1000) = 936.2 W/m^2

Since the power density of the project is greater than 10 W/m^2, PE_y is assumed to be 0 as suggested in ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources, ver. 12.1.

Leakage

The energy generating equipment is not transferred from or to another activity. Therefore leakage does not have to be taken into account and is taken as 0 tCO_{2-eq} /year.

Emission Reductions (ER_y)

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

Where:

ER_y	= Emission reductions in year y (t CO_2e/y)
BE_y	= Baseline Emissions in year y (t CO_2e/y)
PE_y	= Project emissions in year y (t CO_2e/y)
LE_y	= Leakage emissions in year y (t CO_2e/y)

Baseline emissions are the product of electrical energy baseline EG_{BL},y expressed in MWh of electricity produced by the renewable generating unit multiplied by the combined margin emission factor, EF_{CM}.

Therefore; the **emission reduction** is:

(23338 MWh/y x 0. 556098 t CO_2e/MWh) – 0 – 0 = ***12978.244 t CO_{2-eq} /y***

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

Table 25: Summary of the ex-ante estimation of emission reductions

[94] Kadahor Weir and HEPP, Project Description File , page 3

Year	Estimation of project activity emissions (tonnes CO_2-eq)	Estimation of baseline emissions (tonnes CO_2-eq)	Estimation of leakage (tonnes CO_2-eq)	Estimation of overall emission reductions (tonnes CO_2-eq)
May-December 2012	0	8652.14274	0	**8652.14274**
2013	0	12978.2441	0	**12978.2441**
2014	0	12978.2441	0	**12978.2441**
2015	0	12978.2441	0	**12978.2441**
2016	0	12978.2441	0	**12978.2441**
2017	0	12978.2441	0	**12978.2441**
2018	0	12978.2441	0	**12978.2441**
January- April 2019	0	4326.07137	0	**4326.07137**
TOTAL	0	90847.49876	0	**90847.49876**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy, Kadahor**
Data unit:	GWh
Description:	Net Electricity generated and delivered to the grid by the Kadahor Weir and Hydroelectric Power Plant in year "y"
Source of data to be used:	Metering devices used in power plants, monthly records signed by TEIAS and plants manager and invoices will be used.
Value of data	23.338 GWh/year
Description of measurement methods and procedures to be applied:	Generation data will be measured by two metering devices continuously. These measurements will be recorded monthly to provide the data for the monthly invoicing to TEIAS. Each month, an officer from TEIAS and the manager/electricity technician of the power plant will record the readings and sign. The continuous measurement of the produced electricity by electricity metering device –ammeter- is to determine the efficiency of power plant. The recordings of TEİAŞ are used to determine the amount of net electricity generated since it is a g overnmental agency. The document for measurement of electricity generation by "Millli Yük Tevzi Merkezi" which works directly depending upon TEIAS is named as OFS-07. However, if the OSOS (Otomatik Sayaç Okuma Sistemi- Automatic Metering Device Monitoring System) will be assembled, all metering works will be monitored by TEIAŞ automatically.
QA/QC procedures	Two calibrated ammeters will act as backup for each other. Maintenance

to be applied:	and calibration of the metering devices will be made by TEIAS periodically. If the difference between the readings of two devices exceeds 0.2%, maintenance will be done before waiting for periodical maintenance.
Any comment:	

Data / Parameter:	**Qmin**
Data unit:	m^3/s
Description:	The minimum flow released to the downstream of creek after regulator structure also known as minimum flow which is ecological water demand of creek and area when diversion to the transmission channel is present. Minimum flow should be at least 10% of the annual average flow rate of Maden Creek and General Directorate of State Hydraulic Works determines and obliges the releasing of minimum flow.
Source of data to be used:	Will be measured via flow meter.
Value of data	0.762 for all months + 0.3 (for fish farms)
Description of measurement methods and procedures to be applied:	During the operation of HEPP, the flow is measured continuously by a flow meter which is placed after the regulator and in conjunction with DSİ online system. As well, the reports of monthly values of minimum flow will be reported to The Provincial Directorate of Environment and Forestry.
QA/QC procedures to be applied:	The minimum flow is controlled by General Hydraulic State Works The 22nd Regional Directorate and Trabzon Provincial Department of Environment and Forestry.
Any comment:	

Data / Parameter:	**Air quality**
Description:	Air quality is determined by the calculated amount of CO_2 emission reductions by the way of proposed project activity.
Description of measurement methods and procedures to be applied:	The emission reduction amount directly gives the effect of project to air quality. Since the proposed project has no emission of GHG, there will be no effect to the air quality negatively. On the other hand, if the proposed project was a conventional power plant, the GHG emissions would be released. Hence, the air quality parameter can be monitored by means of emission reduction. The reduced CO_2 emission amount will be monitored to monitor the parameter; air quality.
Proof	The official data of TUIK (Turkish Statistical Institute) will be chosen.
Frequency	Per crediting period
QA/QC procedures to be applied:	The data used in the calculation of Emission Factor based on the relevant tool will be taken from official statistics. (referred from TUİK)
Any comment:	

Data / Parameter:	**Employment (Job quality)**

Description:	Trainings are an important issue to improve the job quality of employees.
Description of measurement methods and procedures to be applied:	Respective staff is trained regarding health and safety issues and first aid. There is also technical training regarding the operation of the equipment. The trainees receive a certificate after these trainings. Therefore the training given to the respective staff will be monitored by the certificates that they will obtain following their education.
Proof	Respective certificates are available to the DOE.
Frequency	Each crediting period
QA/QC procedures to be applied:	The trainees receive a certificate after these trainings.
Any comment:	

Data / Parameter:	**Employment (Job quantity)**
Description:	The project activity will create a substantial number of jobs in the project area.
Description of measurement methods and procedures to be applied:	The personnel employed will be registered in the Social Security Institution (SSK). The number of the personnel will be monitored by the domicile and Social Security Institution documents. Domicile documents will prove how many people had been employed in the region. Apart from the documents the registration of an employee to the Social Security Institution may be monitored by the web portal of SSK by simply entering the ID number of the respective employee.
Proof	Domicile and social security records or via the web portal of SSK.
Frequency	Annually
QA/QC procedures to be applied:	All employees in all kinds of sectors shall be registered to SSI portal.
Any comment:	

Data / Parameter:	**Livelihood of the poor**
Description:	Generating electricity from resources that was not used before creates an additional income to the local community, influencing the poverty alleviation, particularly in the rural areas, and accelerates the regional economic development.
Description of measurement methods and procedures to be applied:	The impact on the local economy shall be monitored and reported in form of contracts with and invoices from local subcontractors and businesses.
Proof	Contracts with local people employed or local subcontractors
Frequency	Once for crediting period
QA/QC procedures to be applied:	The contracts will be in consensus with QA/QC procedures.
Any comment:	

Data / Parameter:	**Human and institutional capacity**

Description:	The use of renewable energy in the region will require widespread education and improvement in skills of plant staff, as the local people will be incorporated in the development and maintenance of the project.
Description of measurement methods and procedures to be applied:	Educations and trainings are part of monitoring. The measurement of improved skills of plant staff by the way of training certificates is the method of measurement.
Proof	The number and evaluation of training certificates
Frequency	Once for crediting period
QA/QC procedures to be applied:	The training certificates will be in consensus with QA/QC procedures.
Any comment:	

Data / Parameter:	**Balance of payments (sustainability)**
Description:	The project and its role in strengthening the sustainable sector of electricity generation in Turkey tend to contribute to mitigation of import dependency. . Electricity generation from hydro power sources is completely independent from any imports and thus does not have any negative effects on the balance of payments.
Description of measurement methods and procedures to be applied:	Through comparing electricity generated by the proposed project and natural gas, liquid fuel amount that would be used to produce the same amount of electricity. The positive effect of this project to this indicator will be monitored by calculation of avoided natural gas and liquid fuel import amount for electricity production.
Proof	The avoided natural gas and liquid fuel import amount for electricity production
Frequency	Annually
QA/QC procedures to be applied:	The share of electricity generation from natural gas and liquid petroleum fuels, total natural gas and liquid petroleum fuels amounts used for electricity production and electricity production amount of natural gas and liquid petroleum fuels will be taken from official statistics.
Any comment:	

Data / Parameter:	**Cap_{PJ}**
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data:	Project operation, project site
Measurement procedures (if any):	The aggregation of capacities of each turbine which produces electricity.
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the pond measured in the surface of the water, after the implementation of the project activity, when the pond in front of the weir structure is full.
Source of data:	Project site
Measurement procedures (if any):	Measured from the depth of water into the pond
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

A professional monitoring system is required for the plant to verify the actual emission reduction. Since the emission reductions have to be verified continuously for the whole operation process, a monitoring plan is established.

The generated electricity will already be recorded continuously by OSOS (Otomatik Sayaç Okuma Sistemi- Automatic Metering Device Monitoring System) and read by “Millli Yük Tevzi Merkezi” which works directly depending upon TEIAS. The document for measurement of electricity generation is named as OFS-07. Hence no new additional protocol will be needed to monitor the electricity generation. The Plant Manager will be responsible for the electricity generated, gathering all relevant data and keeping the records on daily basis. They will be informed about VER concepts and mechanisms and how to monitor and collect the data which will be used for emission reduction calculations.

The generation data collected during the first crediting period will be submitted to EN-ÇEV Energy Environmental Investments and Consultancy Limited Company who will be responsible for calculating the emission reduction subject to verification: Generation data will be used to prepare monitoring reports which will be used to determine the emission reduction from the project activity. These reports will be submitted to the duly authorized and appointed Designated Operational Entity –DOE- before each verification period.

TEIAS is responsible for both installation of the metering devices and data monitoring as per regulations. Two metering devise will be used for monitoring the electricity generated by proposed project; one for the main metering, the second one is used as spare (cross check). In case of discrepancy between the two devices, TEIAS will conduct the necessary calibration works or the maintenance.

In case of a major failure at both metering at the same time, electricity generation by the plant since the last measurement will be able to be monitored by another metering device at the inlet of the main substation operated by TEIAS where the electricity is fed to the grid.

Calibration of the metering devices will be made by TEIAS and sealed during first operation of the plant. Pursuant to "Measurement Equipment Inspection Regulation" of the Ministry of Commerce and Industry, Article 9." [95] periodical inspections of electrical meters and the related current and voltage transformers are controlled every ten years. The meters will be calibrated by TEIAS when there is a significant inconsistency between two devices using a fixed template[96] or upon request by either project owner or TEIAS[97]. The manufacturers of the electrical meters do not require any periodical calibration.

In addition to two metering devices, the generated electricity can be cross checked from the website[98] of TEIAS-PMUM (Market Financial Settlement Centre). However it must be noted that PMUM web page will show the net electricity generated; less transmission loss, in order to match the data, the figures taken from PMUM web site must be multiplied by transmission loss factor of the grid. The data which will be the basis of the emission reduction is including transmission loss however excluding internal consumption of power plant.

The net electricity fed to the grid will be measured continuously by metering devices and recorded by TEIAS monthly and form the basis for invoicing using the template formed by TEIAS[99]. The production operator of plant will record the generation data monthly. For consistency, recorded data will be compared with electricity sale receipts. All data collected will be recorded daily and archived both as electronically and as hard copy for at least two year in order to be able to monitor the archived net electricity production. When the power plant starts to generate electricity, the data recording will be started. Every record will be achieved for at least two years after its measurement.

Furthermore to demonstrate the emission reduction, the required data are the amount of electricity generated by the project activity and consumption for the auxiliary diesel generator (IPCC guidelines will be used as data source for calculating the project emissions due to diesel fuel consumption.) since the emission of the diesel generator should be excluded (if any) from the emission reductions, according to the tool.

The installed capacity of the hydro power plant during the operation will be monitored in order to specify that, the installed capacity of proposed project is constant during the creditin period as a small scale HEPP. The capacity of turbine gives the installed capacity. Within the scope of proposed project, 2 turbines will be assembled to gain the installed capacity amount designated by the electricity production licence. For the monitoring purposes; the information will be checked from EMRA website on the production license details and the nameplates of turbines will be photographed for cross-check.

The area of pond should be monitored as well, since, the emissions of reservoir area is explained in the methodology "ACM0002, ver 12.1.0" which is the project emissions. The project emission is used in the emission reduction calculations. Therefore, the area of pond is an important

[95] Retrieved from http://www.mevzuat.adalet.gov.tr/html/21179.html
[96] Retrieved from http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/DAG02.xls
[97] Retrieved from http://www.epdk.gov.tr/english/regulations/electric/balancing/balancing.doc
[98] Please see http://pmum.teias.gov.tr
[99] Retrieved from http://www.teias.gov.tr/mali/GDUY/PRO_FORM/OLCUM/K01.xls

parameter. The monitoring will be based the technical drawing of the pond with respect to isohyets -counter line- .

The institutional arrangement of plant staff during operation of plant is planned to employ 3 people. The proper arrangement of staff tasks and distribution of these tasks result in higher efficiency in all fields and systematic monitoring of plant. The figure below shows the arrangement and the distributed tasks follow.

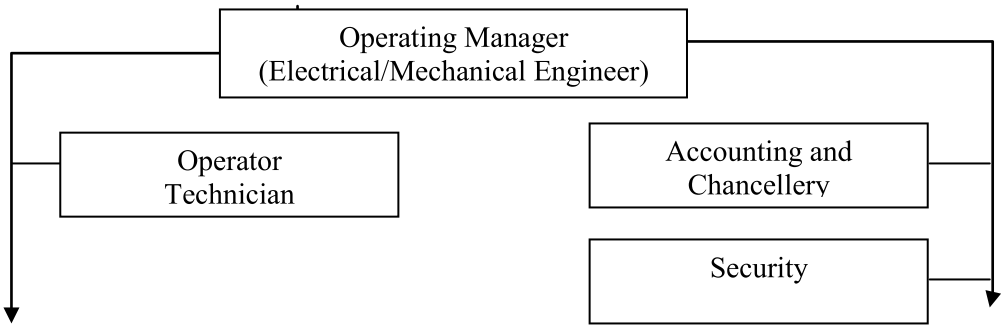

Figure 8: Institutional Arrangement of plant staff during operation

Operating Manager: Overall responsibilities of compliance with VER monitoring plan and operation of plant.

Operator-Technician: Responsible for keeping data to day running of plant, recording, monitoring of relevant data and periodical reporting. Staff will responsible for day to day operation and maintenance of the plant and equipments. All staff will be trained and will have certificate for working with high voltage equipments.

Accounting and Chancellery: Responsible for keeping data about power sales, invoicing and purchasing.

EN-ÇEV (The Consultant): Responsible for emission reduction calculations, preparing monitoring report and periodical verification process.

The potential sustainable development benefits of Kadahor Weir and HEPP will be monitored as per effected indicators of sustainable development matrix. Those indicators are either crucial for an overall positive impact on sustainable development or particularly sensitive to changes in the framework conditions.

The environmental development of monitored by the indicator; air quality. The parameter of air quality is determined by the calculated amount of CO_2 emission reductions by the way of proposed project activity.

The economic and technological development is monitored by the way of indicators; balance of payments and job quantity. Parameter of balance of payments is calculation of avoided natural gas import amount for electricity production. Parameter of job quantity is number of personnel from Social Security Institution documents.

The social development is monitored by the way of indicators; human and institutional capacity, livelihood of the poor and job quality. Parameter of human & institutional capacity and job quality is number of acquired certificates of trained personnel (training certificates). Parameter of livelihood of the poor is contracts invoices with or from local people, subcontractors and businesses.

All of these parameters will be monitored annually. Based on the monitoring plan, the data will be gathered and will be reported on the sustainable development attributed to the Project. For detailed information please refer to tables at section B.7.1.

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

-
Date of completing the final draft of this baseline section: 15/10/2011

Name of entity determining the baseline:
EN-ÇEV Energy Environmental Investments Consultancy L. C
EN-ÇEV which is the carbon consultant of Kadahor Weir and HEPP project is not a project participant.

Address: Mahatma Gandi Caddesi, No: 92/2-3-4-6-7 06680 G.O.P – Ankara/ TURKEY
Tel: +90 312 447 26 22
Fax: +90 312 446 38 10

Contact Person: Özer Emrah Öztürk
E-mail: emrah@encev.com.tr

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:

25/08/2011; the contract to purchasing hydro mechanical equipment- Turbines-.

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

Starting from the date, 18/08/2011, the production license was issued to project owner for 49 years.

The plant will be delivered to the government at the end of operation period gratuitously. The expected operational lifetime of the project is estimated at about ***47 years 3 months 10 days,*** considering that the starting date of operation is 01/05/2013.

As per "Tool to determine the remaining lifetime of the equipment" EB 50, Annex 15, the technical lifetime is defined as the total time for which the equipment is technically designed to operate from its first commissioning. The technical lifetime of electromechanical equipment is accepted as 35 years with respect to the data used in the conducted Feasibility Report of the proposed project.

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

C.2.1. Renewable crediting period

Renewable crediting period is used for the project. The crediting period is expected to be renewed for 2 times, the length of crediting period is 7 years 0 months for each.

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

01/05/2013

C.2.1.2. Length of the first crediting period:

7 years, 0 months, 0 days

C.2.2. Fixed crediting period:

Fixed crediting period is not used for the project.

C.2.2.1. Starting date:

-

C.2.2.2. Length:

-

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The project will contribute to improve the environmental situation in the region and in the country. Avoiding fossil fuel-based electricity will enhance the air quality and help to reduce the adverse affects on the climate. Renewable technologies and hydro power based electricity will be introduced and sustainable development will be promoted. The project activity itself will not have any significant negative impacts on humans, plants, animal life and biodiversity.

In Turkey, it is mandatory to assess projects and construction activities such as power plants, factories, mining projects and large buildings in terms of physicochemical aspects, ecology, socio-economy, socio-culture and public health. This assessment called Project Description File (PDF) and if Ministry of Environment and Forestry decides that PDF is not satisfying, the further one, called EIA (Environmental Impact assessment), must be prepared. The Project Introduction File of Kadahor Weir and HEPP was prepared as per The National EIA Regulations dated 17/07/2008, Annex 2- EIA not required Projects, based on the format of Annex 4. T his assessment interprets the impacts of the HEPP project to project site and environment in detail.

The Project Introduction File of Kadahor Weir and HEPP was submitted to the Trabzon Province Department of Environment and Forestry in order to be evaluated by relevant local governmental agencies. After evaluation of the project and comments of the local agencies Trabzon Province Department of Environment and Forestry had concluded that project does not have significant environmental effects and no need to prepare a further assessment -the EIA assessment- as per regulations. Hence, the Project Introduction File of Kadahor Weir and HEPP was approved by the Trabzon Province Department of Environment and Forestry.

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:

The project has been assessed by its environmental and social affects and has been granted Ministry's decision on the environmental acceptability of the project based on the findings of the Environmental Assessment Committee. There have not been identified any significant environmental impacts of the Project.

SECTION E. Stakeholders' comments

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

According to the Gold Standard Toolkit, the project consultant, EN-ÇEV Energy Environmental Investments Consultancy L. C invited local residents, local/national policy makers, and local/national/international NGOs via mail and follow-up calls. Individual invitees are listed in the Table 22.

Table 26: List of Invitees

Category code	Organization (if relevant)	Name of invitee	Way of invitation	Date of invitation	Confirmation received? Y/N
A	Headman of Coşandere Village	Salim Şahin	Fax/Mail	05.07.2010	Y
B	Directorate of Environment and Forestry of Trabzon Province	Fahrettin Ulu	Fax/Mail	02.07.2010	Y
B	Head Office of Maçka District	Ali Murat Kayhan	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Asım Aykan	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Faruk Nafız Özak	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Safiye Seymenoğlu	Fax/Mail	02.07.2010	Y
B	The Municipality of Maçka District	Ertuğrul Genç	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Cevdet Erdöl	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Mehmet Akif Hamzaçebi	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Süleyman Latif Yunusoğlu	Fax/Mail	02.07.2010	Y
B	The Governor of Trabzon Province	Dr.Recep Kızılcık	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Mustafa Cumur	Fax/Mail	02.07.2010	Y
B	The Grand National Assembly of Turkey	Kemalettin Göktaş	Fax/Mail	02.07.2010	Y
C	The Republic of Turkey Ministry of Environment and Forestry	Mustafa Şahin	Fax/Mail	02.07.2010	Y
E	Gold Standard	Nahla Sabet	E-Mail	01.07.2010	Y
F	Rec Turkey	Sibel Sezer Eralp	Fax/Mail	02.07.2010	Y
F	WWF Turkey	Filiz Demirayak	Fax/Mail	02.07.2010	Y
F	Greenpeace Turkey	Hilal Atıcı	Fax/Mail	02.07.2010	Y
F	Mercy Corps	Nancy Lindborg	Mail/ E-Mail	01.07.2010	Y

An invitation letter in Turkish was sent out by fax/mail to the mentioned stakeholders.

The English version is of the invitation letter as follows:

Dear Sir/Madam,

We request you to participate in the Local Stakeholder Consultation Meeting of Hydroelectric Power Plant planned to be constructed in Province of Trabzon, Maçka District with the capacity of 9.362 MW, by Arsin Elektrik Üretim A.Ş. The Stakeholder Consultation meeting aims to give out information about the hydroelectric power plant station project, its environmental and socioeconomic impacts, and its significance in Gold Standard Organization Platform due to the leading reduction in carbon emissions. The meeting will be held on 22.07.2010 at 13.30 p.m in Bakımlı Village, Bakımlı Village Coffeehouse. Your participation will be a pleasure for us.

Furthermore, an invitation letter was published in Turkish at the regional newspaper "Hizmet" on 14/07/2010. The following figure shows the invitation letter.


damgasını vurdu. Fındık Tanıtım Grubu'nun da ... 14. INC Kongresi ve FTG'nin Çin'deki faaliyet- ... leri arasında gerçekleştir- ilecek olan festivalle ilgili

Sizin Gazeteniz

Hizmet

GÜNLÜK SİYASİ GAZETE

14 TEMMUZ 2010 ÇARŞAMBA   KURUCUSU : AYHAN KIYAK   10 Kr.

Figure 9: The cover page of the newspaper "Hizmet"


İLAN

Trabzon ili Maçka İlçesi'nde yapılması ve işletilmesi planlanan Kadahor Regülatörü ve HES Projesi ile ilgili olarak projenin karbon emisyonun azaltılmasına olan katkısı nedeni ile Uluslararası Gold Standard Organizasyonu platformunda halkı bilgilendirmek, görüş ve önerilerinizi almak üzere aşağıda belirtilen yer ve tarihte bir toplantı düzenlenecektir.

İlgilenenlerin katılmasını rica ederiz.

Toplantı yeri: Bakımlı Köyü, Köy Kahvehanesi Maçka / TRABZON

Tarih :22.07.2010

Saat :13:30

Raporu Hazırlayan Kuruluş:

EN-ÇEV ENERJİ ÇEVREYATIRIMLARI ve DANIŞMANLIĞI LTD.ŞTİ

ADRES: Mahatma Gandi Caddesi No: 92/2 G.O.P / ANKARA

TEL: 0 312 447 26 22 FAX: 0 312 446 38 10

www.encev.com.tr

Firma: ARSİN ELEKTRİK ÜRETİM A.Ş   Basın-1781

Figure 10: The invitation letter published in newspaper "Hizmet"

The stakeholder meeting was held on 22/07/2010 at the Coffee House of the Bakımlı Village with the attendance of 23 local residents; however, only 8 people signed attendance sheet.

The supporters of Gold Standard Organizations i.e WWF, Greenpeace and REC Turkey have been informed about the project. However, they could not attend.

Table 27: Participant List for Stakeholder Consultation Meeting.

Participants List					
Date and time: 22.07.2010 – 13.30 Location: Bakımlı Village, Village Coffee House					
Category Code	Name of participant, job/ position in the community	Male/ Female	Signature	Organization (if relevant)	Contact details
A	İbrahim Keskin Region Resident	Male		Trabzon	0462 326 29 89
A	Mustafa Keskin Village Resident	Male		Bakımlı Village	0532 282 24 43
A	Adil Keskin Village Resident	Male		Bakımlı Village	0535 651 87 66
A	Hasan Teke Village Resident	Male		Bakımlı Village	0535 971 52 81
A	Refik Yıldız Village Resident	Male		Bakımlı Village	0537 451 33 12
A	Gökhan Yıldız Village Resident	Male		Bakımlı Village	0531 711 11 03
A	Aslan Çırak Village Resident	Male		Bakımlı Village	
A	Ömer Alkurt Village Resident	Male		Bakımlı Village	

The place of meeting was chosen to be the closest place to the project area and all local people are informed about meeting in advance of municipality announcements and local newspaper announcements.

Before presentation, agenda of the meeting was explained and non-technical project summary was distributed to the participants for broader view. **Agenda of the meeting** was as follows:

1. Opening of the meeting
2. Explanation of the project
3. Questions for clarification about project explanation
4. Blind sustainable development assessment
5. Discussion on monitoring sustainable development
6. Closure of the meeting

Project presentation and description was made by EN-CEV Energy & Environmental Investments Consultancy Company including information about project developers, the technology and operation of the power plant, estimated emission reduction amount of the plant, the importance of revenue from emission reduction, information about Gold Standard.

Prior to blind sustainable development exercise, questions and comments were taken from participants about further clarification of project. The questions and comments raised by participants were addressed in assessment of comments part.

In brief, the meeting was ended after the project was explained and discussed with the participants.

E.2. Summary of the comments received:

In the Local Stakeholder Consultation Meeting, the stakeholders are pleasant about the project. The briefing was found affirmative and informative.

The stakeholders care about minimum environmental destruction during construction works. Local residents were wondering that the Project owners will fix the roads or not and if they cause any physical corruption in the area, will they fix what they have caused. All corrupted roads in the impact zone will be fixed. Furthermore, the stakeholders really want such kind of investment in their district.

Request is made to choose the staff to be employed in the plant from among the local people as much as possible. All attendance agrees upon the opinion that these types of projects should be supported since they don't cause carbon emission and thus, global heating. Local people believe that the region shall develop socially and economically with the mentioned project.

They are so sensitive to environmental projects that clean and protect their environment. Also with the mentioned Project they know that they will have new employment opportunities and it will be a part of their economy. With the help of such kind of projects they can develop economically. Hence, they support the project due to the employment opportunities and economical development will be positively affected by the project.

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

No major concerns were raised during the entire initial stakeholder consultation process. During the consultation, the concerns of stakeholders (unemployment, waste, pollution and noise) have been taken into consideration all the way. The defined minimum water flow shall always be released continuously into the river basin, without using it, as required by DSI (State Hydraulic Works) by regulations. The employees were primarily chosen from the region. The company's construction works are under the legal limits and no complaints have been received. Moreover, the company has been following the regulations for waste management. All necessary actions will be taken in due course to compensate any damages owing to construction of weir and HEPP. (Please see more details in LSC Report provided to GS)

The stakeholders have not raised any concerns, any important suggestions and negative opinion regarding the project, which may necessitate revisiting sustainability assessment. Therefore sustainable assessment is not going to be revisited as well as no alteration in project design will be done.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Ustaoğlu Elektrik Üretim A.Ş
Street/P.O.Box:	Yaşam Avenue
Building:	Ak Plaza Floor 8 No: 26-27
City:	Söğütözü
State/Region:	Ankara
Postfix/ZIP:	
Country:	Turkey
Telephone:	+90 312 219 00 61
FAX:	
E-Mail:	info@usragroup.com
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Represented by:	İbrahim USTAOĞLU
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Annex 2

ODA DECLARATION

Please find the Official Development Assistance Declaration template below This document should be signed, scanned and submitted as an Annex to your Gold Standard Passport.

Letterhead of Project Owner
Date
Project reference Kadahor HEPP (9.36 MW) Trabzon , GS 968
To Gold Standard Foundation

Declaration of Non-Use of Official Development Assistance by Project Owner

[*Project Owner*] Arsin Enerji Elek. Üret. İç ve Dış Tic A Ş.
As Project Owner of the above-referenced project, acting on behalf of all project participants, I now make the following representations

[*Authorised Representative*:] İbrahim USTA
hereby declare that I am duly and fully authorised by the project owner of the above-referenced project, acting on behalf of all project participants, to make the following representations on Project Proponent's behalf·

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

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

III. Sanctions. I am fully aware that under Section 10 of the Gold Standard Terms and Conditions sanctions and damages may be incurred for the provision of false information related to Projects and/or Gold Standard credits.

Signed·
Name: Özkan Alioğlu
Title: Civil Engineer - Company Coordinator
On behalf of· İbrahim USTA

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Gold Standard Annexes to Toolkit Version 2.1 effective 1 July 2009 – use together with Versions 2.1 of the Gold Standard Requirements and Toolkit

Developed by Ecofys, TÜV-SÜD and FIELD

Annex 3

BASELINE INFORMATION

Table 28: Generation units put into operation in 2009

POWER PLANTS	INSTALLED CAPACITY (MW)	PRODUCTION (GWh)	FUEL TYPE
ITC-KA ENERJİ (SİNCAN)	2,8	22	Waste
ITC-KA ENERJİ MAMAK KATI ATIK TOP.MERK.	2,8	21,062	Waste
ORTADOĞU ENERJİ (KÖMÜRCÜODA)	5,8	45	Waste
ORTADOĞU ENERJİ (ODA YERİ) (İlave)	4,2	77,953	Waste
ORTADOĞU ENERJİ (ODA YERİ) (İlave)	5,7		
ALKİM ALKALİ KİMYA (Cihanbeyli/KONYA)	0,4	3	Lignite
SİLOPİ ELEKTRİK ÜRETİM A.Ş.	135	945	Asfaltit
İÇDAŞ ÇELİK (İlave)	135	1923,33	Imported coal
İÇDAŞ ÇELİK (İlave)	135		
GÜRMAT ELEKT. (GÜRMAT JEOTERMAL)	47,4	313	Geothermal
CARGILL TARIM VE GIDA SAN. TİC. A.Ş.	0,1	0,7	Biogas
KASAR DUAL TEKSTİL SAN. A.Ş. (Çorlu)	5,7	38	N.gas
KEN KİPAŞ ELKT. ÜR.(KAREN) (K.Maraş)	17,5	75,36	N.gas
MARMARA PAMUKLU MENS. SN.TİC.A.Ş.	34,9	271,53	N.gas
MAURİ MAYA SAN. A.Ş.	0,3	19	N.gas
MAURİ MAYA SAN. A.Ş.	2		
TAV İSTANBUL TERMİNAL İŞLETME. A.Ş.	3,3	82	N.gas
TAV İSTANBUL TERMİNAL İŞLETME. A.Ş.	6,5		
TESKO KİPA KİTLE PAZ. TİC. VE GIDA A.Ş.	2,3	18	N.gas
SÖNMEZ ELEKTRİK(Uşak) (İlave)	8,7	67,057	N.gas
RASA ENERJİ (VAN)	78,6	500	N.gas
SELKASAN KAĞIT PAKETLEME MALZ. İM.	9,9	73	N.gas
ZORLU ENERJİ (B.Karıştıran) (İlave)	49,5	394,96	N.gas
NUH ÇİMENTO SAN. TİC. A.Ş.(Nuh Çim.) (İlave)	47	329	N.gas
ENTEK KÖSEKÖY(İztek) (Düzeltme)	0,8	98,68	N.gas
ENTEK KÖSEKÖY(İztek) (Düzeltme)	36,3		
FALEZ ELEKTRİK ÜRETİMİ A.Ş.	11,7	88	N.gas
GLOBAL ENERJİ (PELİTLİK)	8,6	65,66	N.gas
GÜL ENERJİ ELKT. ÜRET. SN. VE TİC. A.Ş.	24,3	170	N.gas
AK GIDA SAN. VE TİC. A.Ş. (Pamukova)	7,5	61	N.gas
AKSA AKRİLİK KİMYA SN. A.Ş. (YALOVA)	70	539	N.gas
AKSA ENERJİ (Antalya) (Güç Değişikliği)	16,2	4744,74	N.gas

AKSA ENERJİ (Antalya) (İlave)	300		
AKSA ENERJİ (Antalya) (İlave)	300		
AKSA ENERJİ (MANİSA) (İlave)	10,5	498,072	N.gas
AKSA ENERJİ (MANİSA) (İlave)	52,4		
ÇELİKLER TAAH. İNŞ. (RİXOX GRAND)	2	16	N.gas
DALSAN ALÇI SAN. VE TİC. A.Ş.	1,2	9	N.gas
CAM İŞ ELEKTRİK (Mersin) (İlave)	126,1	1008	N.gas
ANTALYA ENERJİ (İlave)	41,8	302,096	N.gas
ARENKO ELEKTRİK ÜRETİM A.Ş. (Denizli)	12	84	N.gas
DELTA ENERJİ ÜRETİM VE TİC.A.Ş.	47	467	N.gas
DELTA ENERJİ ÜRETİM VE TİC.A.Ş. (İlave)	13		
DESA ENERJİ ELEKTRİK ÜRETİM A.Ş.	9,8	70	N.gas
ERDEMİR(Ereğli-Zonguldak)	39,2	221,02	Fuel oil
SİLOPİ ELEKTRİK ÜRETİM A.Ş.(ESENBOĞA)	44,8	315	Fuel oil
TÜPRAŞ RAFİNERİ(Aliağa/İzmir)	24,7	171,77	Fuel oil
TÜPRAŞ O.A.RAFİNERİ(Kırıkkale)(Düzeltme)	10	70	Fuel oil
AK ENERJİ (AYYILDIZ RES)	15	51	Wind
ALİZE ENERJİ (ÇAMSEKİ RES)	20,8	82	Wind
ALİZE ENERJİ (KELTEPE RES)	18,9	65	Wind
ALİZE ENERJİ (SARIKAYA RES) (Şarköy)	28,8	96	Wind
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR	16,8	123	Wind
AYEN ENERJİ A.Ş. AKBÜK RÜZGAR (İlave)	14,7		
BAKİ ELEKTRİK ŞAMLI RÜZGAR	36	337,33	Wind
BAKİ ELEKTRİK ŞAMLI RÜZGAR	33		
BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15	95	Wind
BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15		
BORASKO ENERJİ (BANDIRMA RES)	21	179	Wind
BORASKO ENERJİ (BANDIRMA RES)	24		
DATÇA RES (Datça)	0,8	61,0135	Wind
DATÇA RES (Datça)	8,9		
DATÇA RES (Datça) (İlave)	11,8		
KORES KOCADAĞ RES (Urla/İZMİR)	15	56	Wind
MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	10	79	Wind
MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	12,5		
ROTOR ELEKTRİK (OSMANİYE RES)	17,5	218	Wind
ROTOR ELEKTRİK (OSMANİYE RES)	17,5		
ROTOR ELEKTRİK (OSMANİYE RES)	22,5		

SAYALAR RÜZGAR (Doğal Enerji)	3,6	11,368	Wind
SOMA ENERJİ ÜRETİM (SOMA RES)	18	150	Wind
SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	10,8		
SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	16,2		
ÜTOPYA ELEKTRİK (DÜZOVA RES)	15	46	Wind
YAPISAN (KARICA REG. ve DARICA I HES)	48,5	328	Hydro
YAPISAN (KARICA REG. ve DARICA I HES)	48,5		
YEŞİLBAŞ ENERJİ (YEŞİLBAŞ HES)	14	56	Hydro
YPM GÖLOVA HES (Suşehri/SİVAS)	1,1	3	Hydro
YPM SEVİNDİK HES (Suşehri/SİVAS)	5,7	36	Hydro
TOCAK I HES (YURT ENERJİ ÜRETİM SN.)	4,8	13	Hydro
TÜM ENERJİ (PINAR REG. VE HES)	30,1	138	Hydro
UZUNÇAYIR HES (Tunceli)	27,3	105	Hydro
ANADOLU ELEKTRİK (ÇAKIRLAR HES)	16,2	60	Hydro
BAĞIŞLI REG. VE HES (CEYKAR ELEKT.)	9,9	99	Hydro
BAĞIŞLI REG. VE HES (CEYKAR ELEKT.)	19,7		
BEREKET ENERJİ (KOYULHİSAR HES)	42	329	Hydro
BEYOBASI EN. ÜR. A.Ş. (SIRMA HES)	5,9	23	Hydro
AKUA ENERJİ (KAYALIK REG. VE HES)	5,8	39	Hydro
AKÇAY HES ELEKTRİK ÜR. (AKÇAY HES)	28,8	95	Hydro
CİNDERE HES (Denizli)	19,1		Hydro
DENİZLİ ELEKTRİK (EGE I HES)	0,9	4	Hydro
ELESTAŞ ELEKTRİK (YAYLABEL HES)	5,1	20	Hydro
ELESTAŞ ELEKTRİK (YAZI HES)	1,1	6	Hydro
DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	12,9	35,425	Hydro
FİLYOS ENERJİ (YALNIZCA REG. VE HES)	14,4	67	Hydro
ERVA ENERJİ (KABACA REG. VE HES)	4,2	33	Hydro
ERVA ENERJİ (KABACA REG. VE HES)	4,2		
KAYEN ALFA ENERJİ (KALETEPE HES)	10,2	37	Hydro
LAMAS III - IV HES (TGT ENERJİ ÜRETİM)	35,7	150	Hydro
OBRUK HES	212,4	473	Hydro
ÖZGÜR ELEKTRİK (AZMAK II REG.VE HES)	24,4	91	Hydro
ÖZTAY ENERJİ (GÜNAYŞE REG.VE HES)	8,3	29	Hydro
ÖZYAKUT ELEK. ÜR.A.Ş. (GÜNEŞLİ HES)	0,6	8	Hydro
ÖZYAKUT ELEK. ÜR.A.Ş. (GÜNEŞLİ HES)	1,2		
ŞİRİKÇİOĞLU EL.(KOZAK BENDİ VE HES)	4,4	15	Hydro
TAŞOVA YENİDEREKÖY HES (HAMEKA A.Ş.)	2	10	Hydro
TEKTUĞ (Erkenek)	6	50	Hydro

TEKTUĞ (Erkenek) (İlave)	6,5		
SARITEPE HES (GENEL DİNAMİK SİS.EL.)	2,5	20	Hydro
SARITEPE HES (GENEL DİNAMİK SİS.EL.)	2,5		

Table 29: Generation units put into operation in 2008

POWER PLANTS	INSTALLED CAPACITY (MW)	PRODUCTION (GWh)	FUEL TYPE
AKSA ENERJİ (Antalya)	183,8	133,7	N.gas
AKSA ENERJİ (Manisa)	52,4	79,2	N.gas
ANTALYA ENERJİ (İlave)	17,5	256,1	N.gas
ATAÇ İNŞAAT SAN. A.S.B.(ANTALYA)	5,4	10,0	N.gas
CAN ENERJİ (Çorlu-TEKİRDAĞ) (İlave)	52,4	274,3	N.gas
ITC-KA Enerji Üretim A.Ş.(Mamak)(İlave)	14,1	95,8	N.gas
KARKEY(SİLOPİ-5) (154 kV) (İlave)	14,8	16,4	Fuel oil
MİSİS APRE TEKSTİL BOYA EN. SAN.	2,0	5,3	N.gas
MODERN ENERJİ (LÜLEBURGAZ)	13,4	508,9	N.gas
POLAT TURZ. (POLAT RENAISSANCE İST.OT.)	1,6	490,0	N.gas
SARAYKÖY JEOTERMAL (Denizli)	6,9	14,1	Geothermal
YILDIZ SUNTA (Uzunçiftlik-Köseköy)(Düzeltme)	22,6	136,0	N.gas
SÖNMEZ Elektrik (İlave)	8,7	61,0	N.gas
AKKÖY ENERJİ (AKKÖY I HES)	101,9	21,6	Hydro
ALP ELEKTRİK (TINAZTEPE) ANTALYA	7,7	9,2	Hydro
CANSU ELEKTRİK (Murgul/ARTVİN)	9,2	12,5	Hydro
ÇALDERE ELK.(ÇALDERE HES)Dalaman-MUĞLA	8,7	11,2	Hydro
DAREN HES ELKT. (SEYRANTEPE BARAJI VE HES)	49,7	14,4	Hydro
GÖZEDE HES (TEMSA ELEKTRİK) BURSA	2,4	6,1	Hydro
H.G.M. ENERJİ (KEKLİCEK HES) (Yeşilyurt)	8,7	120,0	Hydro
HAMZALI HES (TURKON MNG ELEKTRİK)	16,7	2,9	Hydro
HİDRO KNT.(YUKARI MANAHOZ REG.VE HES)	22,4	13,8	Hydro
İÇ-EN ELK.(ÇALKIŞLA REGÜLAT. VE HES)	7,7	3,4	Hydro
KALEN ENERJİ (KALEN II REGÜLAT. VE HES)	15,7	10,3	Hydro
SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,0	1,5	Hydro
SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,6	1,2	Hydro
TORUL	105,6	18,6	Hydro
ZORLU ENERJİ (MERCAN) (Düzeltme)	1,275	22,828	Hydro
BAKİ ELEKTRİK ŞAMLI RÜZGAR	21,000	60,943	Wind
DATÇA RES (Datça)	8,100	3,778	Wind
ERTÜRK ELEKTRİK Çatalca RES	60,000	65,961	Wind

İNNORES ELK YUNTDAĞ RÜZG. (Aliağa)	42,500	98,058	Wind
LODOS RES (Taşoluk)(GOP/İSTANBUL)	24,000	25,714	Wind
SAYALAR RÜZGAR (Doğal Enerji)	30,600	53,925	Wind
SEBENOBA (DENİZ ELK.) (Samandağ-HATAY)	31,200	46,919	Wind
TOTAL	**1062,512**	**2025,279**	

Table 30: Generation units put into operation in 2007

POWER PLANTS	INSTALLED CAPACITY (MW)	PRODUCTION (GWh)	FUEL TYPE
MOBİL TOPLAM	-462,3		
HABAŞ (Aliağa-ilave)	9,1	72,8	N.gas
BOSEN	-123,5		N.gas
MODERN ENERJİ	5,2	38,7	N.gas
ARENKO	0,7	5,6	N.gas
ALTINMARKA GIDA	0,1	0,8	N.gas
TEKBOY ENERJİ	0,1	0,7	N.gas
VELSAN AKRİLİK	0,1	0,7	N.gas
AKBAŞLAR	-0,1		N.gas
ORS RULMAN	-0,3		N.gas
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kadıköy Hast.)(İstanbul/Kadıköy)	0,5	4,0	N.gas
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Kozyatağı Hast.)(İstanbul/Kadıköy)	0,6	5,0	N.gas
Acıbadem Sağlık Hiz.ve Tic.A.Ş(Nilüfer/BURSA)	1,3	11,0	N.gas
AKATEKS Tekstil Sanayi ve Ticaret A.Ş.	1,8	14,0	N.gas
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)(Poliser Tesisi)	2,1	17,0	N.gas
FLOKSER TEKSTİL SAN.AŞ.(Çatalça/istanbul)(Süetser Tesisi)	2,1	17,0	N.gas
FRİTOLAY GIDA SAN.VE TİC. AŞ.	0,5	4,0	N.gas
KIVANÇ TEKSTİL SAN.ve TİC.A.Ş.	3,9	33,0	N.gas
KİL-SAN KİL SAN.VE TİC. A.Ş	3,2	25,0	N.gas
SÜPERBOY BOYA SAN.ve Tic.Ltd.Şti.(Büyükçekmece/İstanbul) 05.12.2003	1	8,0	N.gas
SWİSS OTEL(Anadolu Japan Turizm A.Ş (İstanbul)	1,6	11,0	N.gas
TAV Esenboğa Yat. Yapım ve İşletmeAŞ./ANKARA	3,9	33,0	N.gas
STARWOOD	-17,3		N.gas
NUH ENERJİ-2 (Nuh Çim.)	73	514,0	N.gas
KAREN	-24,3		Fuel-oil
AKTEKS	0,8	5,4	Fuel-oil
TÜPRAŞ İZMİT RAFİNERİ	-0,9		Fuel-oil
AKBAŞLAR	-3,8		Fuel-oil

UŞAK ŞEKER (NURİ ŞEKER)	1,7	3,1	Lignite
BOR ŞEKER	-0,6		Lignite
SUSURLUK ŞEKER	-0,6		Lignite
AFYON ŞEKER	-0,8	2,0	Diesel
AĞRI ŞEKER	-1		Diesel
ALPULLU ŞEKER	-0,9	2,3	Diesel
BURDUR ŞEKER	-0,8	2,0	Diesel
ÇARŞAMBA ŞEKER	-0,8	2,0	Diesel
ÇORUM ŞEKER	-0,8	2,0	Diesel
ELAZIĞ ŞEKER	-0,5	1,3	Diesel
ELBİSTAN ŞEKER	-0,8	2,0	Diesel
ERCİŞ ŞEKER	-0,8	2,0	Diesel
EREĞLİ ŞEKER	-0,8	2,0	Diesel
KASTAMONU ŞEKER	-0,2	0,5	Diesel
KÜTAHYA ŞEKER (BAHA ESAD TEKAND)	-0,7	1,8	Diesel
MALATYA ŞEKER	-0,5	1,3	Diesel
BOĞAZLIYAN ŞEKER	16,4	43,1	N.gas
KARTONSAN	5	40,0	N.gas
ESKİŞEHİR END.ENERJİ	3,5	26,8	N.gas
ESKİŞEHİR ŞEKER (KAZIM TAŞKENT)	2,9	7,6	N.gas
İGSAŞ	2,2	15,2	N.gas
DESA	0,7	1,8	N.gas
DENTAŞ	0,3	0,8	N.gas
SÜPER FİLMCİLİK	0,1	0,3	N.gas
ATAER ENERJİ	0,1	0,3	N.gas
BİL ENERJİ	0,1	0,7	N.gas
EDİP İPLİK	-0,1	0,8	N.gas
EGE BİRLEŞİK ENERJİ	-0,3	0,8	N.gas
İSKO	-1,8		N.gas
ITC-KA Enerji Üretim Aş.(Mamak)(İlave)	1,4	11,1	Landfill gas
BİS Enerji Üretim AŞ.(Bursa)(İlave)	43	354,8	N.gas
Aliağa Çakmaktepe Enerji A.Ş.(Aliağa/İZMİR)	34,8	278,0	N.gas
BİS Enerji Üretim AŞ.(Bursa)(Düzeltilme))	28,3	233,5	N.gas
BİS Enerji Üretim AŞ.(Bursa)(İlave)	48	396,1	N.gas
BOSEN ENERJİ ELEKTRİK AŞ.	142,8	1071,0	N.gas
Mamara Elektrik Üretim A.Ş.	-8,7		N.gas
NUH ENERJİ-2(Nuh Çim.)	-73		N.gas
SAYENERJİ ELEKTRİK ÜRETİM AŞ. (Kayseri/OSB)	5,9	47,0	N.gas
T ENERJİ ÜRETİM AŞ.(İSTANBUL)	1,6	13,0	N.gas
ZORLU EN.Kayseri (İlave 1 GT)	7,2	55,0	N.gas

SİİRT	25,6	190,0	Fuel-oil
Mardin Kızıltepe	34,1	250,0	Fuel-oil
KAREN	24,3	180,0	Fuel-oil
İDİL 2 (PS3 A- 2)	24,4	180,0	Fuel-oil
İSKUR TEKSTİL (SÜLEYMANLI HES)	-4,6		Hydro
BORÇKA HES	300,6	1039,0	Hydro
TEKTUĞ(Keban Deresi)	5	32,0	Hydro
YPM Ener.Yat.AŞ.(Altıntepe Hidro.)(Sivas/Suşehir)	4	18,0	Hydro
YPM Ener.Yat.AŞ.(Beypınar Hidro.)(Sivas/Suşehir)	3,6	18,0	Hydro
YPM Ener.Yat.AŞ.(Konak Hidro.)(Sivas/Suşehir)	4	19,0	Hydro
KURTEKS Tekstil A.Ş./Kahramanmaraş(KARASU HES-Andırın)	2,4	19,0	Hydro
İSKUR TEKSTİL (SÜLEYMANLI HES)	4,6	18,0	Hydro
ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)	6,3	27,0	Hydro
ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)(İlave)	6,3	27,0	Hydro
ANEMON EN.ELEK.ÜRETİM.AŞ.	8		Wind
ANEMON EN.ELEK.ÜRETİM.AŞ.(İlave)	15,2		Wind
ANEMON EN.ELEK.ÜRETİM.AŞ.(İlave)	7,2		Wind
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	4		Wind
BURGAZ RES (Doğal Enerji Üretim A.Ş.)	10,9		Wind
DENİZ ELEK. ÜRETİM Ltd.Şti.(karakurt)	10,8		Wind
MARE MANASTIR RÜZGAR ENERJİ(ilave)	11,2		Wind
MARE MANASTIR RÜZGAR ENERJİ(ilave)	20		Wind
TOTAL	**258,5**	**5459,7**	

Table 31: Generation units put into operation in 2006

POWER PLANTS	INSTALLED CAPACITY (MW)	PRODUCTION (GWh)	FUEL TYPE
EKOTEN TEKSTİL GR-I	1,93	14,2	N.gas
ERAK GİYİM GR-I	1,37	9,8	N.gas
ALARKO ALTEK GR-III	21,89	158,3	N.gas
AYDIN ÖRME GR-I	7,52	60,2	N.gas
NUH ENERJİ-2 GR II	26,08	180,1	N.gas
MARMARA ELEKTRİK (Çorlu) GR I	8,73	63,0	N.gas
MARMARA PAMUK (Çorlu) GR I	8,73	63,2	N.gas
ENTEK (Köseköy) GR IV	47,62	378,2	N.gas
ELSE TEKSTİL (Çorlu) GR I - II	3,16	24,7	N.gas
BARES IX GRUP	13,50		Wind
SÖNMEZ ELEKTRİK (Çorlu) GR I - II	17,46	125,7	N.gas
DENİZLİ ÇİMENTO(DÜZELTME)	0,45		N.gas

MENDERES ELEKTRİK GR I	7,95	55,7	Geothermal
KASTAMONU ENTEGRE (Balıkesir) GR I	7,52	54,1	N.gas
ÇIRAĞAN SARAYI(Bakanlık çıkardı)	-1,36		N.gas
BARES X. ve XX. GRUPLAR	16,50		Wind
BOZ ENERJİ GR I 8,730	8,73	70,2	N.gas
ADANA ATIK SU ARITMA TESİSİ	0,80	6,0	Biogas
AMYLUM NİŞASTA (ADANA)	-6,20		Fuel-oil
AMYLUM NİŞASTA (ADANA)	14,25	33,9	N.gas
ŞIK MAKAS (Çorlu) GR I	1,58	12,8	N.gas
ELBİSTAN B GR III	360,00	2340,0	Lignite
ANTALYA ENERJİ GR I - II - III - IV	34,92	245,1	N.gas
HAYAT TEM. VE SAĞLIK GR I - II	15,04	108,3	N.gas
EKOLOJİK EN. (Kemerburgaz) GR I	0,98	5,9	Landfill gas
EROĞLU GİYİM (Çorlu) GR I	1,17	8,7	N.gas
CAM İŞ ELEKTRİK (Mersin) GR I	126,10	1008,0	N.gas
ELBİSTAN B GR II	360,00	2340,0	Lignite
YILDIZ ENT. AĞAÇ (Kocaeli) GR I	6,18	39,9	N.gas
ÇERKEZKÖY ENERJİ GR I	49,16	389,7	N.gas
ENTEK (Köseköy) GR V	37,00	293,9	N.gas
ITC-KA EN. MAMAK TOP.M. GR I-II-III	4,24	30,3	Landfill gas
ELBİSTAN B GR IV	360,00	2340,0	Lignite
MARE MANASTIR RÜZGAR (X GRUP)	8,00		Wind
ÇIRAĞAN SARAYI GR I	1,32	11,0	N.gas
ERTÜRK ELEKTRİK Tepe RES GR I	0,85	1,9	Wind
AKMAYA (Lüleburgaz) GR I	6,91	50,1	N.gas
BURGAZ (Lüleburgaz) GR I	6,91	54,1	N.gas
VAN-2 -24,700	-24,70		Fuel-oil
KARACAÖREN-II	-0,80		Hydro
SEYHAN I-II	0,30	1,7	Hydro
ŞANLIURFA GR I-II	51,80	124,0	Hydro
BEREKET ENERJİ GÖKYAR HES 3 Grup	11,62	43,4	Hydro
MOLU EN. Zamantı Bahçelik GR I - II	4,22	16,4	Hydro
SU ENERJİ (Balıkesir) GR I - II	4,60	20,7	Hydro
BEREKET EN.(Mentaş Reg) GR I - II	26,60	108,7	Hydro
EKİN (Başaran Hes) (Nazilli)	0,60	4,5	Hydro
ERE(Sugözü rg. Kızıldüz hes) GR I - II	15,43	31,7	Hydro
ERE(AKSU REG.ve ŞAHMALLAR HES) GR I-II	14,00	26,7	Hydro
TEKTUĞ(Kalealtı) GR I - II	15,00	52,0	Hydro
BEREKET EN.(Mentaş Reg) GR III	13,30	54,4	Hydro
TOTAL	**1720**	**11061,2**	

Table 32: Generation units put into operation in 2005

POWER PLANTS	INSTALLED CAPACITY (MW)	PRODUCTION (GWh)	FUEL TYPE	Start Date to Operation
ÇAN GR I	160,00	1040,0	Lignite	
ÇAN GR II	160,00	1040,0	Lignite	
ELBİSTAN-B GR I	360,00	2340,0	Lignite	
AKBAŞLAR GR-II(İZOLE)	8,83		N.gas	
AKÇA ENERJİ GR-III	8,73	65,4	N.gas+naphtha	14.12.2005
AYKA TEKSTİL GR-I	5,50	40,0	N.gas	
BAYDEMİRLER GR IV-V-VI	6,21	51,4	N.gas	
BOSEN GR-III	50,00	350,0	N.gas	3.12.2005
BOSEN (DÜZELTME)	-6,50		N.gas	
ÇUMRA ŞEKER	16,00	40,0	N.gas+lignite	
ETİ MAD.(BAN.ASİT)(SÖKÜLDÜ)	-3,80		Renew.+wastes	
ETİ MAD.(BAN.ASİT)GR-I	11,50	85,0	Renew.+wastes	
EVYAP GR I-II	5,12	30,0	N.gas	
GRANİSER GRANİT GR-I	5,50	42,0	N.gas	
HABAŞ ALİAĞA GR III	47,69	381,6	N.gas	
HABAŞ ALİAĞA GR IV	47,69	381,6	N.gas	
HABAŞ ALİAĞA GR-V	24,60	196,8	N.gas	
HABAŞ ALİAĞA (DÜZELTME)	6,16		N.gas	
HAYAT KAĞIT GR-I	7,53	56,0	N.gas	
İÇDAŞ ÇELİK GR-I	135,00	1080,0	Imported coal	30.11.2005
KAHRAMANMARAŞ KAĞIT GR-I	6,00	45,0	Imported coal	8.12.2005
KORUMA KLOR GR I-II-III	9,60	77,0	N.gas	3.12.2005
KÜÇÜKÇALIK TEKSTİL GR I-II-III-IV	8,00	64,0	N.gas	
MERCEDES BENZ TURK GR I-II-III-IV	8,28	68,0	N.gas	
MODERN ENERJİ GR-III	8,38	62,9	N.gas	
MODERN ENERJİ (DÜZELTME)	-10,00		N.gas	
MODERN ENERJİ GR-II	6,72	50,4	N.gas+lpg	
MOSB GR I-II-III(SÖKÜLDÜ)	-54,30		F.oil	
MOSB GR I-II-III-IV-V-VI-VII	84,83	434,0	N.gas	
ORS RULMAN	12,42	99,4	N.gas	
PAK GIDA(Kemalpaşa) GR-I	5,67	45,0	N.gas	7.12.2005
TEZCAN GALVANİZ GR I-II	3,66	29,0	N.gas	
YONGAPAN(KAST.ENTG) GR-II	5,20	32,7	N.gas	
ZEYNEP GİYİM SAN. GR-I	1,17	9,0	N.gas	
OTOP DÜZELTME	0,02		Renew.+wastes	
OTOP DÜZELTME	-0,19		N.gas	

OTOP DÜZELTME	-7,20		N.gas+liquid	
OTOP DÜZELTME	-1,02		F.oil	
OTOP DÜZELTME	2,11		Solid+liquid	
OTOP DÜZELTME	0,06		Lignite	
OTOP DÜZELTME	-0,30		Naphtha	
OTOP DÜZELTME	0,61		D.oil	
AK ENERJİ(K.paşa) GR- III	40,00	256,9	N.gas	
AK ENERJİ(K.paşa) GR I-II	87,20	560,1	N.gas	
ALTEK ALARKO GR I-II	60,10	420,0	N.gas	
BİS ENERJİ GR VII	43,70	360,8	N.gas	
CAN ENERJİ GR-I	3,90	28,0	N.gas	
ÇEBİ ENERJİ BT	21,00	164,9	N.gas	
ÇEBİ ENERJİ GT	43,37	340,1	N.gas	
ENTEK ELK.A.Ş.KOÇ ÜNİ.GR I-II	2,33	19,0	N.gas	
KAREGE GR IV-V	18,06	141,9	N.gas	
KARKEY(SİLOPİ-4) GR-IV	6,15	47,2	Fuel-oil	
KARKEY(SİLOPİ-4) GR-V	6,75	51,9	Fuel-oil	23.12.2005
METEM ENERJİ(Hacışıramat) GR I-II	7,83	58,0	N.gas	
METEM ENERJİ(Peliklik) GR I-II-III	11,75	89,0	N.gas	
NOREN ENERJİ GR-I	8,73	70,0	N.gas	
NUH ENERJİ-2 GR I	46,95	319,7	N.gas	
ZORLU ENERJİ KAYSERİ GR-I-II-III	149,87	1144,1	N.gas	
ZORLU ENERJİ KAYSERİ GR-IV	38,63	294,9	N.gas	
ZORLU ENERJİ YALOVA GR I-II	15,93	122,0	N.gas	
TEKTUĞ(Kargılık) GR I-II	23,90	83,0	Run of river	
İÇTAŞ ENERJİ(Yukarı Mercan) GR I-II	14,19	44,0	Run of river	
MURATLI GR I-II	115,00	444,0	Dam	
BEREKET EN.(DALAMAN) GR XIII-XIV-XV	7,50	35,8	Run of river	
YAMULA GRUP I-II	100,00	422,0	Dam	
SUNJÜT(RES) GR I-II	1,20	2,4	Wind	
TOTAL	**2026,02**	**13755,9**		

Table 33: CDM Projects benefitting from VER revenues

Year-Start to Operation	Name of the Power Plant	Installed Capacity (MW)	Electricity Generation (GWh)	Type
	BAKİ ELEKTRİK ŞAMLI RÜZGAR	36		
2009	BAKİ ELEKTRİK ŞAMLI RÜZGAR	33	337,33	Wind
2008	BAKİ ELEKTRİK ŞAMLI RÜZGAR	21	60,943	Wind
2008	DATÇA RES (Datça)	8,1	3,778	Wind

	DATÇA RES (Datça)	0,8		
	DATÇA RES (Datça)	8,9		
2009	DATÇA RES (Datça) (İlave)	11,8	61,0135	Wind
2008	ERTÜRK ELEKTRİK Çatalca RES	60	65,961	Wind
2008	İNNORES ELK YUNTDAĞ RÜZG. (Aliağa)	42,5	98,058	Wind
2008	LODOS RES (Taşoluk) (G.O.P./İSTANBUL)	24	25,714	Wind
2008	SAYALAR RÜZGAR (Doğal Enerji)	30,6	53,925	Wind
2008	SEBENOBA (DENİZ ELK.) (Samandağ-HATAY)	31,2	46,919	Wind
2009	DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	12,9	35,425	Hydro
2008	HAMZALI HES (TURKON MNG ELEKTRİK)	16,7	2,9	Hydro
2008	ÇALDERE ELK.(ÇALDERE HES)Dalaman-MUĞLA	8,7	11,2	Hydro
2006	TEKTUĞ(Kalealtı) GR I - II	15	52	Hydro
2009	ÜTOPYA ELEKTRİK (DÜZOVA RES)	15	46	Wind
	ROTOR ELEKTRİK (OSMANİYE RES)	17,5		
	ROTOR ELEKTRİK (OSMANİYE RES)	17,5		
2009	ROTOR ELEKTRİK (OSMANİYE RES)	22,5	218	Wind
2009	BORASKO ENERJİ (BANDIRMA RES)	24	95,46	Wind
2009	ALİZE ENERJİ (SARIKAYA RES) (Şarköy)	28,8	96	Wind
2009	ÖZTAY ENERJİ (GÜNAYŞE REG.VE HES)	8,3	29	Hydro
2009	AK ENERJİ (AYYILDIZ RES)	15	51	Wind
2009	FİLYOS ENERJİ (YALNIZCA REG. VE HES)	14,4	67	Hydro
2009	KORES KOCADAĞ RES (Urla/İZMİR)	15	56	Wind
2009	ITC-KA ENERJİ MAMAK KATI ATIK TOP.MERK.	2,8	21,062	Waste
2009	ALİZE ENERJİ (KELTEPE RES)	18,9	65	Wind
	AYEN ENERJİ A.Ş. AKBÜK RÜZGAR	16,8		
2009	AYEN ENERJİ A.Ş. AKBÜK RÜZGAR (İlave)	14,7	123	Wind
	BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15		
2009	BELEN ELEKTRİK BELEN RÜZGAR-HATAY	15	95	Wind
	MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	10		
2009	MAZI-3 RES ELEKT.ÜR. A.Ş. (MAZI-3 RES)	12,5	79	Wind
	SOMA ENERJİ ÜRETİM (SOMA RES)	18		
2009	SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	10,8		
	SOMA ENERJİ ÜRETİM (SOMA RES)(İlave)	16,2	150	Wind
2009	ANADOLU ELEKTRİK (ÇAKIRLAR HES)	16,2	60	Hydro
		Total	**2.106,6885**	

Table 34: Electricity generation from capacity additions by fuel type

Year	**2005**	**2006**	**2007**	**2008**	**2009**

Fuel Type	Electricity generation (GWh)					Total
Sub-bituminous Coal	1125.00				2868.33	3993.33
Lignite		7020.00	3.1		3	7023.00
Fuel-oil	51.90		805.40	16.40	777.79	1651.49
Diesel Oil			21.20			21.20
LPG						
Naphtha				578.60		578.60
Natural Gas	537.40	3457.20	3401.90	2050.30	10.089.16	19535.96
Wind		1.90		355.30	1649.7115	2006.91
Geothermal		55.70		14.10	313	382.80
Hydro		484.20	1217.00	269.53	2372.425	4343.15
Renewable +Waste		42.20	11.10		166.715	220.02
Total	1714.30	11061.20	5456.60	3284.23	18240.13	
	39756.45					

Capacity addition between 2005 a nd 2009 = **39756.45** GWh which is above 20% of total electricity generation in year 2009: 194812.9 GWh. The capacity addition is composed of the set of power units in the electricity system commissioned between 2009 and 2006 and for the year 2005, the generation of the latest starting operation dated 7 plants is added to account in order to comprise 20% of total 2009 electricity generation. Hence, the sample group is decided as the set of tables (please see annex 3). The power plants registered as CDM projects should be excluded from the set. Total electricity generation of power plants registered as CDM projects is **2106.69** GWh.

OPERATING MARGIN CALCULATION

Table 35: Heat values of fuel types for 2007-2009

	Heat Value(Tcal)			Heat Value (MJ)		
Fuel Type	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**
Sub-bituminous Coal	32115	33310	35130	134,369,180,317	139,369,061,073	146,982,896,224
Lignite	100320	108227	97652	419,738,943,465	452,821,836,467	408,574,172,080
Fuel Oil	21434	20607	15160	89,679,869,560	86,219,701,036	63,429,039,558
Diesel Oil	517	1328	1830	2,163,128,327	5,556,352,840	7,657,666,742
LPG	0	0	1	0	0	5,154,689
Naphtha	118	113	84	493,712,075	472,792,071	352,288,669
Natural Gas	179634	189057	186266	751,588,769,640	791,014,607,601	779,336,254,324

Table 36: The consumption of fuel types between the years 2007-2009

	FC (tonnes (gas: $10^3 m^3$))		
Fuel Type	**2007**	**2008**	**2009**
Sub-bituminous Coal	6029143	6270008	6621177
Lignite	61223821	66374120	63620518
Fuel Oil	2250686	2173371	1594321

Diesel Oil	50233	131206	180857
LPG	0	0	111
Naphtha	11441	10606	8077
Natural Gas	20457793	21607635	20978040

Table 37: Electricity production from plants, low-cost/must-run production, its exclusion and share of it.

Electricity Gene. (GWh) / Year	**2005**	**2006**	**2007**	**2008**	**2009**
Thermal Total	122242.30	131835.10	155196.17	164139.30	156923.44
Hydro+Geothermal+Wind Total	39713.90	44464.70	36361.92	34278.70	37889.47
Turkey's Total	161956.20	176299.80	191558.09	198418.00	194812.92
Share of low-cost/must-run production	24.52	25.22	18.98	17.28	19.45
Average share (%)			**21.09**		

Table 38: Heat Values, FC, NCV and EF_{CO2}, EG $_{net+\ import}$, simple operation margin CO_2 emission factor values of each fuel source in 2007

2007						
Fuel type	**FC (tonnes (gas: 10^3m^3))**	**Heat value (MJ)**	**NCV (MJ/kg)**	**$EFCO_2$ (kg/TJ)**	**EG $_{net+import}$ (GWh)**	**$EF_{grid,Omsimple,y}$ (tCO2/MWh)**
Sub-bituminous Coal	6,029,143	134,369,180,317	21.43046	92800	149387.035	0.08026
Lignite	61,223,821	419,738,943,465	6.85581	90900	149387.035	0.25541
Fuel Oil	2,250,686	89,679,869,560	39.84557	75500	149387.035	0.04532
Diesel Oil	50,233	2,163,128,327	43.06190	72600	149387.035	0.00105
LPG	0	0	0	61600	149387.035	0
Naphtha	11,441	493,712,075	43.15288	69300	149387.035	0.00023
Natural Gas	20,457,793	751,588,769,640	36.73851	54300	149387.035	0.27319
					TOTAL	**0,65547**

Table 39: Heat Values, FC, NCV and EF_{CO2}, EG $_{net+\ import}$, simple operation margin CO_2 emission factor values of each fuel source in 2008

2008						
Fuel type	**FC (tonnes(gas: 10^3m^3))**	**Heat value (MJ)**	**NCV (MJ/kg)**	**$EFCO_2$ (kg/TJ)**	**EG $_{net+import}$ (GWh)**	**$EF_{grid,Omsimple,y}$ (tCO2/MWh)**
Sub-bituminous Coal	6,270,008	139,369,061,073	22.22789	92800	157706.571	0.08201
Lignite	66,374,120	452,821,836,467	6.82227	90900	157706.571	0.26100
Fuel Oil	2,173,371	86,219,701,036	39.67095	75500	157706.571	0.04128
Diesel Oil	131,206	5,556,352,840	42.34831	72600	157706.571	0.00256
LPG	0	0	0	61600	157706.571	0
Naphtha	10,606	472,792,071	44.57779	69300	157706.571	0.00021
Natural Gas	21,607,635	79,101,460,7601	36.60811	54300	157706.571	0.27235
					TOTAL	**0.65941**

Table 40: Heat Values, FC, NCV and EF_{CO2}, EG $_{net+ import}$, simple operation margin CO_2 emission factor values of each fuel source in 2009

2009						
Fuel type	**FC (tonnes(gas: 10^3m^3))**	**Heat value (MJ)**	**NCV (MJ/kg)**	**$EFCO_2$ (kg/TJ)**	**EG $_{net+import}$ (GWh)**	**EF $_{grid,Omsimple,y}$ (tCO2/MWh)**
Sub-bituminous Coal	6,621,177	146,982,896,224	22.19891	92800	151144.656	0.09024
Lignite	63,620,518	408,574,172,080	6.42205	90900	151144.656	0.24572
Fuel Oil	1,594,321	63,429,039,558	39.78436	75500	151144.656	0.03168
Diesel Oil	180,857	7,657,666,742	42.34100	72600	151144.656	0.00368
LPG	111	5,154,689	46.43864	61600	151144.656	0
Naphtha	8,077	352,288,669	43.61628	69300	151144.656	0.00016
Natural Gas	20,978,040	779,336,254,324	37.15010	54300	151144.656	0.27998
					TOTAL	**0.65147**

Table 41: 2007-2009 generation weighted average of simple operation margin CO_2 emission factor

	EF,grid,OMsimple,y(tCO_2/MWh)		
Year	2007	2008	2009
Total	0.65547	0.65941	0.65147
3-year Generation Weighted Average (tCO_2/MWh)	**0.655506201**		

BUILD MARGIN CALCULATION

Table 42: Average CO2 emission factor, generation efficiency, CO2 emission factor by fuel type in 2009

Fuel Type	**EFCO2 (kg/Tj)***	**EFCO2 (t/Gj)**	**Generation Efficiency (%)**	**EF $_{EL,m,y}$ (tCO2/MWh)**
Sub-bituminous Coal	92800	0.093	0.390	**0.8566**
Lignite	90900	0.091	0.390	**0.8391**
Fuel Oil	75500	0.076	0.395	**0.6881**
Diesel Oil	72600	0.073	0.395	**0.6617**
LPG	61600	0.062	0.395	**0.5614**
Naphtha	69300	0.069	0.395	**0.6316**
Natural Gas	54300	0.054	0.600	**0.3258**

Table 43:Electricity generation, CO_2 emission factor and build margin CO_2 emission factor by fuel type in 2009

	Generation (GWh)	**EF,EL,m,y (tCO2/MWh)**	**Emission by source**
Sub-bituminous Coal	3,993.33	0.8566	3420.7479

Lignite	7,023.00	0.8391	5892.8372
Fuel Oil	1,651.49	0.6881	1136.3924
Diesel Oil	21.20	0.6617	14.027423
LPG		0.5614	0
Naphtha	578.60	0.6316	365.4408
Natural Gas	19,535.96	0.3258	6364.8141
Wind	2,006.91	0	0
Geothermal	69.80	0	0
Hydro	4,343.15	0	0
Renewable + Waste	220.02	0	0
TOTAL	39,756.45		**17,194.26**

39,756.45- 2,106.6885= **37,649.76 GWh** gives the total capacity addition without projects benefitting from VER revenues or registered to CDM.

EF,grid,BM,y (tCO2/MWh)	0.456689

Table 44: Combined margin emission factor (EF,grid,CM,y) for projects other than solar and wind power generation activities

EF,grid ,OMsimple,y(tCO2/MWh)	0.6555
EF,grid,BM,y(tCO2/MWh)	0.4567
EF,grid,CM,y(tCO2/MWh)	**0.556098**

In order to convert the data source units to the required units; 1J = 0.238846 cal. and the density of natural gas is considered to be 0.695kg

<u>Annex 4</u>

MONITORING INFORMATION

Please see Section B.7 for detailed information.