

MURAT HEPP PROJECT



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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity consists of the construction of two Greenfield run-of-river hydroelectric power plants (HEPPs): Murat I and Murat II. They will both be located on the Göksu River flowing through Besni, Adiyaman in Turkey's South-eastern Region.

Murat I and Murat II belong to Murat HEPP Energy Electricity Generation and Trade Inc. (hereafter referred as the "project owner"). Murat I's installed capacity is 24.081 MW whereas, Murat II is 13.14 MW. Therefore, the project's total installed capacity is 37.221 MW.

As it can be seen on the generation licence of Murat Projects, There is one Project consist of two power plants.

The main purpose of the project is to generate approximately 150.39GWh/year¹ of electricity to supply the national grid using a renewable resource. The project activity reduces greenhouse gas (GHGs) emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources. The average annual emission reductions of the proposed Project are estimated to be 97,754 tonnes of CO₂e (tCO₂e).

The Murat HEPP Project contributes to the region's sustainable development in particular and Turkey's sustainable development in general by:

- increasing the use of renewable energy sources for generating electricity
- meeting the need of electricity generation and supply in Turkey in a sustainable way,
- decreasing the consumption of fossil fuels,
- reducing emission of GHGs from the national electricity grid, thereby reducing the effects of global climate change in the medium and long term, and
- 114 people have been hired during the construction phase and 23 people will be employed during the operation phase. The project owner is committed to prioritize local labour force in selecting construction and operating workers. As a result the employment rate and income generation in the region will increase.

It is worth mentioning that the project has been certified to the following standards:

- OHSAS 18001:2007, occupational health and safety management certificate, valid until 05-May-2013,
- TS EN ISO 14001:2004, environmental management system certificate, valid until 05-May-2013, and
- TS EN ISO 9001:2008, quality management system certificate, valid until 05-May-2013.

During the certification process all the employees (including subcontractors) were trained on the requirements established in these standards. Moreover, the project owner has organized monthly trainings and inspections to maintain these certifications.

The project owner has also contributed in the social and economic development of the area by:

- donating 20,000 Turkish Liras (approx. 13,000 USD) to aid to develop sport activities at Adiyaman Sports Club,
- constructing a 6 m wide stabilized road in Şambayat Town's Balka Village, which is one of the settlements near the project area,
- constructing a 2 m wide and 25 m minaret² in the Balka Village's mosque, and

¹ As stated in the feasibility report.

² A tower that is usually built alongside all mosques.

- constructing a cultural affairs facility to be used for social and cultural gatherings. This building was constructed as per request of the locals and holds a great significance since it will also be used as a “condolence hall” after the death of a local person, which is an important part of religious and social life.
- Scholarships provided to 36 students. According to students list the scholarships provided to the high school and university students. Most of these students completed their secondary education in the school which has been built by the same project owner.

1.2 Sectoral Scope and Project Type

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

The approved baseline and monitoring methodology ACM0002-Version 13.0.0: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (“ACM0002”) is applied.

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

Sectoral Scope Number: 1

Sectoral Scope: Energy Industries -Renewable Energy

The project is not a grouped project.

1.3 Project Proponent

The project proponent is Murat HEPP Energy Electricity Generation and Trade Inc., which is a subsidiary of Mehmet Güneş Construction, Trading and Industry Co. Ltd.

Mehmet Güneş Construction Trading and Industry Co. Ltd is a family company owned by Mehmet Güneş and has been conducting both private and public construction works since 1970. For detailed information please visit the following web page: <http://www.mehmetgunesins.com/mg/index.php>

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

Organization:	Murat HEPP Energy Electricity Generation and Trade Inc. Co.
Street/P.O.Box:	Cinnah Caddesi No: 55/10
Building:	
City:	Çankaya / ANKARA
State/Region:	N/A
Postfix/ZIP:	06680
Country:	Turkey
Telephone:	+90 312 441 32 62 / +90 312 441 33 42
FAX:	
E-Mail:	
URL:	
Represented by (1):	Mr.
Position:	General Coordinator
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Middle Name:	
First Name:	Mahmut

Department:	
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Personal E-Mail:	mdoganay@mehmetgunesins.com
Represented by (2):	
Position:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

As stated before the contact person is Mr. Mahmut Doğanay, who is the project's General Coordinator. His responsibility regarding the carbon credit process is to analyse and provide the necessary documents for the PDD elaboration.

1.4 Other Entities Involved in the Project

The following table shows the Carbon consultant's contact information:

Organization:	Suen Ltd.
Street/P.O.Box:	Altinkum Mahallesi Atatürk Bulvarı
Building:	Nadir Apt. No: 239 K.1 D.4
City:	Konyaaltı / ANTALYA
State/Region:	N/A
Postfix/ZIP:	07070 / 1414
Country:	TURKEY
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Represented by (1):	Mrs. / Mrs.
Position:	Project Coordinator
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Middle Name:	-
First Name:	Aynur
Department:	-
Mobile:	-
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Direct tel:	+902422298023
Personal E-Mail:	aynur@suenltd.com
Represented by (2):	
Position:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Suen Ltd./ecosur america responsibilities regarding the carbon credit process are the preparation of the PDD and assisting Murat HEPP Energy Electricity Generation and Trade Inc. Co.during the validation and registration processes.

1.5 Project Start Date

The project start date is 05 October -At-2012.

1.6 Project Crediting Period

The project crediting period is 10 years, renewable once. The start date of the first crediting period is 05 October - -2012 ending on 31-September 2022.

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project	
Large project	√

Years	Estimated GHG emission reductions or removals (tCO ₂ e)
October 2012 – 31 December 2012	24.439
2013	97,754
2014	97,754
2015	97,754
2016	97,754
2017	97,754
2018	97,754

2019	97,754
2020	97,754
2021	97,754
01 January 2022 – 30 September 2022	73.316
Total estimated ERs	977,540
Total number of crediting years	10
Average annual ERs	97,754

1.8 Description of the Project Activity

The project activity will contribute to reduce GHG emissions that would have otherwise occurred in the absence of the project activity by avoiding electricity generation from fossil fuel sources both in the operating margin and build margin of the national grid system. The proposed establishments for Murat I are a diversion weir and a sedimentation pool, conveyance canal, fore-bay, penstock, and Murat I HEPP building. The proposed establishments for Murat II are conveyance canal fore-bay, penstock, tail-water canal, power house and Murat II HEPP building.

Water from the river will be diverted by a diversion weir (516m thalveg elevation), and then it will be carried by a 15,002m conveyance canal to a fore-bay. Accumulated water in the fore-bay will be released through 135 m penstock to the turbines at Murat I HEPP.

Murat I HEPP's tail-water will be carried to a fore-bay through 5,709 m long conveyance canal. Then accumulated water in the fore-bay will be released through 125 m penstock to the turbines and therefore electricity will be generated at Murat II HEPP. Ultimately water will be released to the riverbed.

The electricity generated at Murat II HEPP will be transmitted to Murat I by a 6 km long transmission line where both plants' generation will be fed into the national grid at Adıyaman Çimento 154 kV interconnection point, through a 10 km long transmission line.

The following table shows the project's main technical information:

Main Technical Data			Value
MURAT I	Turbines	Quantity	3
		Capacity	8.027 MWe
		Flow rate	16.67 m ³ /s (Total: 50.00 m ³ /s)
		Rated water head	57.00 m
		Type	Horizontal axis francis
	Generators	Quantity	3
		Capacity	8,500 kW
		Rated voltage	11 kV

MURAT II		Rated current	50 Hz
		Type	Horizontal axis synchronized generator
	Turbines	Quantity	3
		Capacity	4.380 MWe
		Flow rate	16.67 m ³ /s (Total: 50.00 m ³ /s)
		Rated water head	23.40 m
		Type	Horizontal axis francis
	Generators	Quantity	3
		Capacity	3,487 kW
		Rated voltage	11 kV
		Rated current	50 Hz
		Type	Horizontal axis synchronized generator

Table 1: The project's key technical specifications

The technology provider is the Chinese company HRC.

The following table shows the expected level of activity:

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept
Monthly Energy (GWh)	6514,9	9091,9	15576,8	17918,5	19163,7	24363,5	23526,2	20893,7	8254	2917,3	885,9	1278,5

Table 2: The project's expected level of activity³

³ Yolsu International Engineering and Consulting Services Co. Feasibility Study Pages 147-155 (Table 4EK1.2 – Table 4 EK1.10)

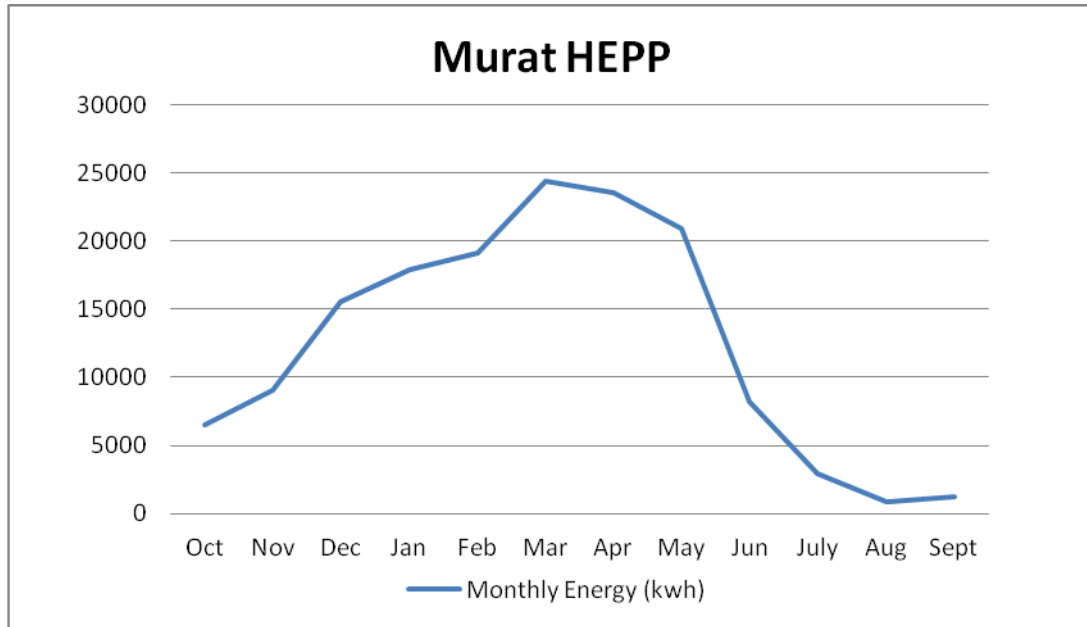


Figure 1: Murat's expected level of activity

The electricity generated at Murat II HEPP will be transmitted to Murat I by a 6 km long transmission line where both plants' generation will be fed into to national grid at Adiyaman Çimento 154 kV interconnection point, through a 10 km long transmission line.

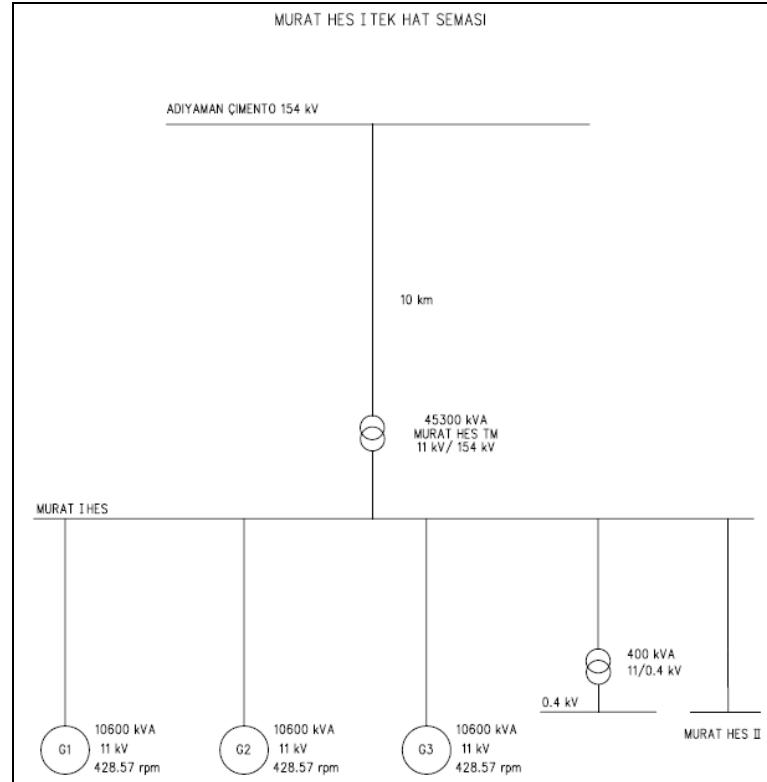


Figure 2: Murat I single-line diagram

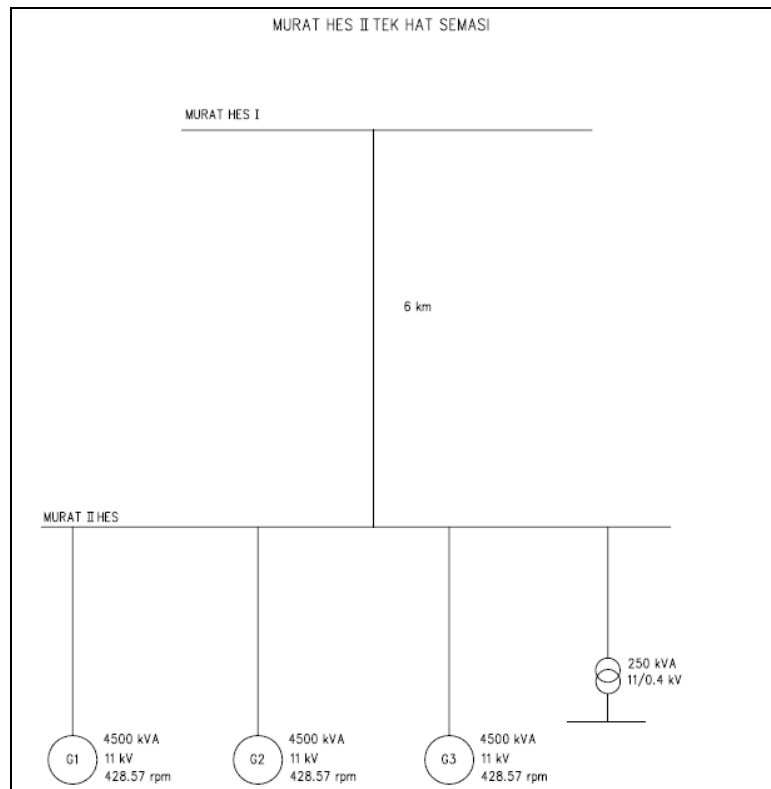


Figure 3: Murat II single-line diagram

As stated in the generation license, the lifetime of the project is 49 years. It is stated that the economical lifetime of the electro mechanic equipment is 35 into the revised feasibility report section 9. However related legislation gives 40 years lifetime for such type of equipment⁴.

According to the EB 50 the default value is 150,000 hours for the hydro turbines and that meets the 37 years for the Murat HEPP projects.

The default value according to the EB 50 has been given as 30 years for the water cooled electric generators.

As a result of the economic life time of the e/m unit has been taken 30 years to be conservative.

1.9 Project Location

The Project site is located in Turkey's South-eastern Region, in Adıyaman province, in Besni town and on Göksu River. The closest village is called Sambayat and is approximately 3 km away from the diversion weir, 9 km from Murat I HEPP and 14 km away from Murat II HEPP.

Precise coordinates for the project activity are:

- Diversion weir: 37°42'44.25"N, 38° 2'58.56"E
- Power House:
 - Murat I HEPP: 37°36'51.99"N, 38° 5'36.76"E
 - Murat II HEPP: 37°34'18.92"N, 38° 6'43.81"E

⁴ <http://www.resmigazete.gov.tr/eskiler/2006/12/20061230M3-2-1.xls>

The following figures show the project's location:



Figure 4: Turkey's map with the project's location

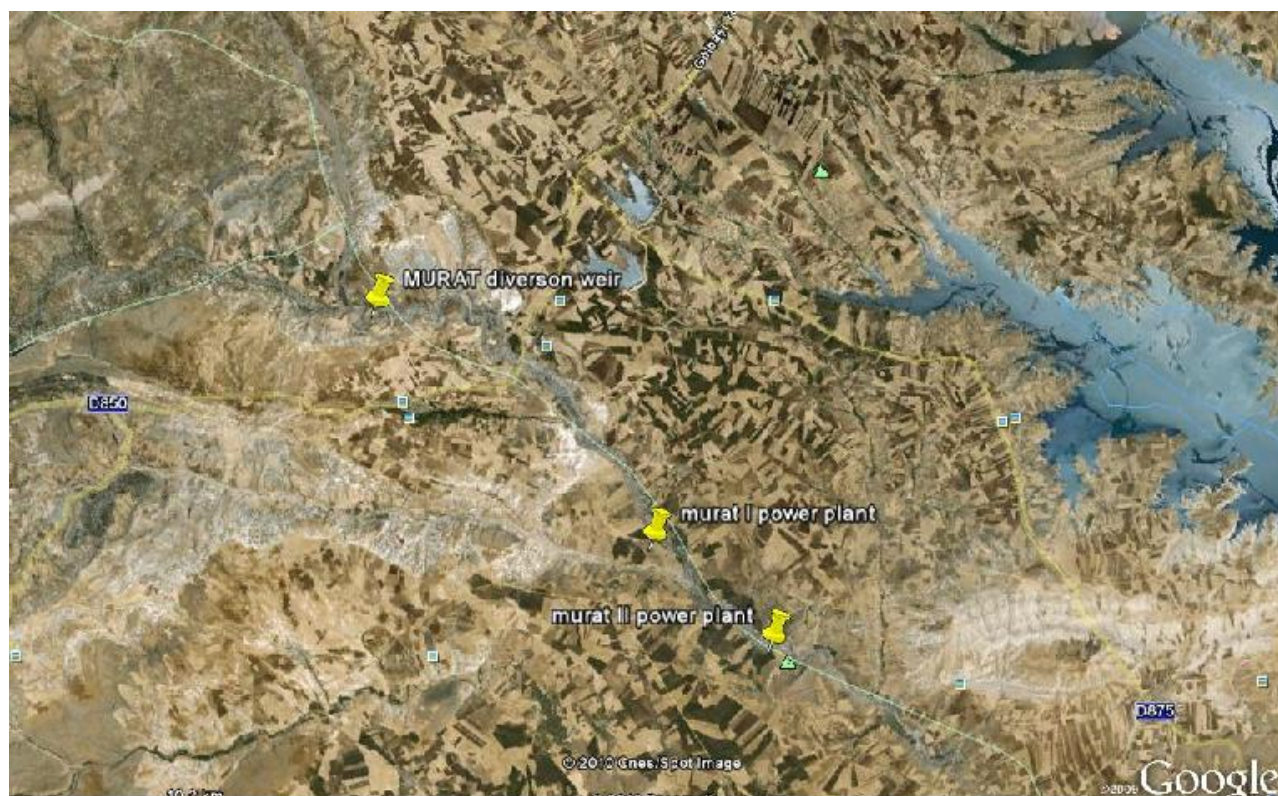


Figure 5: The project's location

1.10 Conditions Prior to Project Initiation

As the project activity is a Greenfield project, the conditions prior to the project initiation is the continuation of the current situation, i.e. the equivalent amount of energy would have been produced by other grid-connected units, which are mainly thermal power plants, undertaking business as usual maintenance.

Moreover, at the project's site, it is only foreseen to generate electricity by the installation of two new hydro power plants. Hence, no previous GHG emissions have occurred.

The project proponent has initiated this project with the aim to supply electricity to the grid, and not primarily for creating GHG emissions in the prospect of their subsequent removal.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

- i. *Electricity Market Law*⁵: It was enacted on March 3rd, 2001. This Law aims to ensure the development of a financially sound and transparent electricity market operating in a competitive environment under the provisions of the civil law. It also underlines the needs to produce a sufficient, high quality, low cost and environmentally friendly electricity to consumers. The text also provides guidelines to structure the autonomous regulation and the supervision of the market.
- ii. *The Renewable Energy Law*⁶: enacted on May 5th 2005; this law compels electricity selling companies to purchase from "Green" energy providers until 2011 at a defined ratio and price. This ratio is based on previous year sales over total energy sold in the country. The price is based on a yearly average wholesale purchase price predetermined by the Energy Market Regulatory Authority (TEIAS).
- iii. *Energy Efficiency Law*⁷: The purpose of this Law is to increase efficiency in using energy sources and energy in order to use energy effectively, avoid waste, ease the burden of energy costs on the economy and protect the environment. It covers the principles and procedures applicable to increasing and promoting energy efficiency in energy generation, transmission, distribution and consumption phases at industrial establishments, buildings, power generation plants, transmission and distribution networks and transport, raising energy awareness in the general public, and utilizing renewable energy sources.
- iv. *The Forest Law*⁸: This law defines the borders of "forest lands" and clarifies the legal details of how these areas shall be used and protected.
- v. *Environmental Law*⁹: This law came into force in 1983; it considers the environment as a single domain, aiming not only to prevent and eliminate environmental pollution, but also to allow the management of land and natural resources in an integrated manner. According to its basic principles, and as also stated in the Constitution, citizens as well as the State bear responsibility for the environment protection. Furthermore, this law states that in all economic activities, every measure should be taken to minimize pollution.¹⁰

⁵ Law Number: 4628 Ratification Date: 20.02.2001 Enactment Date: 03.03.2001

⁶ Law Number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005

⁷ Law Number: 5627 Ratification Date: 18.04.2007 Enactment Date: 02.05.2007

⁸ Law Number 6831 Enactment Date: 31.08.1956

⁹ Law Number 2872 Ratification Date: 09.08.1983 Enactment Date: 11.08.1983

¹⁰ "Turkey's Environment: a review and evaluation of Turkey's environment and its stakeholders", May 2002.

<http://www.rec.org/REC/Programs/ExtensionToTurkey/TurkeysEnvironment.pdf>

- vi. Regulation on procedures and principles of signing the agreement of water resources utilization to generate electricity for the electricity market¹¹.
- vii. Regulation on Environmental Impact Assessment¹²

Moreover, Turkey has no national, legally binding emission reductions scheme.

The project complies with all aforementioned laws as its activity aims at generating electricity by using a renewable resource: hydroelectric power; in a sufficient, low-cost and environmentally-friendly manner, using the latest technology available on the market. Additionally, according to the Governorship of Adiyaman Provincial Directorate of Environment and Forestry, the project has no significant impacts on the environment. Therefore, an Environmental Impact Assessment (EIA) not required certificate has been issued on 22/04/2009. (Please refer to **ANNEX 1** for detailed information)

1.12 Ownership and Other Programs

1.12.1 Right of Use

Murat HEPP project belongs to Murat HEPP Energy Electricity Generation and Trade Inc., which, as stated in **Section 1.3**, is a subsidiary of Mehmet Güneş Construction, Trading and Industry Co. Ltd. The evidence of proof of title will be provided to the DOE during validation.

1.12.2 Emissions Trading Programs and Other Binding Limits

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

1.12.3 Participation under Other GHG Programs

N/A. The project has not been registered, or is seeking registration under any other GHG programs.

1.12.4 Other Forms of Environmental Credit

The project has not created another form of Environmental Credit. (Please refer to ANNEX 2).

1.12.5 Projects Rejected by Other GHG Programs

N/A. The project has not been rejected under any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

N/A.

Leakage Management

¹¹ Official Gazette: #25150, on 26.06.2003

¹² Official Gazette: #26939, on 17.07.2008

N/A.

Commercially Sensitive Information

There is no commercially sensitive information that needs to be excluded from the public version of the VCS PD to be displayed on the VCS Project Database.

Further Information

There is not any relevant information to supplement.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

The CDM approved baseline and monitoring methodology ACM0002-Version13.0.0: *“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”* (ACM0002) is applied.

For the purpose of calculating the emission factor of the Turkish electricity grid, *“Tool to calculate emission factor for an electricity system”* (Version3.0.0) is employed. Whereas, in order to prove the project’s additionality, the *“Tool for the demonstration and assessment of additionality”* (Version7.0.0) has been followed. Conservative options and data were selected during the implementation of the tools and methodology.

2.2 Applicability of Methodology

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

Applicability condition in the ACM0002/Version 13.0.0	Compliance of the condition
This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity involves the installation of two Greenfield run-of-river hydroelectric power plant at the Göksu River flowing through Besni, Adıyaman in Turkey's South-eastern Region, with two power houses. At this site no renewable power plant was operated prior to the implementation of the project activity.
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is the installation of a run-of-river hydro power plant.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use	This condition is not applicable to the project activity as it involves the installation of a new hydroelectric power plant.

Option 2: on page 11 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	
In case of hydro power plants, one of the following conditions must apply: - The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or - The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m ² ; or - The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m ² .	This condition is not applicable to the project activity as it does not result in a new reservoir. However, the project does involve the construction of a regulation pond with a surface of 640,471.91 m ² . Power density (PD) for this regulation pond is: $PD = 37,221,000W / 640,471.91 \text{ m}^2 = 58.11 \text{ W/m}^2$ $PD > 4 \text{ W/m}^2$. (see Figure 11)
This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.	This condition is not applicable to the project activity as it does not involve switching from fossil fuel to renewable energy at the site of the project activity.
This methodology is not applicable to biomass fired power plants.	This condition is not applicable to the project activity as it does not involve the installation of a biomass fired power plant.
This methodology is not applicable to hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m ² .	Even though the project activity involves the installation of an HPP it does not result in new reservoirs or in the increase in existing reservoirs. Therefore, this condition is not applicable.
In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	This condition is not applicable to the project activity as it does not involve a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit(s).

Hence, the approved consolidated methodology ACM0002 is applicable to the project activity.

The project activity also complies with the applicability conditions of the "Tool to calculate the emission factor for an electricity system" (Version 3.0.0) as it displaces electricity generated by power plants in the Turkish electricity system. Moreover, it complies with the applicability criteria of the "Tool for the demonstration and assessment of additionality" (Version 7.0.0).

2.3 Project Boundary

The spatial extent of the project boundary includes the project power plants and all power plants connected physically to the Turkish electricity system.

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

Source		Gas	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project activity	For hydro power plants, emissions of CH ₄ from the reservoir.	CO ₂	No	Minor emission source
		CH ₄	No	Conservative. The project activity does not result in a new reservoir. However, it does involve the construction of a regulation pond, with PD > 4 W/m ² . Therefore, no CH ₄ emissions are expected to occur.
		N ₂ O	No	Minor emission source

The project will be connected to the national grid:

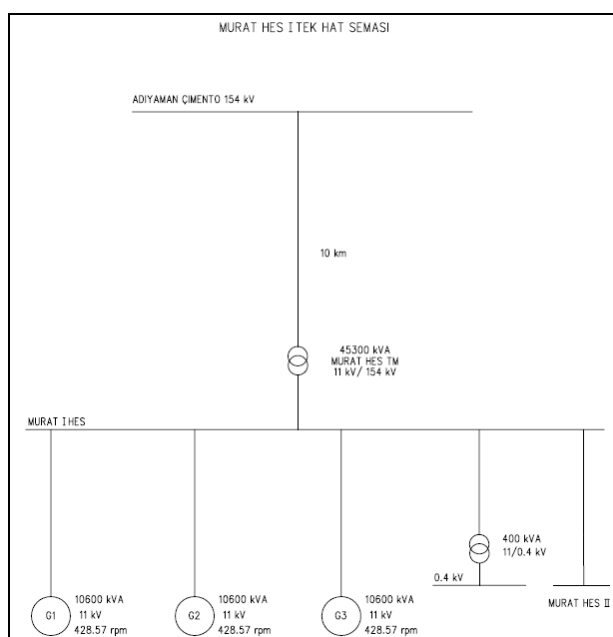


Figure 6 Murat I single-line diagram

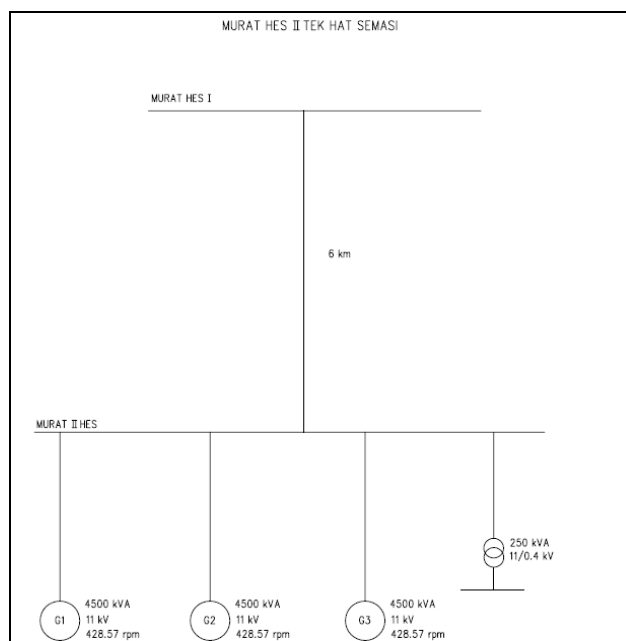


Figure 7 Murat II single-line diagram

2.4 Baseline Scenario

According to the approved consolidated methodology ACM0002 (Version13.0.0), if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline is the following:

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

Since the project activity involves the installation of two new grid-connected hydro power plants the baseline scenario is the same as described above. Combined margin for the Turkish grid has been calculated as per “Tool to calculate the emission factor for an electricity system” (Version 3.0.0.)

2.5 Additionality

The project's additionality has been demonstrated using the latest version of the “Tool for the demonstration and assessment of additionality”- Version 7.0.0. This tool equals “The Project test”, stated in the VCS Standard: VCS Version 3.

The following steps from the additionality tool are completed below:

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

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

Most realistic and reliable alternatives to the project activity are:

- A. Proposed project not undertaken as a VER project activity
- B. Continuation of the current situation-supply of equal amount of electricity in the grid
- 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 2018¹³. In addition, the Figure 6 below shows the energy demand projection (conservative scenario) between 2010 and 2019 prepared by TEİAŞ. 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 applicable¹⁴.

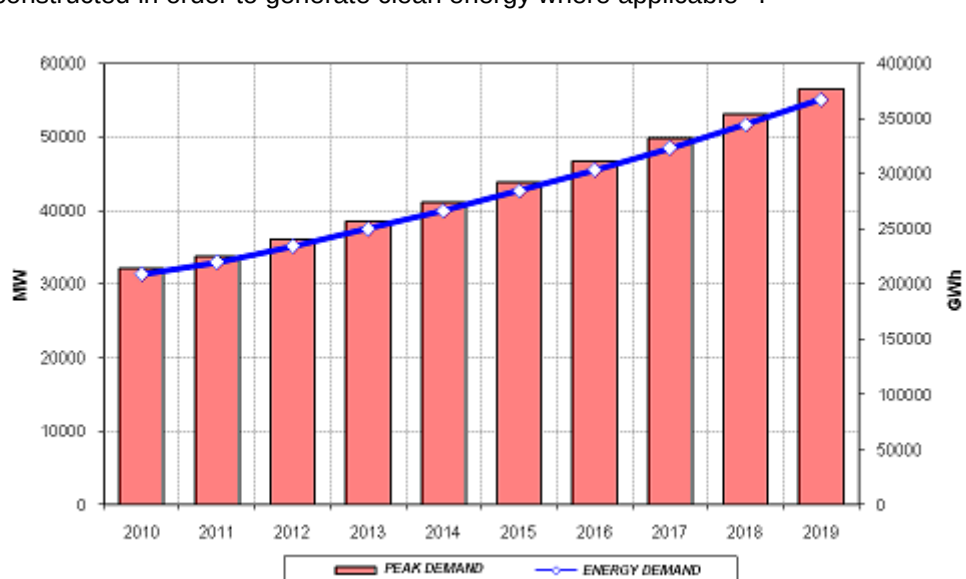


Figure 8 The energy demand projection between 2010 and 2019(low demand)¹⁵

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 32278,5 MW of total 49524,1 MW installed capacity according to 2010 Turkish electrical statistics taken from TEİAŞ (Turkish Electricity Transmission Company)¹⁶.

¹³ E. Kavukçuoğlu, Türkiye Elektrik Enerjisi Piyasası 2010-2011, Deloitte Turkey

¹⁴ Electrical Energy Production Planning Study on Turkey 2005-2010, TEİAŞ, www.teias.gov.tr

¹⁵ Retrieved from <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf>, Page 14

¹⁶ [http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kguc\(1-12\)/7.xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kguc(1-12)/7.xls)

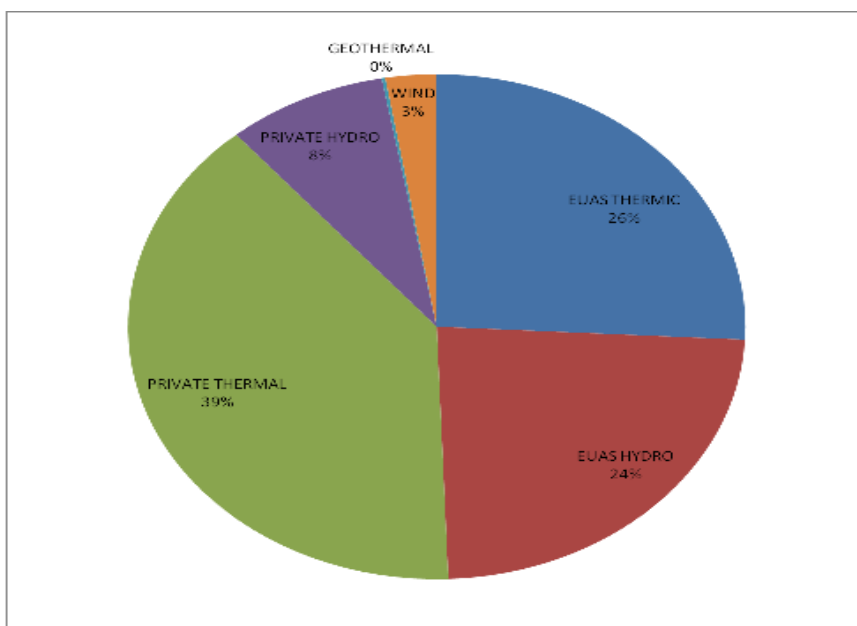


Figure 9 Electricity generation by sources and ownership¹⁷

Outcome of Step 1a

Above mentioned three alternatives are considered for the Project activity. However, Alternative B which is the continuation of the current situation is not considered as a realistic alternative due to increasing electricity demand therefore the Alternative A and C are to be evaluated.

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

The following applicable mandatory laws and regulations have been identified:

- i. *Electricity Market Law*¹⁸: It was enacted on March 3rd, 2001. This Law aims to ensure the development of a financially sound and transparent electricity market operating in a competitive environment under the provisions of the civil law. It also underlines the needs to produce a sufficient, high quality, low cost and environmentally friendly electricity to consumers. The text also provides guidelines to structure the autonomous regulation and the supervision of the market.
- ii. *The Renewable Energy Law*¹⁹: enacted on May 5th 2005; this law compels electricity selling companies to purchase from “Green” energy providers until 2011 at a defined ratio and price. This ratio is based on previous year sales over total energy sold in the country. The price is based on a yearly average wholesale purchase price predetermined by the Energy Market Regulatory Authority (TEIAS).
- iii. *Energy Efficiency Law*²⁰: The purpose of this Law is to increase efficiency in using energy sources and energy in order to use energy effectively, avoid waste, ease the burden of energy costs on the economy and protect the environment. It covers the principles and procedures applicable to increasing and promoting energy efficiency in energy generation, transmission, distribution and consumption phases at industrial

¹⁷ [http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kguc\(1-12\)/7.xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/kguc(1-12)/7.xls)

¹⁸ Law Number: 4628 Ratification Date: 20.02.2001 Enactment Date: 03.03.2001

¹⁹ Law Number: 5346 Ratification Date: 10.05.2005 Enactment Date: 18.05.2005

²⁰ Law Number: 5627 Ratification Date: 18.04.2007 Enactment Date: 02.05.2007

establishments, buildings, power generation plants, transmission and distribution networks and transport, raising energy awareness in the general public, and utilizing renewable energy sources.

- iv. The Forest Law²¹: This law defines the borders of “forest lands” and clarifies the legal details of how these areas shall be used and protected.
- v. *Environmental Law*²²: This law came into force in 1983; it considers the environment as a single domain, aiming not only to prevent and eliminate environmental pollution, but also to allow the management of land and natural resources in an integrated manner. According to its basic principles, and as also stated in the Constitution, citizens as well as the State bear responsibility for the environment protection. Furthermore, this law states that in all economic activities, every measure should be taken to minimize pollution.²³
- vi. Regulation on procedures and principles of signing the agreement of water resources utilization to generate electricity for the electricity market²⁴.
- vii. Regulation on Environmental Impact Assessment²⁵ The resultant alternatives to the project as outlined in Step (1a) are in compliance with the applicable laws and regulations.

Outcome of Step 1b

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

According to the methodology ACM0002 (Version13.0.0), the baseline scenario is Alternative 3: The equivalent electricity will be provided by the existing grid-connected power unit (i.e continuation of the current situation).

Step 2: Investment analysis

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

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

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

Sub-step 2a- Determine appropriate analysis method

²¹ Law Number 6831 Enactment Date: 31.08.1956

²² Law Number 2872 Ratification Date: 09.08.1983 Enactment Date: 11.08.1983

²³ “Turkey’s Environment: a review and evaluation of Turkey’s environment and its stakeholders”, May 2002.

<http://www.rec.org/REC/Programs/ExtensionToTurkey/TurkeysEnvironment.pdf>

²⁴ Official Gazette: #25150, on 26.06.2003

²⁵ Official Gazette: #26939, on 17.07.2008

The “Tool for the demonstration and assessment of additionality” (Version 7.0.0) recommends three analysis methods, namely simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

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

Investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. As it was stated in Step 1, the alternative baseline scenario of the proposed project is the continuation of the current situation, where the equivalent electricity will be provided by the existing power units connected to the national grid. Among the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) is preferred.

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

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. 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 Murat HEPP project²⁶. As is known, there are also benchmarks for other countries in appendix of “guidelines on the assessment of investment analysis” version 05 in the investment analysis.

As is known, there are also benchmarks for other countries in appendix of “Tool for the demonstration and assessment of additionality” version 05 in the investment analysis.

When it is seen, the highest benchmark is %18 and the lowest benchmark is %10,5 among the lots of countries. In 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 parameters needed for calculation of key financial indicators are as follows:

	Data	Unit
Installed Power	37.221	MW
Plant load factor	46.0 ²⁷	%
Operational hours	4.030	hours
Estimation of annual grid-connected power generation	150.39	GWh
Total Investment Cost	75,391,877	USD
Equity	41,641,877	USD
Debt	33,750,000	USD
Annual Operational Costs	924,604	USD
Electricity Selling Price	0.076 ²⁸	USD/kWh

²⁶ http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/05/11/000333037_20090511030724/Rendered/PDF/468080PAD0P112101Official0Use0Only1.pdf

²⁷ See Annex 2

²⁸ According to the valid price regulation the hydroelectric energy price has been set as 7,3 cent\$ by the government link as per below : http://www.enerji.gov.tr/mevzuat/6094/6094_Sayili_Yenilenebilir_Enerji_Kaynaklarinin_Elektrik_Enerjisi_Uretimi_Amacli_Kullanimina_Iliskin_Kanunda_Degisiklik_Yapilmasina_Dair_Kanun.pdf However we have conservatively assumed the electricity selling price as 7,6 cent\$.

VER selling Price	6 ²⁹	USD/tCO ₂
Corporate tax rate	%	20

Table 3: Basic financial parameters of the proposed Project Parameter

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

Total investment cost of **Murat** Weir and Hydroelectric Power Plant is **75,391,877 USD** and is itemized as follows;

Expense items	Value (USD)
Construction site facilities	\$312,500
Road construction	\$218,750
Diversion Weir and Intake Structure	\$8,979,360
Transmission Tunnel	\$16,198,143
Transmission Canal	\$13,734,994
Forebay	\$6,318,172
Power House	\$3,341,526
Penstock	\$1,878,284
Turbine and Generator	\$8,460,000
Accessory Equipment	\$800,000
Other Equipment	\$400,000
Grid	\$2,000,000
Energy Transmission Line	\$1,625,000
Unknown Construction costs (15%)	\$8,041,026
Survey and Project Cost	\$1,849,436
Expropriation	\$1,234,688
TOTAL	\$75,391,877

Table 4 Basic Parameters for Financial Analysis³⁰

Operational costs

The OPEX of the project (1,479,366 TL = 924,604 USD) has been taken from the table 9.1 of the feasibility report. As stated in the feasibility report 1USD= 1,6 TL

The cash inflow or income stream

Renewable Energy Law 6094 dated 29/12/2010 says that the price tariff of the electricity generated by hydro power plants will be applied as 7.3 USD cent per kWh³¹. However in order to be conservative the

²⁹ Ecosystem Marketplace State of the Voluntary Carbon Markets 2011

³⁰ Feasibility study Table 8.1

³¹ <http://www.tbmm.gov.tr/kanunlar/k6094.html>

price of the electricity generated in Murat HEPP has been taken as 7.6 USD cent per kWh for the calculation of sales revenues.

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”.

We have depreciated the assets of the project according to the Turkish Tax Regulation.³²

Interest Expenses and Financial structure

In this project finance, capital structure is 55% debt and 45% equity. 33,750,000 \$ is used as loan to finance this Project.

Equity IRR, Project IRR, VER income and the Benchmark

As is mentioned above, **equity IRR** has been calculated as 11.44% without considering the carbon revenue. When benchmark Equity IRR is taken as 15%, the Project is not financially attractive. We consider 6.00 USD VER Sales Unit Price. When we include the carbon revenues in the cash flows, **equity IRR** increases to nearly 12.08% The IRR even with VERs remains lower than the benchmark of 15%. Project IRRs are also 12.58% and 13.19% in turn.

Based on the parameters above, the project IRRs with and without the VCS-VERs sales revenue are calculated and shown below:

	IRR
Without VCS-VERs revenues	11.44%
With VCS-VERs revenues	12.08%

Table 5: Impact of VCS-VER revenues on the Proposed Project's Equity IRR.

Table 5 shows that the IRR of the total investment of the proposed project without VCS-VERs sales revenue is 11.44%, lower than the benchmark IRR of **15 %**, which means that the proposed project activity indeed faces significant financial barriers. Therefore, the project activity is not the most economically or financially attractive choice of investment.

Sub-step 2d. Sensitivity Analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust under reasonable variations in the critical assumptions. According to the additionality tool, only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subject to reasonable variation. For the proposed project, three basic parameters have been selected as sensitive factors to check out the financial attractiveness:

- Total investment
- Annual operational costs
- Electricity selling revenue

The following table shows the variation of IRR when the three parameters fluctuate from -10% to +10%.

³² http://www.alomaliye.com/aralik_06/vuk_365.pdf (item 45.1.2)

	-10%	-5%	0%	5%	10%
Total Investment	12,85	12,11	11,44	10,83	10,28
Annual operational cost	11,54	11,49	11,44	11,39	11,34
Electricity Selling Revenue	10,06	10,75	11,44	12,13	12,81

Table 6: IRR fluctuation

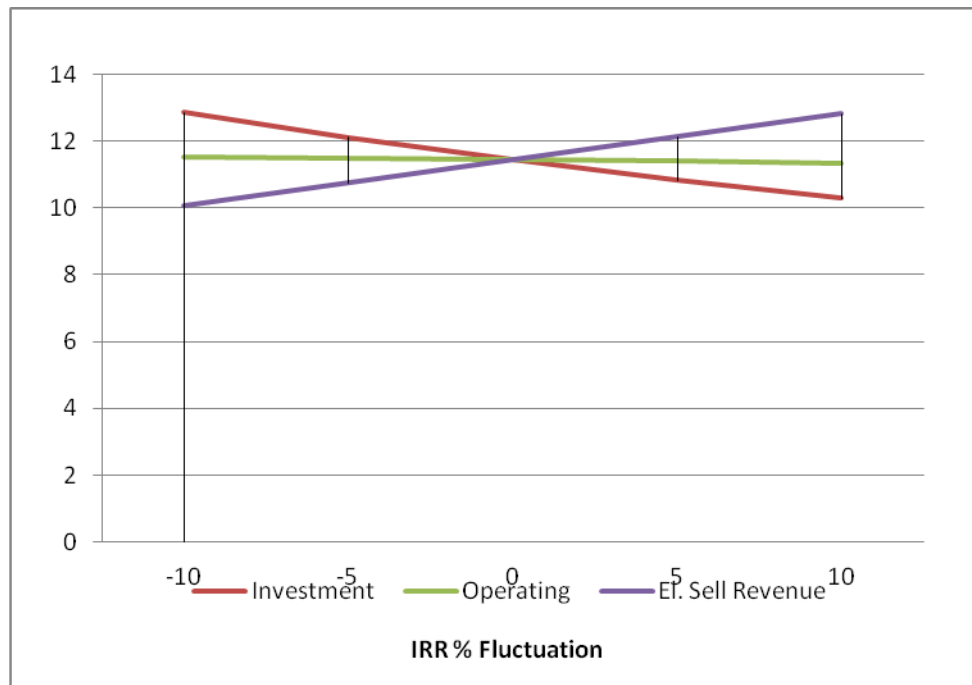


Figure 10: IRR fluctuation

Electricity selling price		
Scenario	\$ cent	IRR
Price By Law	0,073 ³³	10.90
Conservative	0,076 ³⁴	11.44
Low Chance	0,080 ³⁵	12.16

Sensitivity analysis has been carried out for the stated costs and assumptions. It shows that under none of those scenarios the IRR of the project exceeds the Benchmark.

³³ http://www.enerji.gov.tr/mevzuat/6094/6094_Sayili_Yenilenebilir_Enerji_Kaynaklarinin_Elektrik_Enerjisi_Uretimi_Amacli_Kullanimina_Iliskin_Kanunda_Degisiklik_Yapilmasina_Dair_Kanun.pdf

³⁴ Applicable in economic analysis

³⁵ <http://www.epdk.gov.tr/documents/10157/beb57880-96f4-4cbf-a781-e75239c52cff>

It is important to mention that only in the cases where the total investment decreases by 22% or the electricity selling revenue increases by 26%, the IRR of the project without carbon credits exceeds the equity IRR benchmark of the project. However, both cases are very unlikely to occur..

- Investment cost:

The investment cost was estimated based on the feasibility study. However, the construction contract has already been signed and it is expected that costs increase rather than decrease due to unexpected events during construction. Indeed, there have been some changes in the expected construction costs occurred after it started, ie. : tunnel construction and costs of expropriation.

- Electricity selling revenue:

The electricity selling revenue can increase either by increasing the electricity production or by increasing the electricity selling price.

Electricity selling prices tend to decrease rather than increasing due to recent policies and explanations from the government regarding to the nuclear energy investments. Those recent scenarios show that the current **selling prices will be decreased** in the future³⁶. This fact can also be seen from the World Bank Report: Project Appraisal Document on Proposed Loan From Clean Technology Fund (for Turkey)³⁷. On page 63 para 5 the electricity market price for hydro power has been taken as 8 Cent USD per kWh however the current tariff by the legislation is 7,3 Cent USD.³⁸

Electricity production solely depends on water flow, thus changes in rainfall and also uncertainty of the effects of global warming are key factors that affect it. Since Turkey is located in the Mediterranean macroclimate region in the sub-tropical zone, great rainfall variations can be seen between the years. This causes regional and widespread droughts in various intensities. Thus, drought is one of the main problems for the project location region of Turkey³⁹

The following map shows that river flows are decreasing according to the long-term average at the project's location:

³⁶ <http://www.epdk.gov.tr/documents/10157/beb57880-96f4-4cbf-a781-e75239c52c52>

³⁷ http://www.wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2009/05/11/000333037_20090511030724/Rendered/PDF/468080PAD0P112101Official0Use0Only1.pdf

³⁸ <http://www.tbmm.gov.tr/kanunlar/k6094.html>

³⁹ http://www.wmo.int/pages/publications/meteoworld/archive/june09/turkey_en.html

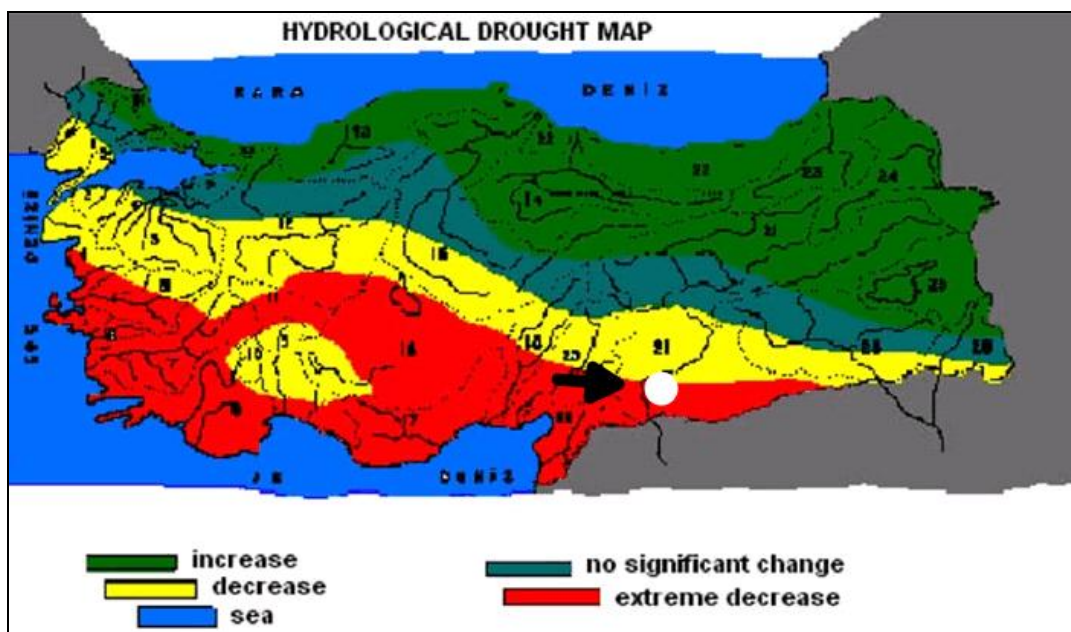


Figure 11: Hydrological drought map of Turkey⁴⁰

Thus, it is improbable that the electricity generation will increase.

Moreover, the electricity selling price is also unlikely to increase. In fact, since April 2011 electricity prices declined. This occurred because the country was on the election process and the negative impact of the high electricity prices on consumers led to such a decline. Therefore, it is foreseen that the electricity prices will only increase to the same value as before April 2011, which is the one used in the investment analysis.

Outcome of Step 2: The above analysis has demonstrated that the project activity is not the most economically or financially attractive choice of investment.⁴¹ Even if the IRR with carbon credits does not overcome the IRR benchmark, the project developer has chosen to develop the project considering carbon credits because of the social benefits that it will bring to the area. Indeed, the project owner, Mehmet Güneş, is aware of local necessities. Therefore, he decided to develop this project since the carbon revenue helps to increase the IRR.

It is worth mentioning that in Turkey there are limited incentives to renewable energy investments. In fact, the only incentive is carbon revenue.

STEP 3 – Barrier analysis

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

STEP 4 – Common practice analysis

Murat HEPP is a privately developed and owned hydro energy power production plant project with the installed power of 37,22 MW_e. It is a channel type hydro power plant having two separate power production centers **Murat I** and **Murat II** downstream the same diversion weir which share the same EMRA license and the project start date is November 2009.

⁴⁰ http://www.wmo.int/pages/publications/meteoworld/archive/june09/turkey_en.html

⁴¹ All financial data and calculations will be provided to the DOE.

According to the latest guideline (EB 65 Report Annex 21"Tool for the demonstration and assessment of additionality") for common practice analysis we took the following values to determine the N_{All} ; The project boundary is the whole country ,Turkey, within this boundary the power production units that are having installed power within the range of **18,61 MW_e – 55,83 MW_e** (+/- 50%)

The Annex-1 (EK-1) of TURKISH ELECTRICAL ENERGY 10-YEAR GENERATION CAPACITY PROJECTION (2010 – 2019) REPORT⁴² pages 85-97 gives the breakdown of the Turkish Electricity Generation Plants by plant type, fuel type and ownership as of 2009 year end and there have been total 447 power production plants in Turkey.

After studying this document in the attached Excel table⁴³ all the plants that fall into the given interval count N_{All} =64 plants (the plants that are CDM registered have been excluded, the list of these plants are in the attached lists⁴⁴⁻⁴⁵). And further study on these 64 plants showed us that only 15 plants are having private energy production license and using hydro power technology.

NO	PLANT NAME	INSTALLED POWER MW	Owner	Fuel Type
1	HOPA	50,00	EÜAŞ	F.OIL
2	SOMA A	44,00	EÜAŞ+PARTNER	LIGNITE
3	ALMUS	27,00	EÜAŞ	HYDRO
4	ÇAMLIGÖZE	32,00	EÜAŞ	HYDRO
5	KAPULUKAYA	54,00	EÜAŞ	HYDRO
6	KARACAÖREN-1	32,00	EÜAŞ	HYDRO
7	KARACAÖREN II	46,40	EÜAŞ	HYDRO
8	KEMER	48,00	EÜAŞ	HYDRO
9	MANAVGAT	48,00	EÜAŞ	HYDRO
10	TORTUM	26,20	EÜAŞ	HYDRO
11	YENİCE	37,90	EÜAŞ	HYDRO
12	KEPEZ I-II	32,40	EÜAŞ	HYDRO
13	ŞANLI URFA	51,80	EÜAŞ	HYDRO
14	HAZAR 1-2	30,10	TOR	HYDRO
15	AKDENİZ SEKA (Silişk)	20,00	AUTOPRODUCER	F.OIL
16	MOPAK (Dalaman)	26,20	AUTOPRODUCER	F.OIL
17	SÜPER FİLM (G.Antep)	25,30	AUTOPRODUCER	F.OIL
18	TÜPRAŞ İZMİR (ALİAĞA RAF.)	44,00	AUTOPRODUCER	F.OIL
19	TÜPRAŞ (Orta Anadolu-Kırıkkale)	34,00	AUTOPRODUCER	F.OIL
20	KARDEMİR	35,00	AUTOPRODUCER	COAL
21	MENDERES TEKS. (AKÇA ENERJİ)	18,70	AUTOPRODUCER	NAPHTA
22	KALESERAMİK (Çan.seramik+Kalebodur)	21,60	AUTOPRODUCER	N.GAS
23	KARTONSAN (İzmit)	24,00	AUTOPRODUCER	N.GAS
24	MARMARA PAMUK	43,70	AUTOPRODUCER	N.GAS
25	TÜPRAŞ ALİAĞA	24,70	AUTOPRODUCER	N.GAS
26	YILDIZ SUNTA (Köseköy)	27,80	AUTOPRODUCER	N.GAS
27	BATIÇİM ENERJİ (AK ENERJİ)	45,00	PRIVATE PRODUCER	N.GAS
28	ALİAĞA Çakmaktepe Enerji	34,80	PRIVATE PRODUCER	N.GAS
29	AYEN OSTİM	41,00	PRIVATE PRODUCER	N.GAS
30	BİL ENERJİ (Ankara)	36,60	PRIVATE PRODUCER	N.GAS
31	CAM İŞ ELEKTRİK (B.Karıştıran)	32,90	PRIVATE PRODUCER	N.GAS
32	ÇERKEZKÖY ENERJİ	49,20	PRIVATE	N.GAS

⁴² <http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSİYONU%202010.pdf>

⁴³ MURAT HEPP Common Practice analysis.xls

⁴⁴ VCS database report-TURKEY

⁴⁵ GS database report-TURKEY

			PRODUCER	
33	GLOBAL ENERJİ (PELİTLİK)	20,30	PRIVATE PRODUCER	N.GAS
34	GÜL ENERJİ	24,30	PRIVATE PRODUCER	N.GAS
35	KEN KİPAŞ KAREN ELEKTRİK	41,80	PRIVATE PRODUCER	N.GAS
36	KAREGE ARGES	43,60	PRIVATE PRODUCER	N.GAS
37	NUH ENERJİ 1 (Nuh Çimento)	38,00	PRIVATE PRODUCER	N.GAS
38	SÖNMEZ ELEKTRİK	34,90	PRIVATE PRODUCER	N.GAS
39	ŞAHİNLER ENERJİ(ÇORLU/TEKİRDAĞ)	26,00	PRIVATE PRODUCER	N.GAS
40	ZORLU ENERJİ (Sıncan)	50,30	PRIVATE PRODUCER	N.GAS
41	AKSA ENERJİ (Hakkarı)	24,00	PRIVATE PRODUCER	F.OIL
42	HABAŞ (İzmir)	36,00	PRIVATE PRODUCER	F.OIL
43	KIZILTEPE	34,10	PRIVATE PRODUCER	F.OIL
44	PS3-A -2 (İDİL)	24,40	PRIVATE PRODUCER	F.OIL
45	SİLOPI ELEKT.ÜRETİM ESENBOĞA	44,80	PRIVATE PRODUCER	F.OIL
46	SİİRT	25,60	PRIVATE PRODUCER	F.OIL
47	AKÇAY	28,80	PRIVATE PRODUCER	HYDRO
48	BEREKET (DALAMAN)	37,50	PRIVATE PRODUCER	HYDRO
49	BEREKET (MENTAİ)	39,90	PRIVATE PRODUCER	HYDRO
50	CİNDERE DENİZLİ	19,10	PRIVATE PRODUCER	HYDRO
51	DAREN HES (SEYRANTEPE BARAJI)	49,70	PRIVATE PRODUCER	HYDRO
52	ENERJİ-SA BİRKAPILI	48,50	PRIVATE PRODUCER	HYDRO
53	EŞEN-II (GÖLTAŞ)	43,40	PRIVATE PRODUCER	HYDRO
54	HİDRO KONTROL YUKARI MANAHOZ	22,40	PRIVATE PRODUCER	HYDRO
55	KALEN ENER. (KALEN I-II)	31,30	PRIVATE PRODUCER	HYDRO
56	PAMUK (Toroslar)	23,30	PRIVATE PRODUCER	HYDRO
57	SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,00	PRIVATE PRODUCER	HYDRO
58	SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,60	PRIVATE PRODUCER	HYDRO
59	TÜM EN. PINAR	30,10	PRIVATE PRODUCER	HYDRO
60	KUZGUN ZORLU	20,90	PRIVATE PRODUCER	HYDRO
61	MERCAN ZORLU	20,40	PRIVATE PRODUCER	HYDRO
62	ALİZE ENERJİ (SARIKAYA ŞARKÖY)	28,80	PRIVATE PRODUCER	WIND

63	BORASKO BANDIRMA	45,00	PRIVATE PRODUCER	WIND
64	GÜRMAT EN.	47,40	PRIVATE PRODUCER	GEOTHERMAL

Table 7 N all plants

Among these 15 privately owned hydro plants 2 of them have been built by the government and then been sold out to a private company under **privatization process**, 6 of them have been built under **Auto producer** agreement and then converted to private production license, 1 of them has been developed by a government entity "**State Hydraulic Works (DSİ)** " and then sold out to private company with a bidding process.

PROJECT DEVELOPMENT ENTITY								
NR	PLANT NAME	Installed Power MW	Fuel Type	Owner	Project Type	JUSTIFICATION SOURCE	ENTITY TYPE	Similarity check
1	AKÇAY	28,80	HYDRO	PRIVATE PRODUCER	Energy+Irrigation	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
2	BEREKET (DALAMAN)	37,50	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
3	BEREKET (MENTAŞ)	39,90	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
4	CİNDERE DENİZLİ	19,10	HYDRO	PRIVATE PRODUCER	Energy+Irrigation	http://www2.dsi.gov.tr/skatablo/Tablo4.htm , http://www2.dsi.gov.tr/bolge/dsi21/denizli.htm#cindre re	DSİ (gov.)	N
5	DAREN HES (SEYRANTEPE BARAJI)	49,70	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
6	ENERJİ-SA BİRKAPILI	48,50	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
7	EŞEN-II (GÖLTAŞ)	43,40	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	AUTO PRODUCER	N
8	HİDRO KONTROL YUKARI MANAHOZ	22,40	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo3.htm	PRIVATE	Y
9	KALEN ENER. (KALEN I-II)	31,30	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo3.htm	PRIVATE	Y
10	PAMUK (Toroslar)	23,30	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	PRIVATE	Y
11	SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,00	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo3.htm	PRIVATE	Y
12	SARMAŞIK II	21,60	HYDRO	PRIVATE	Energy	http://www2.dsi.gov.tr/skatablo/Tablo3.htm	PRIVATE	Y

	HES (FETAŞ FETHİYE ENERJİ)		O	PRODUCER		ov.tr/skatablo/Tablo3.htm	E	
13	TÜM EN. PINAR	30,10	HYDRO	PRIVATE PRODUCER	Energy	http://www2.dsi.gov.tr/skatablo/Tablo3.htm	PRIVATE	Y
14	KUZGUN ZORLU	20,90	HYDRO	PRIVATE PRODUCER	Energy+Irrigation	http://www2.dsi.gov.tr/skatablo/Tablo1.htm	PRIVATE	N
15	MERCAN ZORLU	20,40	HYDRO	PRIVATE PRODUCER	Energy+Irrigation	http://www.oib.gov.tr/tedas/ankara_dogal_electric.htm	PRIVATE	N

Table 8 Similar Projects

So ; $2+6+1=9$ and $15-9=6$. Thus only **6** units among 15 units are similar to the proposed project activity MURAT HEPP.

After the above given analysis we are left with $64-6=58$ of units among 64 are different than MURAT HEPP by technology, ownership, fuel type, legal origin and project development entity(government support). That is ; $N_{diff} = 58$

Applying the common practice analysis formulation which was given in the above mentioned tool as follows;

Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity. The proposed project activity is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:

- (a) the factor F is greater than 0.2, and
- (b) $N_{all}-N_{diff}$ is greater than 3.

$$F = 1 - (N_{diff} / N_{All}) \Rightarrow F = 1 - (58/64) \Rightarrow F = 1 - 0,91 \Rightarrow F = 0,09$$

0,09 is **not greater than** 0,2

So MURAT HEPP project is **not a common practice**

Impact of VCS-VER income

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

As explained before, the financial benefit from the revenue obtained by selling the CO₂ emissions reductions, together with the social benefits derived from the project has been one of the key issues encouraging investment in the proposed project activity.

2.6 Methodology Deviations

N/A

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

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 3.0.0.

This tool provides procedures to determine the following parameters:

<u>Parameter</u>	<u>Unit</u>	<u>Description</u>
EF_{grid,CM,y}	tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y
EF_{grid,BM,y}	tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y
EF_{grid,OM,y}	tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y

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 3.0.0.” by six steps;

Step 1: Identification of the relevant electricity system

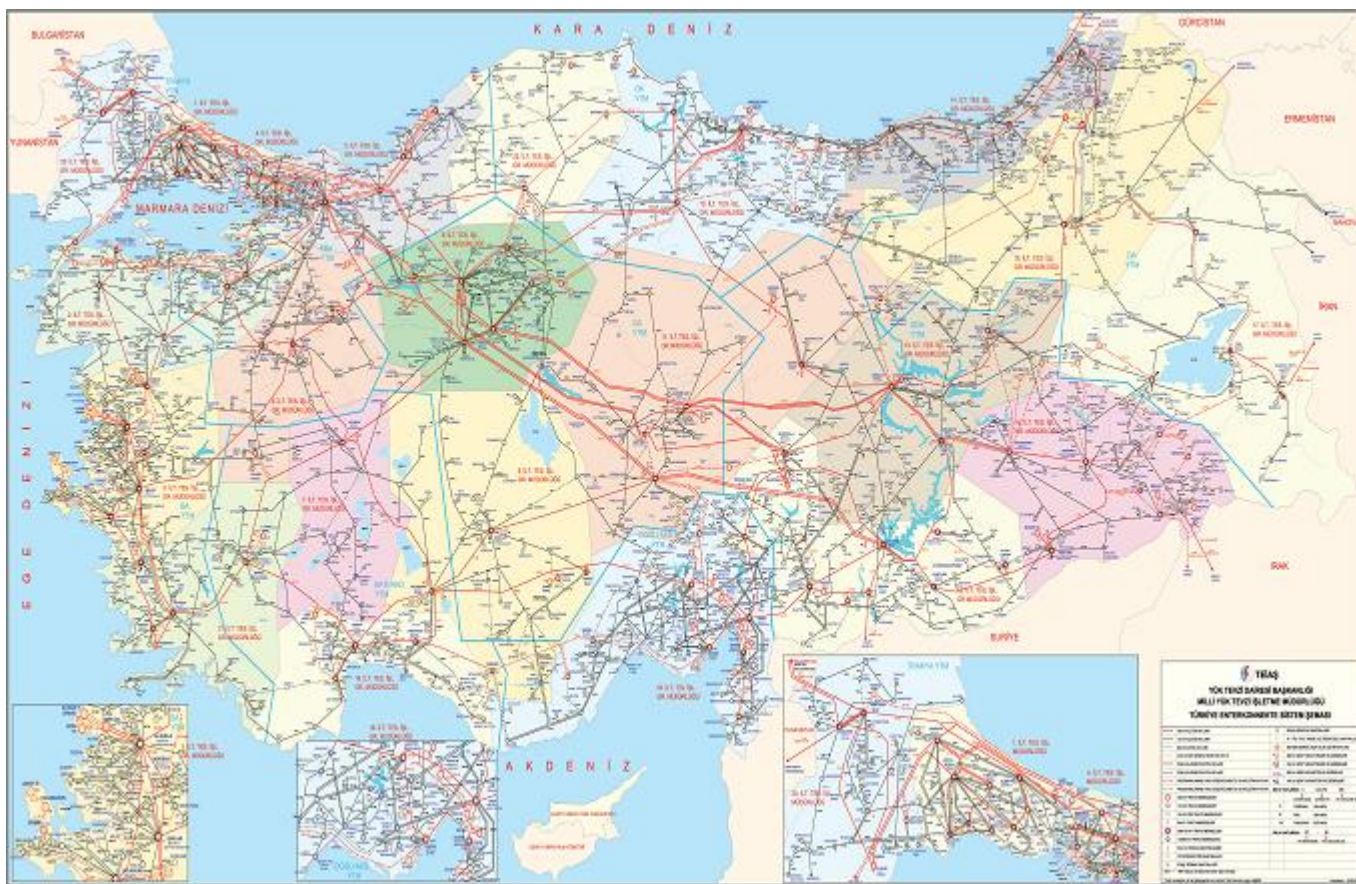


Figure 12 ***Turkish Electricity Transmission System***⁴⁶

According to the “Tool to calculate the emission factor for an electricity system, ver. 3.0.0.”, 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 Murat 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 TEİAŞ (Turkish Electricity Transmission Company Inc.), the Turkish transmission system is interconnected.⁴⁷ Hence, the connected electricity system comprises of the Murat 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. 3.0.0.” 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.

⁴⁶ <http://www.teias.gov.tr/FaaliyetRaporlari.aspx> (2010)

⁴⁷ <http://www.teias.gov.tr/FaaliyetRaporlari.aspx> (2010)

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 percent 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. 3.0.0”, “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 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 CO₂e/MWh is used as the CO₂ 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. 3.0.0.” 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 CO₂ emissions per unit net electricity generation (tCO₂/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. 3.0.0.”, in calculating the operating margin (EFgrid, 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 lowcost/ must run resources constitute less than 50% of total grid generation in average of the five most recent years, 21,43%. Therefore the requirements for the use of the Simple OM calculations (option a) are satisfied.

Electricity Gene. (GWh)/ Year	2006	2007	2008	2009	2010
Thermal Total	131835.10	155196.17	164139.30	156923.44	155827,60
Hydro+Geothermal+Wind Total	44464.70	36361.92	34278.70	37889.47	55380.1
Turkey's Total	176299.80	191558.09	198418.00	194812.92	211207,7
Share of low-cost/must-run production	25.22	18.98	17.28	19.45	26.22
Average share (%)	21.43				

Table 9 Total electricity generation and from low-cost/must run resources (2006-2010)

According to the “Tool to calculate the emission factor for an electricity system, ver. 3.0.0.” 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 2008 - 2010 which are the most recent data available at the time of preparation of the VCS VER PDD.

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 CO₂ 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 necessary 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 CO2 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;

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

Where:

- $EF_{\text{grid,OMsimple},y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂/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)
- $EF_{\text{CO2},i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂/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 grid, 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, 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 electricity generation by thermal power plants excluding internal consumption gives the net generation excluding low-cost/must-run is as follows in Table 12, the E_{Gy} is calculated by multiplying the “gross electricity generation by thermal power plants” by “net/gross ratio” and adding the “imported electricity”.

Electricity Generation (GWh)	Supplied to grid	Low -cost/ must -run	Thermal	Net generation (-) low-cost/ must-run	Import	E _{Gy} (GWh)
2008	189761.9	34278.70	164139.3	156978.6	789.40	157,768.028
2009	186619.3	37889.47	156923.4	150323.4	812.00	151,135.388
2010	203046.1	55380.1	155827.6	149806.0	1143.81	150,949.837
						459,853.25

Table 10 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)⁴⁸

Fuel Type	Total Fuel Consumption 2008-2010 (Tonne , 1000m3 for gas) ⁴⁹	Total Emissions 2008-2010 (tCO ₂)
Hard Coal+Imported Coal+Asphaltite	20,310,888	41,951,665
Lignite	186,684,030	115,302,396
Fuel Oil	4,659,474	14,041,053
Diesel Oil	332,417	1,028,378
LPG	111	318
Naphta	31,823	89,500
Natural Gas	64,369,089	129,543,267
Total		301,956,576

Table 11 Total Emissions from fuels consumed in Thermal Power Plants 2008-2010⁵⁰

$$EF_{\text{grid,OMsimple,y}} = 301,956,576 / 459,853,267.75 = 0.657 \text{ tCO}_2\text{e/MWh}$$

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

⁴⁸ [http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim\(22-45\)/35\(75-10\).xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim(22-45)/35(75-10).xls)

⁴⁹ <http://www.teias.gov.tr/T%C3%BCrkiyeElektrik%C4%B0statistikleri/istatistik2010/front%20page%202010-%C3%A7i%C3%A7ek%20kitap/yak%C4%B1t46-49/47.xls>

⁵⁰ EF calculation excel study, OM worksheet

According to the tool, in terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin 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 build margin 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 renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 has been chosen. Therefore, for the first crediting period, the build margin emission factor has been calculated *ex ante* based on the most recent information available on units already built for sample group *m* at the time of PDD submission to the DOE for validation.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor. The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);
- (c) From $SET_{5-units}$ 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. Ignore steps (d), (e) and (f).

As per above, the SET_{sample} used to calculate the BM has been chosen, using the power plant capacity additions in the electricity system that comprises 20% of the most recently added system generation since $SET_{\geq 20\%}$ annual electricity generation is higher than $SET_{5-units}$. Moreover, none of the the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago. Therefore, steps (d), (e) and (f) have been ignored.

EF CO ₂ (t CO ₂ / GJ)						
Sub-Bituminous Coal	Lignite	Fuel-oil	Diesel-oil	LPG	Naphtha	Natural Gas
0.995	0.999	0.775	0.949	0.493	0.554	0.425

Table 12 *Average CO₂ emission factor by fuel types (tCO₂/Gj)*

The recent capacity additions were obtained from TEIAS website.

The following table shows the capacity additions between 2006 and 2010 (excluding the CDM registered projects) which are considered in BM calculation.

Fuel Type	Electricity generation capacity addition (MWh)	EF,EL,m,y (tCO ₂ /MWh)	Emission by source (tCO ₂)
Coal	10,025,000	0.995	9,976,622
Lignite	6,675,000	0.999	6,667,665
Fuel Oil	3,355,000	0.775	2,600,197
Diesel oil	0	0.949	-
LPG	0	0.493	-
Naphtha	0	0.554	-
Natural Gas	20,945,685	0.425	8,906,814
Renewables and wastes	0	0.000	-
Solid	0	0.000	-
total Renewables	2,784,028	0.000	-
TURKEY'S TOTAL	43,784,713		28,151,298

Table 13 *Total capacity additions considered in the BM emission factor calculation (2006-2010)*

The build margin emissions factor is the generation weighted average emission factor (tCO₂/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

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

Where:

$EF_{grid,BM,y}$ =Build margin CO₂ emission factor in year y (tCO₂/MWh)

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

$EF_{EL,m,y}$ CO₂ =Emission factor of power unit m in year y (tCO₂/MWh)

m =Power unit included in the build margin

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

Based on the capacity additions in 2006-2010

the calculated Build Margin is ;

$$EF_{grid,BM,y} = 28,151,298 \text{ (tCO}_2\text{)} / 43,784,713 \text{ MWh} = 0.643 \text{ tCO}_2/\text{MWh}$$

STEP 6- Calculate the combined margin (CM) emissions factor

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

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method has been preferred. Therefore, the combined margin emissions factor is calculated as follows:

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

$EF_{grid,BM,y}$	Build margin CO ₂ Mission factor in year y (tCO ₂ /MWh)
$EF_{grid,OM,y}$	Operating margin CO ₂ Mission factor in year y (tCO ₂ /MWh)
W_{OM}	Weighting of operating margin emission factor (%)
W_{BM}	Weighting of operating margin emission factor (%)

For all other projects (that are not wind and solar power generation project activities), the following default values should be used: $W_{OM} = 0.5$ and $W_{BM} = 0.5$ for the first crediting period, and $W_{OM} = 0.25$ and $W_{BM} = 0.75$ for the second and third crediting period

Therefore the combined emission factor is calculated as

$$EF_{grid,CM,y} = (0,657 \times 0,5) + (0,643 \times 0,5) = 0.65 \text{ tCO}_2/\text{MWh}$$

Project emissions

According to the methodology, the project emissions shall be accounted using the following equation:

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

Where:

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

Emission Reductions

Last, according to the methodology Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y : Emission reductions in year y (tCO₂e/yr)

BE_y : Baseline Emissions in year y (tCO₂e/yr)

PE_y : Project Emissions in year y (tCO₂e/yr)

LE_y : Leakage Emissions in year y (tCO₂e/yr)

As demonstrated above, PE_y and LE_y values are “0” for the proposed project activity. Therefore ER_y is equal to BE_y.

As a result;

ER_y = BE_y , and BE_y = EG_{facility} × EF_{grid,CM,y} SO,

ER_y = 150.39 (MWh/yr) × 0.65 (tCO₂e/MWh)

ER_y = 97,754 tCO₂e/yr

3.2 Project Emissions

According to the methodology, the project emissions shall be accounted using the following equation:

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

Where:

PE_y Project emissions in year y (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 (tCO₂e/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-off-river hydro power plant.

Fossil fuel consumption (PE_{FF,y})

The project internal annual consumption is 1,728 MWh for Murat I and 1,512 MWh for Murat II, totalizing 3,240 MWh. This consumption will be satisfied from the self electricity generation when the plants are in operation or from the grid when both plants are not operating. However, this will rarely occur. Therefore:

PE_{FF,y} = 0 According to the methodology, the project emissions shall be accounted using the following equation:

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

Where:

PE_y Project emissions in year y (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 (tCO ₂ e/yr)
$PE_{HP,y}$	Project emissions from water reservoirs of hydro power plants in year y (tCO ₂ e/yr)

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

Since the project activity does not involve the operation of a geothermal power plant, $PE_{GP,y} = 0$

Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)

For hydro power project activities that result in new single or multiple reservoirs and hydro power project activities that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH₄ and CO₂ emissions from the reservoirs, estimated as follows:

(a) If the power density of the single or multiple reservoirs (PD) is greater than 4 W/m² and less than or equal to 10 W/m²

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

or equal to 10 W/m²

(b) If the power density of the project activity (PD) is greater than 10 W/m² : $PE_{HP,y} = 0$

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

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

Where:

PD	=	Power density of the project activity (W/m ²)
Cap _{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap _{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero
A _{PJ}	=	Area of the single or multiple reservoirs 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 single or multiple reservoirs 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

For the proposed project activity;

The project activity is a Greenfield run-of-river hydropower project. The water is diverted using a diversion wall structure to power canal and then to the powerhouse. The water will be fed back to river through the tailrace canal. The diversion structure results in a regulation pond with a surface area of 640,471.91 m².

$$\begin{aligned} Cap_{PJ} &= 19,280,000 \text{ W} \\ Cap_{BL} &= 0 \text{ (The project is a new hydro power plant)} \\ A_{PJ} &= 214,825 \text{ m}^2 \\ A_{BL} &= 0 \text{ (The project is a new hydro power plant)} \end{aligned}$$

$$PD = (37,221,000 - 0) / (640,471.91 - 0) = 58.11 \text{ W/m}^2$$

Therefore;

Since the Power Density of the Project is greater than 10 W/m² PE_y is assumed to be 0 as suggested in ACM0002 / Version 13.0.0

Hence option **(b)** above should be applied and **PEHP,y = 0**

As a result, the project emissions for MURAT HEPP is determined as zero.

Baseline emissions

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

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

Where:

- BE_y = Baseline emissions in year y (tCO₂/yr)
- EG_{PJ,y} = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
- EF_{grid,CM,y} = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂/MWh)

Calculation of EGPJ,y

The calculation of EGPJ,y is different for:

- (a) greenfield plants,
- (b) retrofits and replacements; and
- (c) capacity additions.

Since Murat HEPP is a greenfield project we consider only option (a) and the calculation is as follows.

Greenfield renewable energy power plants If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

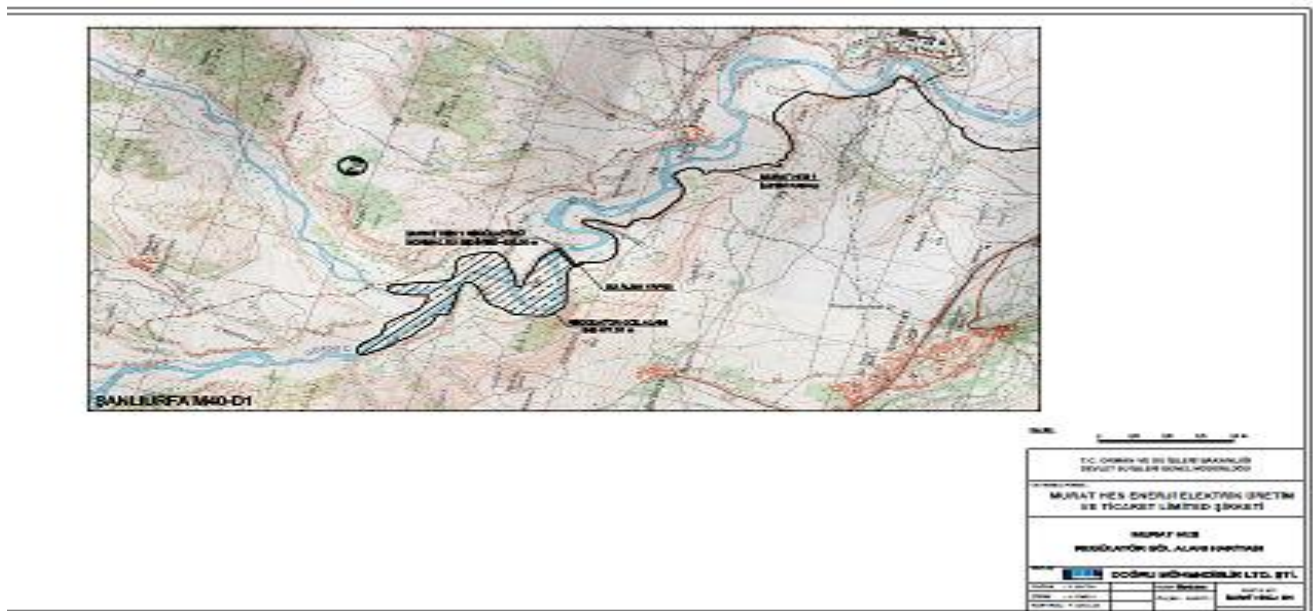
$$EG_{Pj,y} = EG_{\text{facility}}$$

Where:

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

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

$$BE_y = 0.65 \text{ (tCO}_2\text{/MWh)} \times (150.39 \text{ (MWh/yr)} - 0) = 97,754 \text{ (tCO}_2\text{/yr)}$$

Figure 13 *Surface Area*

$$PD = 37,221,000W / 640,471.91 \text{ m}^2 = 58.11 \text{ W/m}^2$$

PD> 4 W/m².

3.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction

and upstream emissions from fossil fuel use (e.g. extraction, processing and transport). These emissions sources are neglected.

3.4 Summary of GHG Emission Reductions and Removals

Years	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
October 2012 – 31 December 2012	24,439	0	0	24,439
2013	97,754	0	0	97,754
2014	97,754	0	0	97,754
2015	97,754	0	0	97,754
2016	97,754	0	0	97,754
2017	97,754	0	0	97,754
2018	97,754	0	0	97,754
2019	97,754	0	0	97,754
2020	97,754	0	0	97,754
2021	97,754	0	0	97,754
01 January 2022 – 30 September 2022	73,316	0	0	73,316
Total	977,540	0	0	977,540

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter:	EGy
Data unit:	GWh
Description:	Net electricity generated and delivered to the grid by all power sources serving the system, excluding low-cost/must-run units/plants, in year y
Source of data used:	Annual development of installed capacity and generation in Turkey http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/kgucunkullanım(13-21)/13.xls
Value applied:	Table 12
Justification of choice of data or description of measurement methods and procedures 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:	FC i, y
Data unit:	m3 / tons (m3 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/istatistik2010/front%20page%202010-ççek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls
Value applied:	Table 11
Justification of choice of data or description of measurement methods and procedures 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:	Electricity Imports
Data unit:	MWh
Description:	Electricity transfers from connected electricity systems to the project electricity system by years (2008-2010)
Source of data used:	TEIAS (Turkish Electrical Transmission Company) Annual development of Turkey’s gross electricity generation-importsexports and demand http://www.teias.gov.tr/istatistik2010/front%20page%202010-ççek%20kitap/ithalat-ihracat(50-54)/52.xls
Value applied:	Table 12

Justification of choice of data or description of measurement methods and procedures applied:	Data used for emission reduction estimation Net electricity generated and delivered to the grid by all power sources serving the system.
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 (2010). http://www.teias.gov.tr/istatistik2010/front%20page%202010-cicek%20kitap/yakit46-49/47.xls
Value applied:	Table 11
Justification of choice of data or description of measurement methods and procedures 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.
Any comment:	

Data / Parameter:	EF_{grid,OM,y}
Data unit:	tCO ₂ /MWh
Description:	Simple operating margin CO ₂ emission factor of the grid in year y
Source of data used:	Calculated value as per “Tool to calculate the emission factor for an electricity system” (Version 3.0.0)
Value applied:	0.657 (average of 3 years 2008, 2009 and 2010)

Justification of choice of data or description of measurement methods and procedures applied:	The calculations follow the “Tool to calculate the emission factor for an electricity system” (Version 3.0.0. Fixed on the basis of 3-year generation-weighted average based on the most recent data available at the time of PDD submission (2008-2010)
Any comment:	Value is calculated ex-ante and is fixed during the crediting period.

Data / Parameter:	NCV i, y
Data unit:	GJ/tonnes
Description:	Net calorific value (energy content) of fossil fuel type <i>i</i> in year <i>y</i>
Source of data used:	TEIAS (Turkish Electricity Transmission Company) Heating values of fuels consumed in thermal plants in Turkey by the electricity utilities http://www.teias.gov.tr/istatistik2010/front%20page%202010-çiçek%20kitap/yakıt46-49/47.xls
Value applied:	Table 11
Justification of choice of data or description of measurement methods and procedures 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:	Value is calculated ex-ante and is fixed during the crediting period.

Data / Parameter:	EF C02,i,y
Data unit:	T CO2/GJ
Description:	CO2 emission factor of fossil fuel type <i>i</i> in year <i>y</i>

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 15
Justification of choice of data or description of measurement methods and procedures applied:	There is no information on the fuel specific default emission factor in Turkey, hence, IPCC values has been used as referred in the “Tool to calculate the emission factor for an electricity system, version 3.0.0”.
Any comment:	

Data / Parameter:	EF_{grid,BM,y}
Data unit:	tCO ₂ /MWh
Description:	Build operating margin CO ₂ emission factor of the grid in year y
Source of data used:	Calculated value as per “Tool to calculate the emission factor for an electricity system” (Version 3.0.0)
Value applied:	0.643
Justification of choice of data or description of measurement methods and procedures applied:	Calculated <i>ex-ante</i> and comprised capacity addition of power plants between years 2006-2010 according to the “Tool to calculate emission factor for an electricity system, version 3.0.0.”
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 (2006-2010)
Source of data used:	Generation units put into operation in 2006;2007;2008;2009;2010 http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2011.pdf 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
Value applied:	Annex 3 Baseline Information
Justification of choice of data or description of measurement methods and procedures 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 2010 are not sufficiently large, the capacity generation of 21 plants with latest starting date to operation at 2006 should be added to meet the %20 of total generation at 2010.
Any comment:	

Data / Parameter:	EF grid, CM, y
Data unit:	tCO ₂ /MWh
Description:	Combined margin CO2 emission factor in year y
Source of data used:	Calculated data applied to the equation 5
Value applied:	0.650
Justification of choice of data or description of measurement methods and procedures applied:	Calculated ex-ante according to the "Tool to calculate emission factor for an electricity system, version 3.0.0.", EB 70 Annex 22."
Any comment:	

4.2 Data and Parameters Monitored

Data Unit / Parameter:	$EG_{PJ,y}$
Data unit:	MWh

Description:	Net electricity generated and delivered to the grid by MURAT HEPP in year y
Source of data:	As per readings from electricity meters
Description of measurement methods and procedures to be applied:	Monitored continuously using electricity meters.
Frequency of monitoring/recording:	Hourly measurement and monthly recording
Value applied:	Measured
Monitoring equipment:	Main Electricity meter (<i>ELSTER A 1500 00424740</i>) Spare Electricity meter (<i>ELSTER A 1500 00424741</i>)
QA/QC procedures to be applied:	Two calibrated electricity meters (ammeters) will act as back-up for each other. Maintenance/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. The production year of the meters are 2009 which means that the first calibration was held at factory in 2009. According to the relevant national regulation : Measurement Equipment Inspection Regulation (http://www.mevzuat.adalet.gov.tr/html/21179.html) article 9 (b) says that the mandatory periodical inspection frequency of ; electricity , water and gas measuring instruments (meters) are 10 years"
Calculation method:	N/A
Any comment:	The electricity meters will be in a sealed box. Only authorized TEIAS staff has the right to open and calibrate them.

Data Unit / Parameter:	CapPJ
Data unit:	MW

Description:	Installed Capacity of the hydropower plant after the implementation of the project activity
Source of data:	Name plates of the hydromechanic equipments of the project.
Description of measurement methods and procedures to be applied:	Aggregation of the capacities of each turbine generator sets that are installed in the project power house(s) for electricity generation
Frequency of monitoring/recording:	Annually
Value applied:	37,22 MW
Monitoring equipment:	N/A
QA/QC procedures to be applied:	N/A
Calculation method:	N/A
Any comment:	

Data Unit / Parameter:	APJ
Data unit:	m
Description:	Reservoir water surface area
Source of data:	Water level measurement in the reservoir by means of gauge equipment. And will be monitored by the cam system will set.
Description of measurement methods and procedures to be applied:	Surface area based on the operational water level of the reservoir is 640,471.91 m ² for the elevation of 522,80 m above sea level. Instead of the surface area measurement, reservoir water level will be measured by the gauge equipment and the measured water level will be monitored.
Frequency of monitoring/recording:	Annually
Value applied:	Measured
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	N/A
Any comment:	

4.3 Description of the Monitoring Plan

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

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

1. Electrical Engineers/ Electrical Technicians will undertake the specific actions required by the monitoring plan, i.e. they accompany TEIAS personnel while they measure the monthly electricity supplied to the Turkish National Grid by the power plant.
2. Power House Supervisor will be in charge of providing the electricity sales receipts and monthly recording spreadsheets to the Operations Manager of the plant.
3. General Manager will be the VER coordinator. He will be in charge of:

- a) Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
- b) Communicating and coordinating the monitoring tasks of all business units.
- c) Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of the data obtained from the electrical engineers, technicians and Supervisors. He will also record this operation properly to be able to provide it to the DOE during the verification process.
- d) Calculating and report the emission reductions, and
- e) Organizing in-house seminars to inform and train the company staff to the monitoring procedures.

Please refer to **Figure 142** where the site organizational chart is presented.

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

- Year
- Net electricity supplied by the project activity to the grid (in MWh)
- Annual gross electricity generation(in MWh)
- Annual electricity internal consumption (in MWh)
- Calculation of the emissions reductions: VERs per year (in tCO₂e/yr) produced from the activity of the project

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

Data will be recorded for the entire crediting period and maintained at least 2 years after its end.

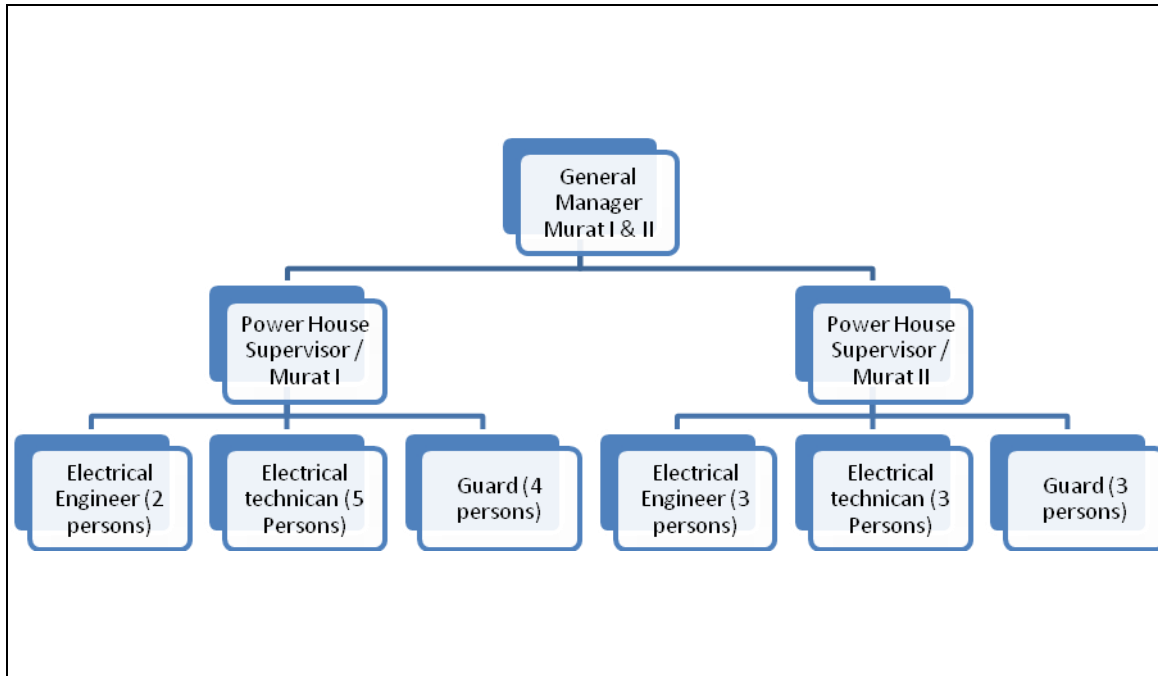


Figure 14: Site Organizational Chart

Measuring

There will be two electricity meters one is main and the other is spare, these two meters are placed at the connection point of the project activity to the grid. These meters will be in a sealed box, and only authorized TEIAS staff are authorized to open.

TEAIS personnel will perform electricity monitoring every month accompanied by an electrical engineer/technician. TEIAS will check the electricity meters' monthly reading and will issue a monthly invoice.

The Electrical Engineers/Technicians will obtain the readings from TEIAS and will report them in a spreadsheet for measurement control and storing the data.

The Electrical Engineers/Technicians will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter's reading and reporting. If new personnel are hired, they will have to follow up a training program and will be trained in the specific skills required to carry out the Monitoring Plan.

5 ENVIRONMENTAL IMPACT

The project will contribute to reduce the adverse effects of climate change by the construction of two Greenfield hydropower plants.

The project activity itself will not have any significant negative impacts on humans, plants, animal life and biodiversity.

According to the Turkish law, an Environmental Impact Assessment (EIA) was not required for hydropower plants with an installed capacity of less than 25MW⁵¹. This requirement was effective for each power house. Please refer to **ANNEX 1** to find the EIA exception certificate.

6 STAKEHOLDER COMMENTS

The stakeholders' consultation meeting was conducted on May 28th 2010 at the Yayla Cafe in Sambayat Town, Besni, Adıyaman Province. This date was chosen, as it was considered to be convenient to all the participants to attend.

An invitation was prepared for the Stakeholder Consultation and sent to the national and local policy makers via e-mail. For the participation of various groups of people to the meeting local head of the villages (Muhtar) and other male locals were asked to attend to the meeting with their spouses.

All invitations sent by email, fax and mail contained a non-technical summary of the project in Turkish (please refer to **ANNEX 3** to find a copy of the non-technical summary). Also these invitations included the contact information of the project consultant Suen Ltd. and all stakeholders invited by the above mentioned means were kindly asked to share their comments about the project.

Apart from the invited local residents by public announcements, the project participant and Suen Engineering and Consultancy Ltd have invited 20 other national and local stakeholders to participate in the meeting and the assessment process. The invited stakeholders were chosen to represent the local policy makers, Non-Governmental Organizations and local people affected by the project.

In addition to the mentioned invitations, two newspaper announcements were made in the regional newspaper Besni Eksen on May 14th and 25th 2010. The mentioned announcements are shown in the following figure:



Figure 15: Newspaper Announcement for the Local Stakeholder Consultation Meeting⁵²

⁵¹ <http://www.mevzuat.adalet.gov.tr/html/27919.html>

⁵² "Besni Eksen"; Date May 14th 2010, page 6

Local stakeholders were interested in the meeting and there were participants even from neighbouring towns. 37 people signed the participants list. (Please refer to

ANNEX 3 to find a copy of the original participants list)

None of the invited local policy makers and Non-Governmental Organizations attended the meeting because of their busy schedules. Local Military commander attended the meeting half way through. There were three Muhtars representing their fellow man.

Although specifically encouraged, there were no women at the meeting, probably because of cultural dynamics in the region. In Turkey's rural regions, men are the dominant part of the family and they are the only ones to decide on family or social affairs. Women, on the other hand are responsible for domestic household tasks such as child rising, cooking etc. As this has been the case for years, there has been a clear-cut discrepancy between the role of man and women in different stages of their lives. Therefore, it seems to have been the task of men to attend the meeting.

All guest were registered followed by a welcome speech by Aynur Sezer (Suen Ltd.), who gave information about the project and global warming.

After all the aspects of the project were presented to the participants, they were discussed by the stakeholders and clarifications were requested.

All the participants were asked to fill out an evaluation form, which included the following questions:

- 1- What is your impression about the meeting?
- 2- What do you like about the project?
- 3- What do you not like about the project?

Some of these evaluations forms are presented below:

 MURAT I ve MURAT II HİDROELEKTRİK SANTRALLERİ PROJESİ PAYDAŞLAR TOPLANTISI KATILIMCI DEĞERLENDİRME FORMU	
Adı Soyadı	Erol ABLAMIS
İmza	
Toplantı hakkındaki izlenimleriniz nelerdir?	
Yeteri kadar bilgilendirilmedi. Ayrıca tarım- laştırılmayan araziimize 2 adet Elektrik direği dikildi. Aramızda su an Buğday ekili ve 2 Hafta içerisinde Hasat olarak halen hasat tespiti yapılmadı. Ayrıca yapılmadı	
Proje ile ilgili neleri beğendiniz?	
Çalıştırılacak tesislerin kendi bakımından olması	
Proje ile ilgili neleri beğenmediniz?	

SUEN Ltd.	
MURAT I ve MURAT II HİDROELEKTRİK SANTRALLERİ PROJESİ PAYDAŞLAR TOPLANTISI KATILIMCI DEĞERLENDİRME FORMU	
Adı Soyadı	MURAT ARICAK
İmza	AR
Toplantı hakkındaki izlenimleriniz nelerdir?	
Hiç birini beğenmedim	
Proje ile ilgili neleri beğendiniz?	
Hiç birini beğenmedim	
Proje ile ilgili neleri beğenmediniz?	

Figure 16: Evaluation forms completed by the stakeholders

All participants were optimistic about the project's positive impact on the economy of the country and global warming. However, some of the people attended the meeting to ask about expropriation issues since at the time of the meeting, there were still some lands which had not been expropriated yet. People were therefore curious about the result of this matter. However, all expropriation matters were underway waiting to be resolved very soon.

One of the main topics at the meeting was related to employment opportunities for the local people. A local participant explained that most of the local people were unemployed and that they needed jobs more than anything else. A representative of the project participant explained that their priority is to employ local people and that they will employ as many as possible. It is expected that approximately 300 people will be employed during construction phase and 30 people during operation phase.

The overall response to the project was encouraging and positive. All the hearings were held in Turkish.



Figure 17: Scenes from the Local Stakeholder Consultation Meeting

Furthermore, a team from Project participant and project consultant firm had an unofficial meeting with Besni city Mayor, Mr. Orhan Mutlu who was not able to attend the meeting and an official meeting with the local military commander. As official state representatives in the region, their ideas were important and their suggestions were taken into consideration.

In addition to these meetings, a team of Suen Ltd. will undertake a second visit to the project area in order to check if there is any concern among people regarding the project. The main purpose is to gather people's ideas and concerns about the project and to clarify any doubts. This tour includes the neighboring towns where there might be locals who were not able to attend the physical meeting. Moreover, when project site is established on the project area, evaluation forms and a notebook will be kept to collect further comments as mentioned during consultation meeting.

ANNEX 1

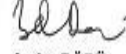
EIA exception certificate

T.C.
ADYAMAN VALİLİĞİ
İL ÇEVRE VE ORMAN MÜDÜRLÜĞÜ

Karar Tarihi : 22/04/2009
Karar No : 29

ÇED GEREKLİ DEĞİLDİR BELGESİ

16 Aralık 2003 tarih ve 25318 sayılı Resmi Gazete'de yayımlanarak yürürlüğe giren Çevresel Etki Değerlendirmesi Yönetmeliği'nin Ek-II listesinde yer alan "Murat HES1(24,08 MW) ve Murat HES2(13,14 MW) Hidroelektrik Santrali " Projesi ile ilgili olarak inceleme değerlendirme yapılmış ve Proje Tanıtım Dosyasında çevresel etkilere karşı alınması öngörülen önlemler yeterli görülmüştür. Ayrıca ÇED Raporu hazırlanmasına gerek bulunmadığı tespit edilmiş olup, söz konusu projeye ÇED Yönetmeliğinin 17. Maddesi gereğince Valiliğimizce "Çevresel Etki Değerlendirilmesi Gerekli Değildir Kararı" verilmiştir.


Aydın BÖRÜ
Vali a.
Vali Yardımcısı

Proje Sahibi : Murat HES Enerji Elektrik Üretim ve Tic.Ltd.Şti.
Projenin Yeri: Adıyaman İli Merkez İlçesi Yeniköy köyünden başlayıp Besni İlçesi umutlu köyüne kadar Göksu çayı üzerinde
(Regülatör: Y:416500 X:4176000)
(Murat HES1: Y:419700 X:4165400)
(Murat HES2: Y:423000 X:4158500)

ANNEX 2

Demonstration that the project has not created another form of environmental credit


MURAT HES
ENERJİ ELEKT. ÜRETİM ve TİC. A.Ş.

13/01/2011, ANKARA

Subject: Declaration that the project has not created another form of environmental credits.

To: Voluntary Carbon Standard (VCS)

Aware of the necessity of avoiding GHG double counting, Murat HEPP Energy Electricity Generation and Trade Inc. Co. declares that:

- 1- The GHG reductions generated by the Murat I and II run-of-river HEPPs project has not been included in any emissions trading program other than the VCS.
- 2- Murat I and II run-of-river HEPPs projects does not take place in a jurisdiction in which bidding limits are established on GHG emissions, and therefore, the emission reductions will not be used for the purpose of demonstrate compliance with binding limits at the project site.

Yours sincerely,


MURAT HES ENERJİ ELEKTİRİM
ÜRETİM VE TİCARET ANONİM ŞİRKETİ
Cinnah C. No: 55/10 Çankaya / ANKARA
Tic. Sic. No: 27090 / Şişli / İSTANBUL
KURUMSAL YERİ: 13/01/2011

Cinnah Caddesi No: 55/10 Çankaya / ANKARA • Tel: (0 312) 441 32 62 Fax: (0 312) 441 33 42

MURAT HES 2 AYLIK TOPLAM ENERJİ ÜRETİMLERİ (MWh)
(2012 YILI PROJEKSİYONU DOĞANKAYA BARAJI OLMADIĞI DURUMDA)

YIL	EKİM	KASIM	ARALIK	OCAK	ŞUBAT	MART	NİSAN	MAYIS	HAZİRAN	TEMMUZ	AĞUSTOS	EYLÜL	TOPLAM		Yük Faktörü
1973	1541.0	1185.9	1089.3	1037.8	1207.6	2523.1	3419.4	1760.8	0.0	0.0	0.0	0.0	13765.4	1147.119	33.65%
1974	1070.6	1411.1	2255.7	3331.8	2753.0	7773.5	7522.7	4341.8	1146.9	0.0	0.0	0.0	31608.1	2834.008	33.88%
1975	1253.4	1488.0	6394.2	5443.6	6279.9	7773.5	7522.7	7773.5	3310.8	1240.2	0.0	998.5	48480.2	4040.854	51.96%
1976	1720.8	1870.4	2245.4	5897.0	8320.3	7773.5	7622.7	7773.5	5070.0	2285.3	1236.6	1842.7	51357.1	4279.76	58.08%
1977	5109.7	5341.8	7773.5	5508.3	7021.2	7773.5	7522.7	7773.5	3752.3	1613.0	0.0	1301.5	61483.4	5124.115	65.82%
1978	2398.9	2383.6	3746.0	7472.2	7021.2	7773.5	7522.7	5883.9	1855.5	915.7	0.0	0.0	47173.2	3931.098	59.67%
1979	1861.3	1838.8	3754.2	7773.5	8449.8	8449.8	5859.0	4304.4	1178.8	0.0	0.0	0.0	39465.4	3288.785	42.31%
1980	1828.1	7522.7	7225.1	8777.5	7076.2	7773.5	7522.7	7773.5	4129.9	1547.7	982.8	1389.5	61630.0	5135.835	68.07%
1981	2440.5	2441.7	4282.1	7773.5	7021.2	7773.5	7522.7	7773.5	5018.5	2284.8	1142.7	1522.4	57007.2	4750.602	61.11%
1982	2511.6	2638.8	7023.6	7773.5	6116.3	7456.0	7522.7	7773.5	3882.6	1279.0	0.0	0.0	53758.6	4479.888	57.83%
1983	1954.7	1952.9	2004.5	2175.8	2751.0	7773.5	7522.7	7773.5	2697.2	0.0	0.0	0.0	36595.8	3048.854	39.23%
1984	2861.7	3981.9	6777.9	5177.4	7272.0	7773.5	7622.7	7349.1	2458.0	970.3	0.0	0.0	52144.5	4345.378	66.90%
1985	1388.2	2400.3	2808.8	3844.0	5988.9	6484.8	7522.7	3726.9	0.0	0.0	0.0	0.0	34082.7	2838.557	37.73%
1986	2407.0	2058.1	2401.9	7773.5	7021.2	6477.7	5141.0	4589.0	2168.5	1278.8	1117.8	0.0	42441.5	3536.791	48.80%
1987	2058.0	2386.5	3321.7	6197.8	5834.2	7773.5	7522.7	7773.5	3251.3	1490.5	0.0	0.0	47388.6	3949.132	60.80%
1988	2010.6	3697.7	7752.4	8724.0	7272.0	7773.5	7522.7	7773.5	4357.9	1928.8	1449.7	1343.3	58604.9	4883.74	62.83%
1989	3589.8	3884.9	5135.8	3917.7	2884.0	4693.2	3150.5	1634.4	0.0	962.5	0.0	0.0	28932.9	2484.409	48.57%
1990	1174.8	3205.8	7773.5	4857.8	7021.2	7773.5	6532.8	3327.4	0.0	0.0	0.0	0.0	40488.4	3372.188	43.38%
1991	1043.6	2437.0	2103.2	1857.7	2507.8	5887.2	8073.5	5023.2	0.0	0.0	0.0	0.0	27033.2	2252.783	37.99%
1992	1018.8	1824.5	4333.9	4212.0	3864.2	7026.4	7522.7	7773.5	3883.4	1032.0	0.0	0.0	42183.4	3516.114	46.29%
1993	1289.4	2186.3	8845.2	4779.0	6219.2	7773.5	7522.7	7773.5	5444.3	2407.4	845.6	1099.7	53294.7	4441.278	67.13%
1994	2022.0	2126.0	2081.6	4303.5	7021.2	7773.5	6689.3	4123.8	896.0	0.0	0.0	0.0	38868.7	3080.561	38.64%
1995	1198.6	2847.2	4130.7	8046.0	8757.0	7773.5	7522.7	7548.1	3004.4	901.5	0.0	0.0	47406.5	3850.553	60.82%
1996	1728.7	3058.5	2404.0	7773.5	7272.0	7773.5	7522.7	7773.5	4308.7	2085.4	1222.2	1510.9	54428.5	4535.711	58.94%
1997	3076.2	2727.2	7773.5	7773.5	8130.3	6212.1	7522.7	7188.8	2576.1	0.0	0.0	0.0	50958.2	4248.518	54.63%
1998	2983.5	5120.5	7124.5	5709.0	7021.2	7773.5	7522.7	7773.5	3887.1	1223.5	0.0	895.8	57134.7	4761.224	61.25%
1999	1771.1	2386.9	7773.5	6153.2	7021.2	7773.5	7522.7	3983.7	1313.4	0.0	0.0	0.0	45886.2	3888.264	48.99%
2000	1220.3	1320.6	1624.8	3445.8	5173.4	7153.3	7522.7	4987.3	0.0	0.0	0.0	0.0	32448.4	2704.032	36.94%
2001	1221.0	1451.8	1687.3	1866.5	1837.2	4303.5	3878.7	3380.2	0.0	0.0	0.0	0.0	19524.1	1827.012	37.81%
2002	0.0	1058.2	7773.5	7773.5	7021.2	7773.5	7522.7	7737.2	3028.7	1200.9	0.0	0.0	50890.4	4240.871	54.66%
2003	1545.3	1703.7	2061.6	2507.8	4325.6	7773.5	7522.7	7022.6	2866.1	0.0	0.0	0.0	37429.6	3118.09	40.12%

TOPLAM	59478.6	82838.3	141242.9	182455.4	173391.8	228137.9	212548.0	188045.3	78222.1	28654.7	8096.3	11683.9	136276.8
ORT.	1918.7	2872.1	4588.2	5240.5	5883.3	7101.2	6886.3	6098.2	2476.6	858.8	281.2	378.9	43981.0

MURAT HES 1 AYLIK TOPLAM ENERJİ ÜRETİMLERİ (MWh)
(2012 YILI PROJEKSİYONU DOĞANKAYA BARAJI OLMADIĞI DURUMDA)

YIL	EKİM	KASIM	ARALIK	OCAK	ŞUBAT	MART	NİSAN	MAYIS	HAZİRAN	TEMMUZ	AĞUSTOS	EYLÜL	TOPLAM	Yük Faktörü	
1973	3688.8	2836.5	2557.4	2482.0	2980.8	6043.4	8204.8	4189.0	0.0	0.0	0.0	0.0	32962.2	2746.851	33.48%
1974	2560.5	3375.9	5401.0	7961.3	6001.5	18933.0	18322.3	10437.2	2743.3	0.0	0.0	0.0	76368.0	8363.838	33.81%
1975	2998.2	3586.0	15474.7	13128.3	12751.3	18933.0	18322.3	18933.0	7042.2	2966.5	0.0	2380.4	117428.0	9785.496	51.68%
1976	4117.2	4476.7	5376.1	14214.3	15319.0	18933.0	18322.3	18933.0	12219.1	5472.1	2055.8	3930.6	124299.2	10388.27	54.71%
1977	12309.9	15357.9	18933.0	13282.3	17100.8	18893.0	18322.3	18933.0	9010.1	3860.1	0.0	3113.2	148158.0	12429.65	66.89%
1978	5744.9	5708.7	8992.3	18171.2	17100.8	18933.0	18322.3	14458.7	4880.7	2189.9	0.0	0.0	114302.5	9525.211	50.31%
1979	4684.3	4840.8	8012.1	18933.0	16658.9	15610.5	13658.8	10348.3	2811.8	0.0	0.0	0.0	95375.8	7947.979	41.88%
1980	4817.0	18322.3	17549.5	16428.7	17216.3	18933.0	18322.3	18933.0	9928.9	3702.9	2350.0	3276.2	149577.1	12484.78	65.84%
1981	5844.9	6848.4	10282.2	18933.0	17100.8	18933.0	18322.3	18933.0	12099.0	5494.9	2733.1	3642.4	138171.1	11514.28	60.82%
1982	6015.8	6322.7	17044.0	18933.0	14825.7	18130.5	18322.3	18933.0	8792.8	3081.4	0.0	0.0	130381.1	10885.1	67.39%
1983	4678.5	4874.8	4788.0	5209.2	6594.8	18933.0	18322.3	18933.0	8438.0	0.0	0.0	0.0	88562.2	7381.851	38.09%
1984	6358.0	8566.8	16429.7	12475.5	17711.5	18933.0	18322.3	17861.3	5887.5	2320.5	0.0	0.0	126386.0	10530.5	55.82%
1985	3320.8	5749.0	8249.5	9471.8	14503.0	15699.7	18322.3	8940.2	0.0	0.0	0.0	0.0	82262.2	6855.161	37.41%
1986	5764.3	4922.3	5752.2	18933.0	17100.8	19482.1	12383.1	11083.0	5194.4	3054.2	2873.4	0.0	102532.8	8544.386	45.13%
1987	4926.3	5987.6	7966.7	14987.8	13627.0	18933.0	18322.3	18933.0	7796.4	3565.8	0.0	0.0	114728.0	9580.865	50.60%
1988	4812.7	8877.8	18870.5	13819.8	17711.5	18933.0	18322.3	18933.0	10480.3	4811.7	3488.1	3213.3	142083.2	11838.8	62.83%
1989	8586.6	9573.8	12373.7	9407.9	8915.4	11282.7	7556.1	3910.8	0.0	2301.8	0.0	0.0	71887.7	5891.475	40.42%
1990	2809.5	7688.6	18933.0	11206.5	17100.8	18933.0	13355.2	7980.5	0.0	0.0	0.0	0.0	98007.3	8167.271	43.14%
1991	2486.0	5837.1	9034.8	4685.8	6009.0	14219.9	14691.5	12098.2	0.0	0.0	0.0	0.0	65072.3	5422.634	38.81%
1992	2436.8	4386.5	10418.0	10121.9	9284.1	17056.0	18322.3	18933.0	8601.1	2468.1	0.0	0.0	102007.8	8500.648	44.80%
1993	3084.2	5258.8	18997.7	11501.8	12601.5	18933.0	18322.3	18933.0	13138.0	5765.3	2281.4	2627.9	129025.0	10752.08	58.79%
1994	4840.1	5090.1	4935.1	10344.0	17100.8	18933.0	18322.3	18933.0	16174.5	8907.2	2071.0	0.0	89395.9	7449.658	39.35%
1995	2882.1	6102.0	9924.4	14609.7	16382.4	18933.0	18322.3	18362.7	7203.0	2155.9	0.0	0.0	114857.5	9571.456	50.85%
1996	4138.7	7328.4	5757.1	18933.0	17711.5	18933.0	18322.3	18933.0	10353.4	4992.1	2923.4	3814.9	131938.9	10894.8	58.07%
1997	7374.7	6535.1	18933.0	18933.0	14880.8	15023.1	18322.3	17402.8	6171.5	0.0	0.0	0.0	123556.0	10298.33	54.38%
1998	7151.2	12342.9	17296.9	13780.8	17100.8	18933.0	18322.3	18933.0	9579.4	2926.6	0.0	0.0	110831.1	9235.928	48.28%
1999	4238.2	5716.7	18933.0	14877.3	17100.8	18933.0	18322.3	18933.0	3141.9	0.0	0.0	0.0	110831.1	9235.928	48.28%
2000	2918.9	3159.2	3867.7	8266.5	12480.3	17388.1	18322.3	12010.5	0.0	0.0	0.0	0.0	78414.5	6534.530	35.86%
2001	2920.6	3473.2	4037.4	3987.5	4637.8	10344.0	9311.8	8108.1	0.0	0.0	0.0	0.0	46820.0	3801.687	37.72%
2002	0.0	2530.9	18933.0	18933.0	17100.8	18933.0	18322.3	18341.2	7263.8	2872.6	0.0	0.0	123730.6	10310.88	54.46%
2003	3697.1	4078.9	4935.1	6006.0	10410.9	18933.0	18322.3	17041.4	7110.5	0.0	0.0	0.0	80533.1	7544.429	38.85%

TOPLAM	142493.8	199014.2	341637.8	383019.1	420682.8	538131.5	516766.0	456662.0	180662.1	83782.4	19385.1	27950.7	3299147.3		
ORT.	4596.2	6419.8	11028.8	12878.8	13570.4	17262.3	16089.8	14785.5	5627.5	2057.6	624.7	901.6	106424.1		

Figure 18 Load Factor

HEPP 1 Average generation: 106424,1
HEPP 2 Average generation: 43961,0

Total Average generation: 150,39
Load factor: % 46

$37,221 * 0,46124 * 8760 = 150,39$

ANNEX 3

LSC additional information

Sayfa 1 / 2

Serkan BAYBO

Kimden: "Sevda ÖZCAN" <sevda@suenltd.com>
Kime: <info@cdmgoldstandard.com>
Bilgi: "Serkan BAYBO" <serkan@suenltd.com>
Gönderme tarihi: 10 Mayıs 2010 Pazartesi 17:04
Ek: MURAT II non tech summary eng.docx
Konu: MURAT II HEPP Stakeholder Invitation/TURKIYE
To Whom It May Concern,

We take pleasure in inviting you to attend to a stakeholder consultation meeting to be held on 28th May 2010 at 02.00 pm at Yayla Cafe in Sambayat Town, Besni, Adıyaman Province, TURKIYE in order to discuss Murat II Hydroelectric Power Plant Project located on the Göksu Stream, Besni Town, Adıyaman Province. We hereby cordially invite you to share your views about the environmental and socio economic benefits and possible impacts of the project. If you have any concern or questions about the proposed establishments in the projects, please attend the meeting in person or please do not hesitate to send your views to the addresses of SUEN Ltd. given below or deliver it by hand at the meeting hall. We also would like to hear your any recommendations in order to assist the contribution to improve the living of the local community.

Murat II Hydroelectric Power Plant Project will be carried out by Murat Hepp Energy Generation and Trade Ltd. We want to ensure that the project is sustainably implemented to the highest standards in relation to social and ecological aspects. Therefore, we have chosen to develop the project in accordance with international climate change rules and United Nations CDM (Clean Development Mechanism) Principles. As part of this process we are consulting with you to ensure that we have taken into account all relevant social and environmental impacts.

SUEN ENGINEERING AND CONSULTANCY Ltd.
Aynur SEZER – Project Coordinator

Adress: Fener Mah. 1964 Sk. Gazez Apt. K:3 D:10 Antalya / TÜRKİYE
Tel. no.: 0242 324 79 60 – 61
Fax no.: 0242 324 79 62
info@suenltd.com

Project Participant:
MURAT HEPP ENERGY GENERATION AND TRADE CO.LTD.

***The non technical summary of the project can be seen in the attachment.**

_____ ESET NOD32 Antivirus Akıllı Güvenlik tarafından sağlanan bilgiler, virüs imza
veritabanı sürümü: 5101 (20100510) _____

İletti ESET NOD32 Antivirus Akıllı Güvenlik tarafından denetlendi.

<http://www.nod32.com.tr>

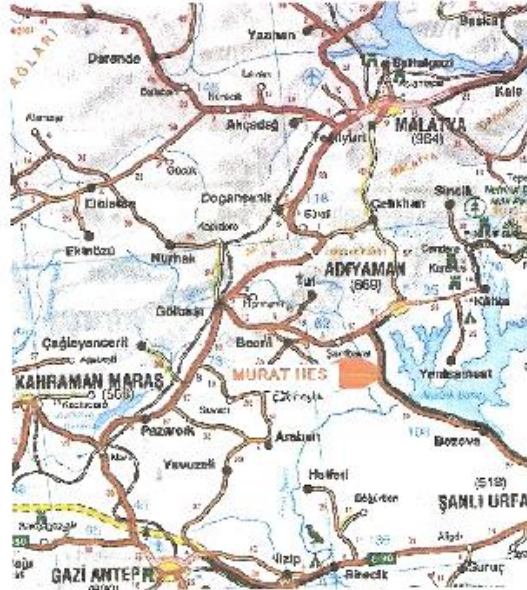
12.05.2010

Figure 19: Sample of the invitation sent to the stakeholders

MURAT I ve MURAT II HİDROELEKTRİK SANTRALLERİ (HES) PROJESİ**TEKNİK OLMAYAN PROJE TASARIM ÖZETİ**

ÖZET BİLGİ		
Proje sahibi	Murat HES Enerji Elektrik Üretim ve Tic. Ltd. Şti.	
Proje Adı	Murat I ve II Hidroelektrik Santralleri	
Yeri	Besni, Adıyaman	
İnşaatın Başlama Tarihi	2010 ikinci çeyreği	
Hedeflenen Toplam Enerji Üretimi	150.38 GWh	
	MURAT HES I	MURAT HES II
Kurulu Güç	27.00 MW	10.44 MW
Toplam Enerji Üretimi	106.42 GWh	43.96 GWh
Enerji Nakil Hattı Uzunluğu	10 km	6 km
Brüt Düşü	58,55 m	24,81 m

Murat HES Projesi, Güneydoğu Anadolu Bölgesi'nde, Adıyaman İli, Besni İlçesi, Göksu Çayı üzerinde yer almaktadır. Göksu Nehri, Nurhak Dağları'ndan doğar ve geniş bir alandan beslenerek bölgenin en önemli akarsuyu Fırat Nehri'ne katılır. Nehrin uzunluğu 150 km'yi bulmaktadır.



Proje kapsamında yapımı önerilen tesisler; regülatör ve çöktürme havuzu, iletim kanalı 1, yükleme havuzu 1, cebri boru 1, Murat HES I santral binası ile iletim kanalı 2, yükleme havuzu 2, cebri boru 2, Murat HES 2 santral binası, kuyruksuyu kanalı ve salt sahasıdır. Göksu Çayı üzerinde 516.00 m talveg kotunda Murat Regülatörü ile toplanan suyun toplam 15002.00 m uzunluğundaki iletim kanalı ile bir-

yükleme havuzuna iletilmesi ve yüklem havuzundan, 135.00 m uzunluğundaki cebri boru ile 454,93 m kuyruksuyu kotunda bulunan Murat HES I santral binasına alınması planlanmaktadır. Santral binasından sonra, toplam 5709.00 m uzunluğundaki iletim kanalı ile yüklem havuzuna aktarılması ve ardından 125.00 m uzunluğundaki cebri boru ile 427,57 m kuyruksuyu kotunda bulunan Murat HES II santral binasına alınması proje kapsamındadır. Bu tesislerle birlikte santralde üretilen elektrik taşımak amacıyla Enerji Nakil Hattı da yapılacaktır.

Kurulu gücün, Murat I Santralinde 27.00 MW, Murat II Santralinde ise 10,44 MW olarak planlandığı projede, yıllık enerji üretimi toplam 150,38 GWh olarak hedeflenmiştir. Çevrilen su, yaklaşık 135m ve 125 m uzunluğundaki boru hatları ile iletilen, türbinlerden geçirilerek potansiyel enerji, elektrik enerjisine dönüştürülecektir. 2010'da başlayacak inşaat çalışmalarının, 2012'de tamamlanması hedeflenmektedir.

İnşaat esnasında ve işletme süresince, iş gücü ihtiyacı, öncelikle bölgeden karşılanacaktır. Böylelikle, bölge için yeni iş imkânları oluşacaktır. Projenin inşaatı esnasında da malzeme, cihaz, gıda ve konaklama gibi ihtiyaçlardan hizmet talebi doğacaktır. Aynı zamanda, proje yüzünden halkın yeniden iskânı gerekemeyecektir.

Murat HES 1 ve HES 2, su gücü ile enerji üreteceği için; kömür veya doğalgaz gibi fosil yakıt kullanılarak üretilen enerjilerin aksine, atmosfere karbondioksit salımları yol açmaz; zararlı sera gazları üretmeyerek hava, toprak, su, başka bir deyişle tüm ekosistemin kalitesinin gelişimine katkıda bulunur. Bu, insan sağlığı ve de gelecek nesiller için bir hayati bir katkıdır. Hedeflenen yıllık üretim ile sağlayacağı CO₂ azaltımı, yaklaşık 92.000 tondur. Proje, Türk yasaları, ilgili Çevre Düzenlemeleri ve CDM (Temiz Kalkınma Mekanizması) ilkeleri ile uyumludur. Tüm ilgili lisanslar için başvurular yapılmıştır. Proje, yerli kaynaklar kullanılması ile aynı zamanda, dışa bağımlılığı da azaltmış olacaktır.

1. Sosyal – Ekonomik Katkıları:

- Proje, inşaat ve işletme esnasında yeni iş imkânları yaratacaktır.
- Proje aynı zamanda, inşaat esnasında malzeme, cihaz, gıda ve konaklama gibi diğer hizmetler için talep oluşturacaktır.
- Murat I ve II HES Projelerine yöre halkına fayda sağlayabilecek herhangi bir konuda, birden fazla sayıda sosyal sorumluluk projesi de dâhil edilebilir. Toplantı esnasında, en fazla faydayı sağlayabileceğini düşündüğünüz sosyal sorumluluk projesi önerilerinizi sizden bekliyoruz. Bu konuda, yöre ve yöre halkının ihtiyaçları doğrultusunda bize fikir vermeniz, en uygun projeyi seçmemiz açısından faydalı olacaktır. Bu projeler ile ilgili kararlar alındığında duyuruları yapılacaktır.

- Proje, elektrik santrallerinde kullanılan diğer kaynaklardan biri olan ve yurt dışından satın aldığımız fosil yakıt tüketiminin azalmasına katkıda bulunarak Türkiye'nin ödemeler dengesini geliştirecek ve ülke için enerji güvenesi yaratacaktır.

2. Çevresel Katkıları:

- Hidroelektrik santralleri, elektriği su enerjisi ile ürettiğinden dolayı, yaşadığımız yöreye ve dünyamıza zarar veren sera gazlarının hiçbirini üretmez ve zararlı atık içermez; bu sayede hava, su ve toprak kalitesinin gelişimine olumlu katkı sağlar.
- Proje, Türk Yasaları, ilgili çevre düzenlemeleri ve CDM (Birleşmiş Milletler Temiz Kalkınma Mekanizması) kriterlerini doğrultusunda yapılmaktadır ve çevre dostudur. Tüm ilgili ruhsatlara başvurular yapılmıştır. İlgili evraklar toplantıda incelenebilir.

3. Diğer Olası Etkiler:

- Hidroelektrik santrallerinde suyu hapseden bir baraj yapısının olmaması sayesinde sadece su alma ve verme noktaları arasında su seviyesi değişikliği yaşanır. Bağlı olduğumuz yasalara göre, bu iki nokta arasında, nehir ekosistemine etki etmeyecek yeterlilikte su geri bırakılacaktır. Akarsuyun hiçbir noktasının kurumasına izin verilmeyecektir.
- İnşaat sırasındaki kazı ve dolgu çalışmaları ile arazi ıslahı sebebi ile mevcut arazinin topografik yapısında değişiklikler olabilir. Kazılardan çıkan artık malzeme, uygun biçimde depolanarak toprağın nehre akmasını engellemek için toprak tutma çalışmalarında veya proje alanında ya da civardaki yolların iyileştirilmesinde kullanılacaktır. Etkilenen alanlar hakkında daha detaylı bilgi toplantıda verilecektir.

Figure 20: Non-technical summary (in original language)

The non-technical summary was sent to the stakeholders together with the invitation letters. Hard copies were also handed out to each participant during the meeting. Please refer to **Annex 4** to find a copy in its original language (Turkish). The English version of the non-technical summary is as follows:

MURAT I-II HYDROELECTRIC POWER PLANT PROJECT NON-TECHNICAL SUMMARY

BRIEF SUMMARY		
Project Owner	Murat HEPP Energy Electricity Production Trade Ltd. Co.	
Project name	Murat HEPP	
Location	Göksu River, Besni Town, Adıyaman Province, Turkey	
Starting date of construction	Second quarter 2010	
Total expected annual electricity production	150.30 GWh	
	MURAT I	MURAT II
Installed capacity	27.00 MW	10.44 MW
Total electricity generation	106.42 GWh	43.96 GWh
Electricity Transmission Line	10 km	6 km
Gross Head	58.55 m	24.81 m

The Murat HEPP Project is located on the Göksu River flowing through Besni, Adıyaman in the Southeastern Region of Turkey. The Göksu River starts from the Nurhak Mountains and by being fed in a large area, it joins the Fırat River, the most considerable river in the region. The length of the Göksu River is roughly 150 km.

The proposed establishments for Murat I are a diversion weir and a sedimentation pool, conveyance canal, fore-bay, penstock, and Murat I HEPP building. The proposed establishments for Murat II are conveyance canal fore-bay, penstock, tail-water canal, power house and Murat II HEPP building.

Water on the river will be diverted by a diversion weir then it will be carried by a 15,002m conveyance canal to a fore-bay. Accumulated water in the fore-bay will be released through 135 m penstock to turbines and therefore electricity will be generated at Murat I HEPP.

Murat I HEPP's tail-water will be carried to a fore-bay through 5,709 m long conveyance canal. Then accumulated water in the fore-bay will be released through 125 m penstock to turbines and therefore electricity will be generated at Murat II HEPP.

Ultimately water will be released to the riverbed.

Generated electricity at both plants will be transmitted to national grid through an energy transmission line.

Murat HEPP Project will not produce any greenhouse gas emissions contributing to air, soil and water quality which is vital for the whole ecosystem and next generations. The estimated total emission reduction amount is approximately 92,000 tonnes CO₂. The Project is in compliance with Turkish Laws, Environmental Regulations and United Nations CDM (Clean Development Mechanism) Principles. All the applications have been completed for the licenses. Moreover contribution of renewable energy by

Murat HEPPs to Turkish National Grid will help decrease dependency on foreign countries due to petrol importation.

1. Socio-economic Development

- No negative socio-economic impacts are expected.
- New employment opportunities and demand for other services such as provision of equipment, food and accommodation will be created during the construction and operation phases.
- The standards of living of the local people will increase due to donations that the company will make in order to improve local facilities.
- A reduction in the importation of fossil fuels will improve the balance of payments for Turkey and improve the energy security of the country.
- The access to electricity for local communities will be improved.
- No resettlements are required as the project is run-of-river type.

2. Environmental Benefits

- Project will not produce any greenhouse gas emissions. Thus, it will contribute to improve the air quality.
- The Project is in compliance with the Turkish Law, Environmental Regulations and United Nations CDM (Clean Development Mechanism). All the applications have been completed for the relevant licenses.

3. Other Possible Impacts

- Changes in water levels in the river: Water levels will only change between the water intake and water outlet points in the river as this is a run-of-river Project and no dams are involved. By law we are required to maintain sufficient levels of water between these two points to ensure that there is no impact on the river ecosystems. At no point will the river be allowed to run dry. In other words, the wild life will have been preserved.
- Changes in the topographical structure due to excavations, fillings, levelling, material removal and reclamation during the construction: During Project implementation, the materials removed from the diggings will be carefully stored and then reused to avoid local waterways being polluted by runoff. Further details about the affected areas will be provided at the meeting.
- The most considerable negative impact of the HEPP projects is the need to cut down trees. However, regarding the physical characteristics of the region there is no need to cut down any.
- All the materials from the excavation area will be used either for landscaping or for improving

the local roads.

It is necessary for us to share your opinions in order to increase the contribution to the local community. We will be pleased to supply further information in this regard.

MURAT I VE MURAT II HİDROELEKTRİK SAĞITILAN PROJESİ
PANDASLAN TOPLANTI
KATILIMCI LİSTESİ
Tarih: 18/05/2010
Yer: Sam Boyat / Adnanmarmar

Adı / Soyadı	Mesleki Toplumal Pozisyon	Bay/Bayan	Tel. No.	İmza
Mehmet Simsek	Alihan	Erkek	0336 823 14 01	[Signature]
Yasas Orluc	Mahlar	Erkek	0544 852 3632	[Signature]
E. H. Deniz	Mahla Nish	Erkek	0532 155 7197	[Signature]
Sahitliq Bekmez	Yatmadan	Erkek	0579 670 69 80	[Signature]
Mahmud Maki	Yatmadan	Erkek		[Signature]
Emel Kulu	Erkek			[Signature]
122600000	Erkek			[Signature]
Mahmud Maki	Erkek		0533 251 0521	[Signature]
Yasas Orluc	Erkek		0532 880 2969	[Signature]
Yasas Orluc	Erkek		0544 246 8002	[Signature]

NEURAT İVE MURAT @ HİDROELEKTRİK SANTRALİ PROJESİ
PİYDAĞLAR TOPLANTISI

KATUNOCI LIBRESA

DATE: 28/05/2010 14:30

we saw by of ADDITION

Adi/Soyadı	Meslek	Toplamsal Pütüryon	Bey/Bayan	Tel No.	İmza
Hadi Çilmece	Sefer		Ereke	0362 760938	<i>[Signature]</i>
H.A.C. Kılıç	Sefer		=	0332 3471128	<i>[Signature]</i>
Zekariyyagilhan	Sefer		Ereke	05439357431	<i>[Signature]</i>
Ali Örsen	Diğer (Soket)		=	0539 5697125	<i>[Signature]</i>
Kenan Duran	Sefer		=	0566 437 6926	<i>[Signature]</i>
Michael Pınar	Çiğir		=	0735 849 1381	<i>[Signature]</i>
Canal Alınoğlu	Çiğir		=	0542 734 1114	<i>[Signature]</i>
Abdül Zengin	E. Çiğir		=	0538 605 7274	<i>[Signature]</i>
Osman Toprak	Sefer		=	0512 414 9239	<i>[Signature]</i>
Aliya Özden	Sefer		=	0304 816 3535	<i>[Signature]</i>

MURAT II HİDROELEKTRİK SANTRALİ PROJESİ

FAYDAŞLAR TOPLANTISI

KATILIMCI LİSTESİ

Tarih: 28/05/2016 19.30

Yer: Şanlıurfa / ADIRANMA

Adı /Soyadı	Meslek	Bay/Bayan	Tel. No.	İmza
Tuncay Aksoy	Kimyacı	Erkek	0506 557 9928	[İmza]
Halil Doğan	Öğretmen	Erkek	0537 561 7045	[İmza]
Erkut Aydın	Çiftçi	Erkek	0542 320 8873	[İmza]
Engel Özcan	Çiftçi	Erkek	0544 860 0666	[İmza]
M. Ali Simsek	Çiftçi	Erkek	0542 414 8601	[İmza]
Mehmet Arıcanlı	Çiftçi	Erkek	0568 315 1440	[İmza]
Ednan Aydın	Çiftçi	Erkek	-	[İmza]
Abdulkadir Yıldırım	Çiftçi	Erkek	0537 518 50233	[İmza]
İsmail Aksoy	Çiftçi	Erkek	0537 289 4752	[İmza]
Bayram Güler	Çiftçi	Erkek	0544 846 5838	[İmza]

MURAT IYE MURAT II HİDROELEKTRİK SANTRALİNİN PROJESİ

PANDASAR TOPLANTISI

KATILIMCI LİSTESİ

Tarih: 23/05/2010 14:23

Yer: Sarıyerat/ADIRMANCI

Adı / Soyadı	Meslek	Bay/Bayan	Tel. No.	İmza
Emel Ağlayan	İşçi	Bay	0542 285 20 65	[Signature]
Fedime Çakır	Çiftçilik	Bay	0 308 282 6532	[Signature]
Muhammed Selim	Çiftçilik	Bay	0522 234 9738	[Signature]
Mehmet Korkmaz	Çiftçilik	=	0305 601 4662	[Signature]
Seydi Dönel	Çiftçilik	=	0544 716 6863	[Signature]
Mehmet Celal	Proje uzmanı	Bay	515 36002	[Signature]
Sakir Baydar	Denetman	BAY	542 332 1816	[Signature]
Aliye Sarı	Denetman	Bayan	0242 5247368	[Signature]

Figure 21: Original participants list

BASELINE INFORMATION

Generation units put into operation in 2010

NO	PLANT NAME	INSTALLED POWER MW	GENERATION GWh	FUEL TYPE	START DATE
1	KIRKA BORAKS (Kırka)	18,2	120	FUELOIL	29.09.2010
2	TÜPRAŞ (İzmit-Yarımca)	85	550	FUELOIL	15.12.2010
3	ETİ SODA	24	144	LIGNITE	22.01.2010
4	AKBAŞLAR	10,2	80	N.GAS	18.02.2010
5	ALTINMARKA	8,2	66	N.GAS	28.01.2010
6	CAN TEKSTİL (Çorlu)	13	100	N.GAS	28.01.2010
7	FLOKSER TEKSTİL (ÇERKEZKÖY)	5,2	42	N.GAS	17.07.2010
8	FRİTOLEY GIDA	0,6	4	N.GAS	26.11.2010
9	INTERNATIONAL HOSPITAL (İstanbul)	0,8	6	N.GAS	31.12.2010
10	KURTOĞLU BAKIR KURŞUN	1,6	12	N.GAS	19.08.2010
11	KESKİNOĞLU TAVUKÇULUK	3,5	25	N.GAS	11.08.2010
12	MARMARA PAMUK	69,9	543	N.GAS	25.11.2010
13	POLYPLEX EUROPA	7,8	61	N.GAS	16.12.2010
14	RB KAREŞİ TEKS. (BURSA)	8,6	65	N.GAS	23.07.2010
15	ATAER ENERJİ (EBSO)	119,2	676	NAPHTA	05.05.2010
16	ALARKO ALTEK	164	1134	N.GAS	18.12.2010
17	ALİAĞA Çakmaktepe Enerji	104,7	836,4	N.GAS	26.11.2010
18	BİNATOM ELEKTRİK ÜRT. A.Ş.	2,0	13	N.GAS	17.08.2010
19	CAN ENERJİ ELEK. Ü. A.Ş. (TEKİRDAĞ)	29,1	203	N.GAS	19.08.2010
20	CENGİZ ENERJİ (Tekkeköy/SAMSUN)	203,9	1604	N.GAS	31.07.2010
21	ENERJİ-SA (Bandırma)	930,8	7540	N.GAS	07.10.2010
22	GLOBAL ENERJİ (PELİTLİK)	23,8	181,7	N.GAS	26.02.2010
23	RASA ENERJİ (VAN)	114,9	731	N.GAS	29.12.2010
24	SÖNMEZ ELEKTRİK	70,7	545,1	N.GAS	07.12.2010
25	UĞUR ENERJİ (TEKİRDAĞ)	60,2	506	N.GAS	07.10.2010
26	AKSA ENERJİ (Antalya)	850	6545	N.GAS	01.07.2010

27	ITC-KA ENERJİ SINCAN	4,2	33	WASTE	30.04.2010
28	ITC-KA ENERJİ ADANA (BIYOKÜTLE)	9,9	80	WASTE	02.09.2010
29	CEV EN.(GAZİANTEP ÇÖP)	1,1	8,6	WASTE	01.02.2010
30	ORTADOĞU ENERJİ (Oda yeri)	16,9	132,8	WASTE	24.02.2010
31	EREN ENERJİ ELEK.Ü.R.A.Ş.	1360	9.080	IMPORTED COAL	29.12.2010
32	AKIM (CEVİZLİK HES)	91,4	187	HYDRO	28.05.2010
33	ASA EN.(KALE REG.)	9,6	18	HYDRO	19.02.2010
34	BAYBURT HES	14,6	24	HYDRO	28.01.2010
35	ALAKIR (YURT EN.)	2,1	4	HYDRO	29.01.2010
36	BEYTEK(ÇATALOLUK HES)	9,5	17	HYDRO	07.04.2010
37	BİRİM (ERFELEK HES)	6,5	11	HYDRO	14.05.2010
38	BULAM	7	19	HYDRO	10.08.2010
39	BURÇBENDİ (AKKUR EN.)	27,3	64	HYDRO	04.11.2010
40	CEYHAN HES (BERKMAN HES-ENOVA)	25,2	58	HYDRO	28.08.2010
41	CEYHAN HES (OŞKAN HES- ENOVA)	23,9	55	HYDRO	03.06.2010
42	CİNDERE DENİZLİ	28,2	50	HYDRO	21.01.2010
43	ÇAKIT HES	20,2	54	HYDRO	01.06.2010
44	ÇAMLIKAYA	5,6	11	HYDRO	30.06.2010
45	DAMLAPINAR(CENAY ELEK.)	16,4	52	HYDRO	08.07.2010
46	DİM HES (DİLER ELEK.)	38,3	70	HYDRO	08.07.2010
47	DİNAR HES (ELDA ELEK.)	4,4	9	HYDRO	03.07.2010
48	DOĞUBAY ELEK.(SARIMEHMET HES)	3,1	6	HYDRO	11.03.2010
49	EGEMEN 1 HES (ENERSİS ELEK.)	19,9	41	HYDRO	28.12.2010
50	ERENLER REG.(BME BİRLEŞİK EN.)	45	48	HYDRO	04.06.2010
51	ERENKÖY REG.(TÜRKERLER)	21,5	49	HYDRO	07.10.2010
52	ERİKLİ - AKOCAK REG.(AK EN.)	82,5	146	HYDRO	29.07.2010
53	FEKE 2 (AKKUR EN.)	69,3	126	HYDRO	24.12.2010
54	FIRTINA ELEK.(SÜMER HES)	21,6	39	HYDRO	16.04.2010
55	GÖK HES	10	24	HYDRO	06.08.2010
56	GÜDÜL I (YAŞAM EN.)	2,4	8	HYDRO	25.08.2010
57	GÜZELÇAY-I HES(İLK EN.)	8,1	24	HYDRO	11.11.2010

58	HETAŞ HACISALİHOĞLU (YILDIZLI HES)	1,2	3	HYDRO	23.02.2010
59	HİDRO KONTROL (SELİMOĞLU HES)	8,8	20	HYDRO	07.01.2010
60	KAHRAMAN REG.(KATIRCIOĞLU ELEK.)	1,4	3	HYDRO	30.09.2010
61	KAHTA I HES(ERDEMYILDIZ ELEK.)	7,1	20	HYDRO	14.10.2010
62	KALE HES	34,1	66	HYDRO	16.06.2010
63	KALKANDERE-YOKUŞLU HES(AKIM EN.)	14,5	36	HYDRO	30.12.2010
64	KARADENİZ ELEK.(UZUNDERE I HES)	62,2	93	HYDRO	07.11.2010
65	KAR-EN KARADENİZ ELEK.(ARALIK HES)	12,4	32	HYDRO	30.04.2010
66	KARŞIYAKA HES (AKUA EN.)	1,6	5	HYDRO	28.08.2010
67	KAYABÜKÜ HES (ELİTE ELEK.)	14,6	28	HYDRO	21.07.2010
68	ÖZGÜR ELEKTR. KİRPİLİK HES	6,2	13	HYDRO	11.07.2010
69	KOZAN HES (SER-ER EN.)	4	5	HYDRO	21.09.2010
70	KULP IV HES (YILDIZLAR EN.)	12,3	23	HYDRO	13.01.2010
71	MURGUL BAKIR	24,2	39	HYDRO	11.11.2010
72	NARINKALE HES (EBD EN.)	3,1	6	HYDRO	30.09.2010
73	NİSAN EN.(BAŞAK HES)	6,9	12	HYDRO	09.04.2010
74	NURYOL EN.(DEFNE HES)	7,2	13	HYDRO	26.03.2010
75	ÖZGÜR ELEKTR.AZMAK II	6,3	11	HYDRO	01.04.2010
76	PAŞA HES(ÖZGÜR EL.)	8,7	19	HYDRO	11.06.2010
77	PETA EN. (MURSAL II HES)	4,5	11	HYDRO	19.02.2010
78	REŞADIYE I HES(TURKON MNG EL.	15,7	71	HYDRO	26.11.2010
79	REŞADIYE II HES(TURKON MNG EL.	26,1	119	HYDRO	17.09.2010
80	SABUNSUYU II HES (ANG EN.)	7,4	12	HYDRO	28.10.2010
81	SELEN EL.(KEPEZKAYA HES)	28	70	HYDRO	06.09.2010
82	TEKTUĞ-ANDIRIN	40,5	60	HYDRO	03.09.2010
83	UZUNÇAYIR	82	182	HYDRO	11.04.2010
84	YEDİGÖZE HES	155,3	268	HYDRO	02.12.2010

85	YAVUZ HES (MASAT EN.)	22,5	47	HYDRO	14.07.2010
86	ULUABAT KUVVET TÜN.(AK EN.)	97	210	HYDRO	25.11.2010
87	ALİZE ENERJİ (KELTEPE)	20,7	62	WIND	28.04.2010
88	AKDENİZ ELEK. MERSİN RES	33	50	WIND	19.03.2010
89	ASMAKİNSAN (BANDIRMA-3 RES)	24	45	WIND	26.03.2010
90	BAKRAS ELEK.ŞENBÜK RES	15	40	WIND	22.04.2010
91	BELEN HATAY	36	70	WIND	02.09.2010
92	BERGAMA RES (ALİAĞA RES)	90	302	WIND	16.06.2010
93	BORASKO BANDIRMA	57	143	WIND	30.06.2010
94	BOREAS EN.(ENEZ RES)	15	42	WIND	09.04.2010
95	MAZI 3	30	80	WIND	18.06.2010
96	KUYUCAK (ALİZE ENER.)	25,6	94	WIND	09.12.2010
97	ROTOR (OSMANİYE RES-GÖKÇEDAĞ RES)	135	435	WIND	15.10.2010
98	SARES (GARET ENER.)	15	51	WIND	22.12.2010
99	SEBENOBA (DENİZ ELEK.)SAMANDAĞ	30	96	WIND	12.03.2010
100	SOMA RES	79,2	200	WIND	20.08.2010
101	SOMA RES (BİLGİN ELEK.)	90	261	WIND	11.11.2010
102	TURGUTTEPE RES (SABAŞ ELEK.)	22	55	WIND	30.12.2010
103	ÜTOPYA ELEKTRİK	30	60	WIND	03.09.2010
104	ZİYARET RES	35	119	WIND	13.10.2010
105	MENDERES JEOTERMAL DORA-2	9,5	73	GEOTHERMAL	26.03.2010
106	TUZLA JEO.	7,5	55	GEOTHERMAL	13.01.2010
	RENEWABLES (HYDRO + WIND)	606.80	1,106	1,106,000	
	IMPORTED COAL	1,360	9080	9,080,000	
	LIGNITE	24	144	144,000	
	N.GAS	1,254.1	10081	10,081,000	
	CDM REGISTERED PROJECTS AND CAPACITY ADDITIONS TO EXISTING PLANTS ARE EXCLUDED				

Generation units put into operation in 2009

NO	PLANT NAME	INSTALLED POWER MW	GENERATION GWh	Fuel Type	START DATE
1	KISIK	9,60	20,00	HYDRO	2009
2	OBRUK I-II	212,40	337,00	HYDRO	2009
3	ALIAĞA PETKİM	222,00	1.554,00	FUELOIL	2009
4	SÜPER FİLM (G.Antep)	25,30	203,00	FUELOIL	2009
5	TİRE-KUTSAN (Tire)	8,00	37,00	FUELOIL	2009
6	ALKİM (ALKALİ KİMYA) (Konya)	0,40	3,00	LIGNITE	2009
7	AKGIDA PAMUKOVA	7,50	61,00	N.GAS	2009
8	MAURİ MAYA	2,30	19,00	N.GAS	2009
9	ÇELİKLER RIXOS ANKARA	2,00	16,00	N.GAS	2009
10	DALSAN ALÇI	1,20	9,00	N.GAS	2009
11	ERDEMİR	117,60	710,00	N.GAS	2009
12	KASAR DUAL TEKSTİL ÇORLU	5,70	38,00	N.GAS	2009
13	MARMARA PAMUK	43,70	340,00	N.GAS	2009
14	NUH ENERJİ 2 (Nuh Çimento)	120,00	840,00	N.GAS	2009
15	SELKASAN	9,90	73,00	N.GAS	2009
16	TAV İSTANBUL	9,80	82,00	N.GAS	2009
17	TESKO KİPA İZMİR	2,30	18,00	N.GAS	2009
18	TÜPRAŞ ALIAĞA	24,70	170,00	N.GAS	2009
19	CARGILL TARIM	0,10	0,70	BIOGAS	2009
20	ARENKO DENİZLİ	12,00	84,00	N.GAS	2009
21	AKSA AKRİLİK KİMYA (YALOVA)	70,00	539,00	N.GAS	2009
22	BİL ENERJİ (Ankara)	36,60	255,00	N.GAS	2009
23	EGE BİRLEŞİK ENERJİ	12,80	107,00	N.GAS	2009
24	CAM İŞ ELEKTRİK (Mersin)	252,20	2.016,00	N.GAS	2009
25	DELTA ENERJİ	60,00	467,00	N.GAS	2009
26	DESA ENERJİ	9,80	70,00	N.GAS	2009
27	GLOBAL ENERJİ (PELİTLİK)	20,30	155,00	N.GAS	2009
28	GÜL ENERJİ	24,30	170,00	N.GAS	2009
29	KEN KİPAŞ KAREN ELEKTRİK	41,80	180,00	N.GAS	2009
30	FALEZ ELEKTRİK	11,70	88,00	N.GAS	2009
31	MANİSA O.S.B.	84,80	434,00	N.GAS	2009

32	MAKSİ ENERJİ	7,70	55,00	N.GAS	2009
33	MODERN ENERJİ	96,80	680,00	N.GAS	2009
34	HABAŞ (Aliağa)	224,50	1.796,00	N.GAS	2009
35	HAYAT KAĞIT SAN.	7,50	56,00	N.GAS	2009
36	RASA ENERJİ VAN	78,60	500,00	N.GAS	2009
37	SÖNMEZ ELEKTRİK	34,90	269,00	N.GAS	2009
38	ŞAHİNLER ENERJİ(ÇORLU/TEKİRDAĞ)	26,00	185,00	N.GAS	2009
39	YURT BAY (Eskişehir)	6,90	50,00	N.GAS	2009
40	ZORLU ENERJİ (B. Karşıran)	115,30	920,00	N.GAS	2009
41	ESKİŞEHİR ENDÜSTRİ ENERJİ(OSB)	59,00	452,00	N.GAS	2009
42	AKSA ENERJİ (Antalya)	800,00	6.160,00	N.GAS	2009
43	AKSA ENERJİ (Manisa)	115,30	913,00	N.GAS	2009
44	ITC-KA ENERJİ MAMAK	22,60	170,00	WASTE	2009
45	ITC-KA ENERJİ SİNCAN	2,80	22,00	WASTE	2009
46	ORTADOĞU ENERJİ (Oda yeri)	12,70	100,00	WASTE	2009
47	ORTADOĞU ENERJİ (KÖMÜRCÜODA)	5,80	45,00	WASTE	2009
48	SİLOPİ ASFALTİT	135,00	945,00	ASPHALTİT	2009
49	HABAŞ (Bilecik)	18,00	144,00	FUELOIL	2009
50	HABAŞ (İzmir)	36,00	288,00	FUELOIL	2009
51	SİLOPİ ELEKT.ÜRETİM ESENBOĞA	44,80	315,00	FUELOIL	2009
52	İÇDAŞ ÇELİK	405,00	2.885,00	COAL	2009
53	AKÇAY	28,80	45,00	HYDRO	2009
54	ANADOLU ÇAKIRLAR	16,20	28,00	HYDRO	2009
55	CEYKAR BAĞIŞLI	29,60	47,00	HYDRO	2009
56	BEREKET (KOYULHİSAR)	42,00	155,00	HYDRO	2009
57	BEYOBASI (SIRMA)	5,90	11,00	HYDRO	2009
58	AKUA KAYALIK	5,80	20,00	HYDRO	2009
59	CİNDERE DENİZLİ	19,10	30,00	HYDRO	2009
60	DEĞİRMENÜSTÜ (KAHRAMANMARAŞ)	38,60	52,00	HYDRO	2009
61	DENİZLİ EGE 1	0,90	2,00	HYDRO	2009
62	ELESTAŞ YAYLAL	5,10	10,00	HYDRO	2009
63	ELESTAŞ YAZI	1,10	3,00	HYDRO	2009
64	ERVA KABACA HES	8,50	15,00	HYDRO	2009
65	FİLYOS YALNIZCA HES	14,40	33,00	HYDRO	2009
66	KALEN ENER. (KALEN I-II)	31,30	47,00	HYDRO	2009

67	KAREL (PAMUKOVA)	9,30	40,00	HYDRO	2009
68	KAYEN KALETEPE HES	10,20	17,00	HYDRO	2009
69	TGT EN. LAMAS III-IV	35,70	71,00	HYDRO	2009
70	ÖZGÜR ELEKTR.AZMAK II	24,40	43,00	HYDRO	2009
71	ÖZTAY GÜNAYŞE	8,30	14,00	HYDRO	2009
72	ÖZYAKUT GÜNEŞLİ HES	1,80	4,00	HYDRO	2009
73	SARITEPE HES DİNAMİK	4,90	9,00	HYDRO	2009
74	ŞİRİKÇİOĞLU KOZAK	4,40	7,00	HYDRO	2009
75	TAŞOVA YENİDEREKÖY	2,00	6,00	HYDRO	2009
76	TEKTUĞ-ERKENEK	12,50	30,00	HYDRO	2009
77	TURKON MNG REŞADİYE III	22,30	88,00	HYDRO	2009
78	UZUNÇAYIR	27,30	49,00	HYDRO	2009
79	YEŞİLBAŞ	14,00	26,00	HYDRO	2009
80	YAPISAN KARICA DARICA	97,00	154,00	HYDRO	2009
81	YPM GÖLOVA	1,10	2,00	HYDRO	2009
82	YPM SEVİNDİK	5,70	18,00	HYDRO	2009
83	YURT EN. TOCAK I	4,80	6,00	HYDRO	2009
84	TÜM EN. PINAR	30,10	65,00	HYDRO	2009
85	ALİZE ENERJİ (ÇAMSEKİ)	20,80	70,00	WIND	2009
86	ALİZE ENERJİ (KELTEPE)	18,90	55,00	WIND	2009
87	ALİZE ENERJİ (SARIKAYA ŞARKÖY)	28,80	82,00	WIND	2009
88	AK ENERJİ AYYILDIZ (BANDIRMA)	15,00	44,00	WIND	2009
89	AYEN ENERJİ (AKBÜK)	31,50	104,00	WIND	2009
90	BELEN HATAY	30,00	81,00	WIND	2009
91	BORASKO BANDIRMA	45,00	152,00	WIND	2009
92	MAZI 3	22,50	67,00	WIND	2009
93	KORES KOCADAĞ	15,00	48,00	WIND	2009
94	ROTOR OSMANİYE	57,50	185,00	WIND	2009
95	BAKİ ELEKTRİK ŞAMLI RÜZGAR	90,00	375,00	WIND	2009
96	DATÇA RES	29,60	71,00	WIND	2009
97	SAYALAR RÜZGAR (DOĞAL ENERJİ)	34,20	100,00	WIND	2009
98	SOMA RES	45,00	127,00	WIND	2009
99	ÜTOPYA ELEKTRİK	15,00	39,00	WIND	2009
100	GÜRMAT EN.	47,40	313,00	GEOTHERM AL	2009

		MW	GWh/year	MWh/year	
	RENEWABLES (WIND-HYDRO-G.THER- WASTE-BIOGAS)	501,50	1.279,70	1.279.700,00	
	ASPHALTIT	135,00	945,00	945.000,00	
	FUELOIL	354,10	2.541,00	2.541.000,00	
	LIGNITE	0,40	3,00	3.000,00	
	N.GAS	936,20	6.654,00	6.654.000,00	
CDM REGISTERED PROJECTS AND CAPACITY ADDITIONS TO EXISTING PLANTS ARE EXCLUDED					

Generation units put into operation in 2008

NO	PLANT NAME	INSTALLED POWER MW	GENERATION MWh	FUEL TYP
1	MB ŞEKER NİŞASTA SAN. A.Ş. (Sultanhanı)	8,8	0	N.GAS
2	AKSA ENERJİ (Antalya)	183,8	133.736	N.GAS
3	AKSA ENERJİ (Manisa)	52,38	79.183	N.GAS
4	ANTALYA ENERJİ (İlave)	17,46	256.120	
5	ATAÇ İNŞAAT SAN. A.S.B.(ANTALYA)	5,4	10	N.GAS
6	BAHÇIVAN GIDA (LÜLEBURGAZ)	1,165	0	N.GAS
7	CAN ENERJİ (Çorlu-TEKİRDAĞ) (İlave)	52,38	274.260	
8	FOUR SEASONS OTEL (ATİK PASHA TUR.A.Ş)	1,165	0	N.GAS

9	FRITOLAY GIDA SAN.VE TİC.AŞ.(İlave)	0,06	0	
10	ITC-KA Enerji Üretim A.Ş.(Mamak)(İlave)	14,13	95.832	
11	KARKEY(SİLOPI-5) (154 kV) (İlave)	14,78	16.362	
12	MELİKE TEKSTİL (GAZİANTEP)	1,584	0	N.GAS
13	MİSİS APRE TEKSTİL BOYA EN. SAN.	2	5.324	N.GAS
14	MODERN ENERJİ (LÜLEBURGAZ)	13,4	508.942	N.GAS
15	ORTADOĞU ENERJİ (ODA YERİ) (Eyüp/İST.)	2,83	0	WASTE
16	POLAT TURZ. (POLAT RENAISSANCE İST.OT.)	1,6	490	N.GAS
17	SARAYKÖY JEOTERMAL (Denizli)	6,85	14.099	GEO
18	YILDIZ SUNTA (Uzunçiftlik- Köseköy)(Düzeltilme)	22,63	136.018	N.GAS
19	SÖNMEZ Elektrik (İlave)	8,73	61	
20	AKKÖY ENERJİ (AKKÖY I HES)	101,94	21.608	HYDRO
21	ALP ELEKTRİK (TINAZTEPE) ANTALYA	7,689	9.245	HYDRO
22	CANSU ELEKTRİK (Murgul/ARTVİN)	9,18	12.518	HYDRO
23	ÇALDERE ELK.(ÇALDERE HES)Dalaman-MUĞLA	8,74	11.153	HEPP
24	DAREN HES ELKT. (SEYRANTEPE BARAJI VE HES)	49,7	14.370	HYDRO
25	DEĞİRMENÜSTÜ EN. (KAHRAMANMARAŞ)	25,7	0	HEPP
26	GÖZEDE HES (TEMSA ELEKTRİK) BURSA	2,4	6.107	HYDRO

27	H.G.M. ENERJİ (KEKLİCEK HES) (Yeşilyurt)	8,674	120	HYDRO
28	HAMZALI HES (TURKON MNG ELEKTRİK)	16,7	2.934	HEPP
29	HİDRO KNT.(YUKARI MANAHOZ REG.VE HES)	22,4	13.772	HYDRO
30	İÇ-EN ELK.(ÇALKIŞLA REGÜLATÖRÜ VE HES)	7,66	3.364	HYDRO
31	KALEN ENERJİ (KALEN II REGÜLAT. VE HES)	15,65	10.281	HYDRO
32	MARAŞ ENERJİ (FIRNIS REGÜLATÖRÜ VE HES)	7,22	0	HYDRO
33	SARMAŞIK I HES (FETAŞ FETHİYE ENERJİ)	21,04	1.472	HYDRO
34	SARMAŞIK II HES (FETAŞ FETHİYE ENERJİ)	21,58	1.221	HYDRO
35	TORUL	105,6	18.551	HYDRO
36	YEŞİL ENERJİ ELEKTRİK (TAYFUN HES)	0,82	0	HYDRO
37	ZORLU ENERJİ (MERCAN) (Düzelme)	1,275	22.828	HEPP
38	BAKİ ELEKTRİK ŞAMLI RÜZGAR	21	60.943	WIND
39	DATÇA RES (Datça)	8,1	3.778	WIND
40	ERTÜRK ELEKTRİK Çatalca RES	60	65.961	WIND
41	İNNORES ELK YUNTDAĞ RÜZG. (Aliağa)	42,5	98.058	WIND
42	LODOS RES (Taşoluk)(G.O.P./İSTANBUL)	24	25.714	WIND
43	SAYALAR RÜZGAR (Doğal Enerji)	30,6	53.925	WIND
44	SEBENOBA (DENİZ ELK.) (Samandağ- HATAY)	31,2	46.919	WIND

		MW	MWh/year	
	N.GAS	271,29	727.685,00	
	RENEWABLES (WASTE - GEOTHERMAL- HYDRO)	391,23	126.728,00	
CDM REGISTERED PROJECTS AND CAPACITY ADDITIONS TO EXISTING PLANTS ARE EXCLUDED				

Generation units put into operation in 2007

NO	PLANT NAME	INSTALLED POWER (MW)	GENERATION (GWh)	FUEL TYPE
1	MOBİL TOPLAM	-462,30		
2	HABAŞ (Aliağa-ilave)	9,10	1.796,00	N.GAS
3	BOSEN	-123,50		N.GAS
4	MODERN ENERJİ	5,20	650,00	N.GAS
5	ARENKO	0,70	101,00	N.GAS
6	ALTINMARKA GIDA	0,10	29,00	N.GAS
7	TEKBOY ENERJİ	0,10	16,00	N.GAS
8	VELSAN AKRİLİK	0,10	0,00	N.GAS
9	AKBAŞLAR	-0,10		N.GAS
10	ORS RULMAN	-0,30		N.GAS
11	Acıbadem Sağlık Hiz.ve Tic.A.Ş.(Kadıköy Hast.)(İstanbul/Kadıköy)	0,50	4,00	N.GAS
12	Acıbadem Sağlık Hiz.ve Tic.A.Ş.(Kozyatağı Hast.)(İstanbul/Kadıköy)	0,60	5,00	N.GAS
13	Acıbadem Sağlık Hiz.ve Tic.A.Ş.(Nilüfer/BURSA)	1,30	11,00	N.GAS
14	AKATEKS Tekstil Sanayi ve Ticaret A.Ş.	1,80	14,00	N.GAS
15	FLOKSER TEKSTİL SAN.AŞ.(Çatalca/İstanbul)(Poliser Tesisi)	2,10	17,00	N.GAS
16	FLOKSER TEKSTİL SAN.AŞ.(Çatalca/İstanbul)(Süetser Tesisi)	2,10	17,00	N.GAS

17	FRİTOLAY GIDA SAN.VE TİC. AŞ.	0,50	4,00	N.GAS
18	KIVANÇ TEKSTİL SAN.ve TİC.A.Ş.	3,90	33,00	N.GAS
19	KİL-SAN KİL SAN.VE TİC. A.Ş	3,20	25,00	N.GAS
20	SÜPERBOY BOYA SAN.ve Tic.Ltd.Şti.(Büyükçekmece/İstanbul)	1,00	8,00	N.GAS
21	SWİSS OTEL(Anadolu Japan Turizm A.Ş (İstanbul)	1,60	11,00	N.GAS
22	TAV Esenboğa Yatırım Yapım ve İşetme AŞ./ANKARA	3,90	33,00	N.GAS
23	STARWOOD	-17,30		N.GAS
24	NUH ENERJİ-2(Nuh Çim.)	73,00	514,00	N.GAS
25	KAREN	-24,30		FUELOIL
26	AKTEKS	1,80	14,00	FUELOIL
27	TÜPRAŞ İZMİT RAFİNERİ	-0,90		FUELOIL
28	AKBAŞLAR	-3,80		FUELOIL
29	UŞAK ŞEKER (NURİ ŞEKER)	1,70		LIGNITE
30	BOR ŞEKER	-0,60		LIGNITE
31	SUSURLUK ŞEKER	-0,60		LIGNITE
32	AFYON ŞEKER	-0,80		GASOIL
33	AĞRI ŞEKER	-1,00		GASOIL
34	ALPULLU ŞEKER	-0,90		GASOIL
35	BURDUR ŞEKER	-0,80		GASOIL
36	ÇARŞAMBA ŞEKER	-0,80		GASOIL
37	ÇORUM ŞEKER	-0,80		GASOIL
38	ELAZIĞ ŞEKER	-0,50		GASOIL
39	ELBİSTAN ŞEKER	-0,80		GASOIL
40	ERCİŞ ŞEKER	-0,80		GASOIL
41	EREĞLİ ŞEKER	-0,80		GASOIL
42	KASTAMONU ŞEKER	-0,20		GASOIL
43	KÜTAHYA ŞEKER (BAHA ESAD TEKAND)	-0,70		GASOIL
44	MALATYA ŞEKER	-0,50		GASOIL
45	BOĞAZLIYAN ŞEKER	16,40		N.GAS
46	KARTONSAN ilave	24,00	192,00	N.GAS
47	ESKİŞEHİR END.ENERJİ	3,50		N.GAS
48	ESKİŞEHİR ŞEKER (KAZIM TAŞKENT)	2,90		N.GAS
49	İGSAŞ	2,20	76,00	N.GAS
50	DESA ilave	0,70	70,00	NAPHTA
51	DENTAŞ ilave	0,30	38,00	NAPHTA
52	SÜPER FİLMCİLİK ilave	0,10	203,00	N.GAS

53	ATAER ENERJİ ilave	0,10	398,00	NAPHTA
54	BİL ENERJİ ilave	0,10	255,00	N.GAS
55	EDİP İPLİK	-0,10		N.GAS
56	EGE BİRLEŞİK ENERJİ	-0,30		LPG
57	İSKO	-1,80		N.GAS
58	ITC-KA Enerji Üretim AŞ.(Mamak)(İlave)	1,40	45,00	BIOGAS
59	BİS Enerji Üretim AŞ.(Bursa)(İlave)	43,00		N.GAS
60	Aliağa Çakmaktepe Enerji A.Ş.(Aliağa/İZMİR)	34,80	278,00	N.GAS
61	BİS Enerji Üretim AŞ.(Bursa)(Düzeltilme))	28,30	3.383,00	N.GAS
62	BİS Enerji Üretim AŞ.(Bursa)(İlave)	48,00		N.GAS
63	BOSEN ENERJİ ELEKTRİK AŞ.	142,80	1.071,00	N.GAS
64	Mamara Elektrik Üretim A.Ş.	-8,70		N.GAS
65	NUH ENERJİ-2(Nuh Çim.)	-73,00		N.GAS
66	SAYENERJİ ELEKTRİK ÜRETİM AŞ. (Kayseri/OSB)	5,90	47,00	N.GAS
67	T. ENERJİ ÜRETİM AŞ.(İSTANBUL)	1,60		N.GAS
68	ZORLU EN.Kayseri (İlave 1 GT)	7,20		N.GAS
69	SİİRT	25,60	190,00	FUELOIL
70	Mardin Kızıltepe	34,10	250,00	FUELOIL
71	KAREN	24,30	180,00	FUELOIL
72	İDİL 2 (PS3 A- 2)	24,30	180,00	FUELOIL
73	İSKUR TEKSTİL (SÜLEYMANLI HES)	-4,60		HYDRO
74	BORÇKA HES	300,60	600,00	HYDRO
75	TEKTUĞ(Keban Deresi)	5,00	20,00	HYDRO
76	YPM Ener.Yat.AŞ.(Altıntepe Hidro.)(Sivas/Suşehir)	4,00	10,00	HYDRO
77	YPM Ener.Yat.AŞ.(Beypınar Hidro.)(Sivas/Suşehir)	3,60	9,00	HYDRO
78	YPM Ener.Yat.AŞ.(Konak Hidro.)(Sivas/Suşehir)	4,00	10,00	HYDRO
79	KURTEKS Tekstil A.Ş./Kahramanmaraş(KARASU HES-Andırın)	2,40	19,00	HYDRO
80	İSKUR TEKSTİL (SÜLEYMANLI HES)	4,60	4,00	HYDRO
81	ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)	6,30	54,00	HYDRO
82	ÖZGÜR ELK.AŞ.(K.MARAŞ)(Tahta)(İlave)	6,30		HYDRO
83	ANEMON EN.ELEK.ÜRETİM.AŞ.	8,00	83,00	WIND
84	ANEMON EN.ELEK.ÜRETİM.AŞ.(İlave)	15,20		WIND
85	ANEMON EN.ELEK.ÜRETİM.AŞ.(İlave)	7,20		WIND

86	BURGAZ RES (Doğal Enerji Üretim A.Ş.)	4,00	48,00	WIND
87	BURGAZ RES (Doğal Enerji Üretim A.Ş.)	10,90		WIND
88	DENİZ ELEK. ÜRETİM Ltd.Şti.(karakurt)	10,80	24,00	WIND
89	MARE MANASTIR RÜZGAR ENERJİ(ilave)	11,20	129,00	WIND
90	MARE MANASTIR RÜZGAR ENERJİ(ilave)	20,00		WIND
		MW	GWh/year	MWh/year
	RENEWABLES	26,60	102,00	102.000,00
	FUELOIL	110,10	814,00	814.000,00
	LIGNITE	1,70	0,00	0,00
	N.GAS	123,20	1.568,00	1.568.000,00
CDM REGISTERED PROJECTS AND CAPACITY ADDITIONS TO EXISTING PLANTS ARE EXLUDED				

Generation units put into operation in 2006

NO	PLANT NAME	INSTALLED POWER (MW)	GENERATION (GWh)	FUEL TYPE
1	AKMAYA (Lüleburgaz) GR I	6,91	50,00	N.GAS
2	BURGAZ (Lüleburgaz) GR I	6,91	54,00	N.GAS
3	ERTÜRK ELEKTRİK Tepe RES GR I	0,85	2,00	WIND
4	BEREKET EN.(Mentaş Reg) GR III	13,30	140,00	HYDRO
5	MARE MANASTIR RÜZGAR (X GRUP)	8,00	12,00	WIND
6	ÇİRAĞAN SARAYI GR I	1,32	11,00	N.GAS
7	TEKTÜĞ(Kalealtı) GR I - II	15,00	11,00	HYDRO
8	ERE(AKSU REG.ve ŞAHMALLAR HES) GR I-II	14,00	6,60	HYDRO
9	ELBİSTAN B GR IV	360,00		LIGNITE
10	ENTEK (Köseköy) GR V	37,00		N.GAS
11	ITC-KA EN. MAMAK TOP.M. GR I-II-III	4,24	30,00	BIOGAS

12	ÇERKEZKÖY ENERJİ GR I	49,16	390,00	N.GAS
13	YILDIZ ENT. AĞAÇ (Kocaeli) GR I	6,18	40,00	N.GAS
14	ELBİSTAN B GR II	360,00		LIGNITE
15	CAM İŞ ELEKTRİK (Mersin) GR I	126,10	1008,00	N.GAS
16	ERE(Sugözü rg. Kızıldüz hes) GR I - II	15,43	7,90	HYDRO
17	EKİN (Başaran Hes) (Nazilli)	0,60	2,90	HYDRO
18	EROĞLU GİYİM (Çorlu) GR I	1,17	9,00	N.GAS
19	EKOLOJİK EN. (Kemerburgaz) GR I	0,98	6,00	BIOGAS
20	BEREKET EN.(Mentaş Reg) GR I - II	26,60		HYDRO
21	HAYAT TEM. VE SAĞLIK GR I - II	15,04	108,00	N.GAS
22	ANTALYA ENERJİ GR I - II - III - IV	34,92	245,00	N.GAS
23	SU ENERJİ (Balıkesir) GR I - II	4,60	4,20	HYDRO
24	ELBİSTAN B GR III	360,00	6528,00	LIGNITE
25	ŞIK MAKAS (Çorlu) GR I	1,58	13,00	N.GAS
26	BOZ ENERJİ GR I	8,73	70,00	N.GAS
27	ADANA ATIK SU ARITMA TESİSİ	0,80	6,00	BIOGAS
28	AMYLUM NIŞASTA (ADANA)	-6,20		FUELOIL
29	AMYLUM NIŞASTA (ADANA)	14,25	34,00	N.GAS
30	MOLU EN. Zamantı Bahçelik GR I - II	4,22	10,70	HYDRO
31	KASTAMONU ENTEGRE (Balıkesir) GR I	7,52	54,00	N.GAS

32	ÇIRAĞAN SARAYI(Bakanlık çıkardı)	-1,36		N.GAS
33	MENDERES ELEKTRİK GR I	7,95	56,00	GEOTHERMAL
34	BEREKET ENERJİ GÖKYAR HES 3 Grup	11,62	28,00	HYDRO
35	DENİZLİ ÇİMENTO(DÜZELTME)	0,45		N.GAS
36	SÖNMEZ ELEKTRİK (Çorlu) GR I - II	17,46	126,00	N.GAS
37	BARES IX GRUP	13,50	95,00	WIND
38	ELSE TEKSTİL (Çorlu) GR I - II	3,16	25,00	N.GAS
39	ENTEK (Köseköy) GR IV	47,62	931,00	N.GAS
40	MARMARA ELEKTRİK (Çorlu) GR I	8,73	63,00	N.GAS
41	MARMARA PAMUK (Çorlu) GR I	8,73	63,00	N.GAS
42	NUH ENERJİ-2 GR II	26,08	504,00	N.GAS
43	ŞANLIURFA GR I-II	51,80	0,00	HYDRO
44	AYDIN ÖRME GR-I	7,52	60,00	N.GAS
45	ALARKO ALTEK GR-III	21,89	420,00	N.GAS
46	KARACAÖREN-II	-0,80		HYDRO
47	SEYHAN I-II ilave	0,30		HYDRO
48	EKOTEN TEKSTİL GR-I	1,93	14,00	N.GAS
49	ERAK GİYİM GR-I	1,37	10,00	N.GAS
50	VAN-2	-24,70		
		MW	GWh/year	
	TOTAL	1.441,08	8.612,60	
	RENEWABLES (HYDRO-	76,37	169,60	

	WIND-BIOGAS)			
	LIGNITE	1.080,00	6.528,00	
	N.GAS	284,72	1.915,00	
CDM REGISTERED PROJECTS AND CAPACITY ADDITIONS TO EXISTING PLANTS ARE EXCLUDED				

	MWh
Gross Electricity Generation in Year 2010	211.207.700,0
Electricity generation in year 2010 from CDM projects	6.476.600,0
Gross Electricity Generation in Year 2010 - Exl.CDM Projects	204.731.100,0
20% corresponding to most recent plants	40.946.220,0
2006-2007-2008-2009-2010	43.784.713,0
Total Capacity of plants build in 2010	20.411.000,0
Lignite	144.000
Imported Coal	9.080.000
N.gas	10.081.000
Fuel Oil	
Wastes	
Renewable	1.106.000,00
Total Capacity of plants build in 2009	11.422.700,0
Lignite	3.000
N.gas	6.654.000
Total Renewable	1.279.700
Diesel Oil	0
Fuel Oil	2.541.000
Import Coal + Asphaltic	945.000
LPG	0
Total Capacity of plants build in 2008	854.413,0
Lignite	-
N.gas	727.685,0
Total Renewables	126.728,0
Diesel Oil	0
Fuel Oil	0
Import Coal	0

Solid	0
LPG	0
Total Capacity of plants build in 2007	2.484.000,00
Total Renewable	102.000,0
N.gas	1.568.000,0
Lignite	0
Diesel Oil	0
Fuel Oil	814000
Import Coal	0
Solid	0
LPG	0
Total Capacity of plants build in 2006	8.612.600,00
Total Renewable	169.600,0
N.gas	1.915.000,0
Lignite	6.528.000,0
Diesel Oil	0
Fuel Oil	0
Import Coal	0
Solid	0
LPG	0

Total Capacity Additions considered for BM calculation	
Fuel Source	Total (MWh)
Total Renewable	2.784.028,0
N.gas	20.945.685,0
Lignite	6.675.000
Naphtha	0
Diesel Oil	0
Fuel Oil	3355000
Coal	10.025.000
Solid	0
LPG	0

Total	43.784.713,0

Fuel Source	MWh	EF	Weighted average EF	Emission by Source	Percent in overall generation
Coal	10.025.000	0,995	217,29	9.976.622	22,9%
Lignite	6.675.000	0,999	145,22	6.667.665	15,2%
Fuel Oil	3.355.000	0,775	56,63	2.600.197	7,7%
Diesel oil	0	0,949	0,00	-	0,0%
LPG	0	0,493	0,00	-	0,0%
Naphtha	0	0,554	0,00	-	0,0%
Natural Gas	20.945.685	0,425	193,99	8.906.814	47,8%
Renewable and wastes	0	0,000	0,00		0,0%
Solid	0	0,000	0,00		0,0%
Total Renewable	2.784.028	0,000	0,00		6,4%
TURKEY'S TOTAL	43.784.713,0		613,132	28.151.298	100,0%
	EFBM =	0,643			

EF,grid,BM,y (tCO2/MWh)	0.643
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Details of OM Calculation

Fuel Source	NCV (Tj/kt) (unit ton or 1000m3 for gas)	EF (tCO2/Tj)	COEF(tCO2/kt)	2008	2009	2010	Total Fuel Consumption 2008-2010	Total Emission 2008-2010
Hard Coal	22,26	92,8	2.065	6.270.008	6.621.177	7.419.703	20.310.888	41.951.764
Lignite	6,79	90,9	618	66.374.120	63.620.518	56.689.392	186.684.030	115.302.561
Fuel Oil	39,91	75,5	3.013	2.173.371	1.594.321	891.782	4.659.474	14.041.084
Diesel Oil	42,61	72,6	3.094	131.206	180.857	20.354	332.417	1.028.335

LPG	12,57	61,6	774	0	111	0	111	86
Naphta	40,55	69,3	2.810	10.606	8.077	13.140	31.823	89.424
Natural Gas	37,06	54,3	2.013	21.607.635	20.978.040	21.783.414	64.369.089	129.543.312
								301.956.566

Net Calorific Values⁵³

	Net Calorific Value			
	2008	2009	2010	Average
<i>Hard Coal + Import Coal</i>	22,2	22,2	22,3	22,26
<i>Lignite</i>	6,8	6,4	7,1	6,79
<i>Fuel Oil</i>	39,7	39,8	40,2	39,91
<i>Diesel Oil</i>	42,4	42,4	43,1	42,61
<i>Lpg</i>	0,0	37,7	0,0	12,57
<i>Naphtha</i>	44,6	43,5	33,5	40,55
<i>N. Gas</i>	36,6	37,2	37,4	37,06

Turkey's Net Electricity Production and Imports⁵⁴

⁵³ [http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim\(22-45\)/40\(06-10\).xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls)

<http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/yakit46-49/47.xls>

⁵⁴ [http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim\(22-45\)/40\(06-10\).xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim(22-45)/40(06-10).xls)

[http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim\(22-45\)/35\(75-10\).xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim(22-45)/35(75-10).xls)

[http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/ithalat-ihracat\(50-54\)/52.xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/ithalat-ihracat(50-54)/52.xls)

[http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim\(22-45\)/33\(84-10\).xls](http://www.teias.gov.tr/istatistik2010/front%20page%202010-çicek%20kitap/uretim%20tuketim(22-45)/33(84-10).xls)

Electricity Generation(GW/h)							
Year	Gross generation	Net generation	NET/Gross	Gross Gen. Thermal	Net Gen Thermal	Import	Total
2008	198418.0	189761.9	0.96	164139.3	156978.6	789.40	157768.028
2009	194812.9	186619.3	0.96	156923.4	150323.4	812.00	151.135.388
2010	211207.7	203046.1	0.96	155827.6	149806.0	1143.81	150.949.837
				Total Net Thermal Gen.	457108.0	2745.21	459853.25

EF,grid ,OMsimple,y(tCO2/MWh)	0.657
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EF Grid, OM, y	0.657
EF Grid, BM, y	0.643
EF Grid, CM, y	0.650