



**Verified Carbon
Standard**

GRID CONNECTED ELECTRICITY
GENERATION FROM RENEWABLE SOURCES:
UZUNCAYIR 82.0 MW HYDROELECTRIC
POWER PLANT PROJECT, TURKEY



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1 PROJECT DETAILS

1.1 Summary Description of the Project

Uzuncayir HPP had originally been developed by DSI (State Water Works). The project's construction was started in 1993 by DSI. By 2005, the project was completed by only 93 percent and 99 percent in terms of investment completion ratio and construction completion ratio, excluding installation of electromechanical equipment, respectively. . However, with the change in government policies in the energy sector, it was decided that the project would be transferred to private sector, as the government did not want to invest in the project anymore. Limak Insaat Sanayi and Ticaret A.S. won the tender, which was held on 12/09/2006 and took over the project to complete construction works and install electromechanical equipments. In this tender, Limak promised to pay certain fees for water usage privileges and to pay off the amount, which had been invested in the project by DSI so far.

Uzuncayir HEPP is located on Munzur River and it is 18 km away from Tunceli city center. The project will have a dam and a 13.4 km² reservoir. The project's installed capacity is 82 MW. The objective of the project is to generate electricity and supply it into the public grid. Uzuncayir HEPP will be registered as a Voluntary Emission Reduction (VER) project and facilitate the project implementation with carbon revenue coming from the carbon credits sale. The project is not a grouped project. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MW. Total installed capacity of the project is 82.0 MWe and the expected electricity generation is 322,000 MWH per annum. The first unit of the project was started to produce electricity on December 2nd, 2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced wit full capacity on 12/04/2010, after the commissioning of the last unit. The first crediting period of the project begins with the commissioning of the plant.

Due to its significant contribution in diminishing carbon emissions and protecting the climate as well as due to some significant additionality issues as discussed further below, this project is anticipated to fulfill VCS requirements and qualify for carbon finance. The project has not been rejected by another GHG program before. The following table summarizes the project milestones:

Table 1: Milestones of Project

Date	Milestone
10.11.2009	Calibration date of meters
02.12.2009	Date of commissioning of the plant /First Unit became operational
28.01.2010	Second unit became operational
12.04.2010	Third unit became operational

31.12.2010	Final Validation Report
31.10.2011	End of the first monitoring period
30.11.2019	End of calibration validity
01.12.2019	End of the second Monitoring period
02.12.2019	Renewal of crediting period start date from second crediting period

Project capacity, number of units and technical equipments remained the same in the renewal period. In 2019, new meters were installed due to the expiration of the old meters. The detailed specifications of the meters are given below (please see Section 5.3).

During the 2nd monitoring period (01-11-2011 to 01-12-2019) the project has produced a net total of 1,955,506 MWh electricity and a total amount of 916,543 tCO₂e of emission reduction. Based on this data and Turkey's Combined Margin Emission Factor of 0.4929 the project is expected to produce 244,438 MWh electricity and a total amount of 98,484 tonnes of CO₂e GHG reductions each year for this crediting period. Total estimated emission reduction within the crediting period is 984,840 tCO₂e. The estimated data are lower than the first crediting period since climate change and drought effected the production of electricity.

1.2 Sectoral Scope and Project Type

According to domestic regulations, with an installed capacity of 82.0 MWe the Uzuncayir HEPP is qualified as a large-scale project. The project comes under Type I – Renewable Energy Project as per Appendix B of the procedures for CDM project activities. The project is an 82.0 MWe HPP and it uses renewable sources to produce electricity. Since the installed capacity of the planned HPP larger than 15 MW; it is a large scale renewable energy project activity according to the Decision 17/ CP.7 Article 6. The project category is Sectoral Scope 1: Energy industries (renewable-/non-renewable sources). The project type is grid connected electricity generation from renewable sources. The project is a non- grouped, stand-alone project.

1.3 Project Eligibility

The Project was eligible to be a VCS Project in 2007,

- VCS accepts all six Kyoto gases. The Project aims to reduce CO₂, which is one of these six Kyoto gases.
- VCS accepts all technologies supported by an approved VCS program. The Project is a hydropower plant, the technology of which is included in the UNFCCC CDM sectoral scope 1.
- VCS requires the use of one of the VCS program approved project methodologies. The Project activity uses the tools and methodologies of approved by UNFCCC CDM executive board, which is a VCS approved program.

- The project does not benefit from any kind of Official Development Assistance.
- In addition to the above, the project is not a grouped project activity, nor de-bundled part of a grouped project activity.

Project registered before the version 4 of the VCS published, so it is still eligible.

1.4 Project Design

The project has been designed to include a single installation of an activity.

Eligibility Criteria

The project is a non-grouped, stand-alone project.

1.5 Project Proponent

Organization name	Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
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1.6 Other Entities Involved in the Project

Organization name	Ekobil Environmental Services and Consulting Ltd ¹
Role in the project	Preparation of the Project Description Document
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1.7 Ownership

The ownership of the emission reductions will be Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi. All the equipments in the project are owned by Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi.

1.8 Project Start Date

Project Start Date is: 2 December 2009.

1.9 Project Crediting Period

Starting date of the project activity is December 2nd, 2009, when the plant first commences electricity generation.. Therefore, the carbon crediting period and the monitoring starts with this commencement date. Therefore the first crediting period started on December 2nd, 2009 and completed by December 1st. 2019. The crediting of the project is renewed for 10 years for the second time after the completion of the first period.

Since the project is in the renewable period the new crediting period is again 10 years: from 2/12/2019- 1/12/2029 (both days inclusive).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	x
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
2019 (02.12.2019 to 31.12.2019)	8,207
2020	98,484
2021	98,484
2022	98,484
2023	98,484

2024	98,484
2025	98,484
2026	98,484
2027	98,484
2028	98,484
2029 (01.01.2029 to 01.12.2029)	90,277
Total estimated ERs	984,840
Total number of crediting years	10
Average annual ERs	98,484

1.11 Description of the Project Activity

Uzuncayir HEPP project entails the construction and operation of a 82.0 MW hydroelectric power plant. The plant consists of three turbines. The brand new turbines, which will be used in the project, will be supplied from Voit-Siemens. The turbines will be Francis type with horizontal axis. The net electricity production (delivered to the grid after the consumption in the plant) from the plant is estimated to be 322,000 MWh per annum. It is estimated that the plant will consume around 3.066 GWh per annum internally.

The project was designed by Baget Mühendislik Müsavirlik Ve Ticaret A.Ş, Su-Yapı Mühendislik Müsavirlik A.Ş, Özmak Makine ve Elektrik Sanayi A.Ş, Rona Makina Sanayi Ve Ticaret A.Ş, under the supervision and control of DSI (Water State Works). All these companies have significant experience in the field of hydropower plant design, control and consultancy.

The technology used in the plant is a state-of-the-art technology with extensive automatization. In addition to this, the equipments, which are used in the project, are all first-hand equipments. There is no new technology which is expected to replace the plant's technology in the short run and the expected life of the equipment is around 20 years. The project does not need extensive initial training and maintenance efforts in order to work as presumed during the project period. Necessary trainings to the plant staff will be provided by the supplier right after the installation of the electro mechanic equipments in line with the agreement between the project owner and the supplier.

The economic life of an HEPP in Turkey is assumed as 50 years. However, it is recommended to renew the equipment in every 20 years.

The Project, consists of construction of the following main structures:

- Two derivation tunnels (398 meters and 468 meters)
- Two coffer dams
- One spill weir
- One rock-fill dam
- Power house with Francis type vertical² turbines;

In the powerhouse, there are three vertical shaft Francis turbines, each with 28 MWm (total capacity 84 MWm and 82 MWe). There are three generators attached to the facility. Generators pursue power factor of 0,9 d/d, a frequency of 50 Hz and an output of 31 MVA.

As it was also mentioned above, the power plant consists of three turbines. The turbines are procured from Voith-Siemens. The net electricity production (delivered to the grid after the consumption in the plant) from the plant is estimated to be 322,000 MWh per annum. It is estimated that the plant will consume around 3.066 GWh per annum internally.

1.12 Project Location

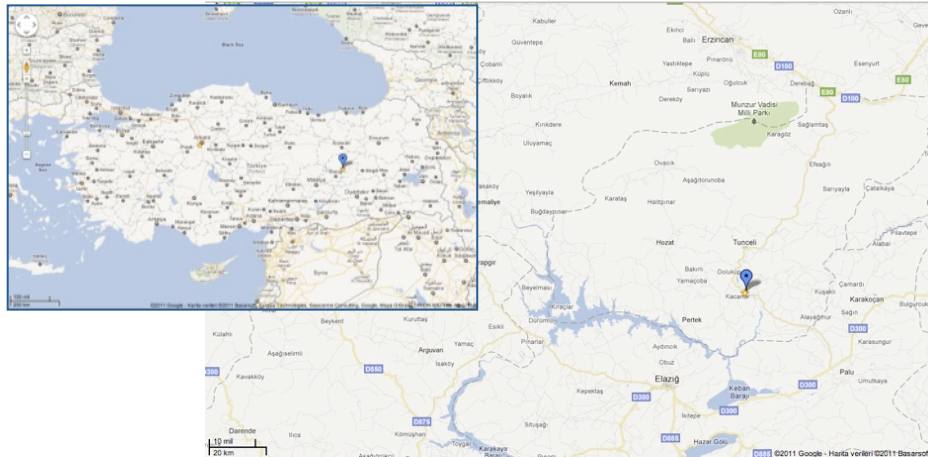
Uzuncayir HPP is located on Munzur River and it is 18 km away from Tunceli city center. The project has a dam and a 13.4 km² reservoir. The project is located in the Eastern Anatolia Region of Turkey, within the province of Tunceli. The project is on the Munzur River. The altitude is 845 m at powerhouse location.

The project is located between the latitudes 39° 06" 39° 58" and longitudes 39° 28" 39° 36".

The Following is a map showing the project location:

² In the validated PDD and the validation report the turbine type is erroneously, mentioned to be horizontal, this mistake is corrected in this report and the VCS monitoring Report.

Figure 1:Location Map of the Project



1.13 Conditions Prior to Project Initiation

The Uzuncayir HPP project is originally a DSI (State Water Works) project. The project's construction started in 1993 by DSI (State Water Works). Until 2005, the project's completion ratios (except electromechanical installments) reached 93% in investment amount wise and 99% in physical installation wise. However, with the change in government policies in the energy field, the project was decided to be transferred to the private sector as the government did not want to invest in the project anymore. Limak won the tender (which was held on 12/09/2006) to take over the project and complete unfinished constructions works and install electromechanical installments. In this tender, Limak promised to pay certain fees for water usage privileges and to pay back the amount, which had been invested in the project so far. Therefore, prior to Limak's take-over of the project, the construction was stopped and no further installation or construction was being held in the project.

At the time of the takeover, the physical completion ratio of the project's construction was 99%. Therefore, the project owner almost had no initiative in the construction of the project (some of the construction was completed after the takeover). On the other hand, DSI had reported in the feasibility study of the project which was prepared in 1985 that the project would lead to the transfer of 3258 people, 92 mud brick houses, 20 concrete houses and 12 public buildings. It would also lead to relocation of 24 km road. However, all these reallocations were made by DSI in the past. With its inappropriate climatic conditions, farming is very limited in the region. Neither the livestock farming and nor the agriculture is developed in the region.

The project site had been vacant as the project is a new power unit and it did not replace an old plant.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Environmental Law No. 28721 is the primary legislation governing environmental protection and improvement of the environment, appropriate and efficient use and protection of natural resources and land, the prevention of pollution and the protection and maintenance of wildlife and plantations. On 26 April 2006, Law No. 5491 was passed; revising, modernizing and expanding the Environmental Law ("Revised Environmental Law"). While keeping the general outline and spirit of the original law, the Revised Environmental Law is more specific on various issues and embraces a more modern perspective regarding environmental issues, with a view to draw level with EU legislation.

Turkish law prohibits the direct or indirect release, storage, transportation and dislodgement of any type of waste or residue in a manner that may harm the environment. Entities falling within the scope of the relevant prohibitions are obligated to take preventive measures if there is a possibility of pollution; to stop pollution; and to lessen or restore its impact on the environment if pollution has taken place. The Ministry shall procure and implement country-wide zoning plans on the scale of 1/50,000 and 1/100,000 to prevent environmental pollution that may arise due to meeting various needs of urban and rural populations.

The protection of biological diversity and ecological balance are essential. Commercial activities regarding endangered fauna and flora as well as rare species, unless otherwise allowed by legislation, are prohibited. Similarly, marine fish farms cannot be established either in any closed coves bearing a sensitive-lands quality or within natural and archeologically protected areas. All types of resources, income, fees and fines that are collected and gained within the framework of environmental legislation shall be allotted towards environmental matters before all else.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not participated in any other GHG Programs.

1.15.2 Projects Rejected by Other GHG Programs

Not applicable since the project has not participated in any other GHG Programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

There is no other form of environmental credit generated by the project because there is no such system within the host country. The projects originate from Turkey do not comply for renewable

energy certificates of EU because there is no energy trade between EU and Turkey because of different grid structures.

1.16.2 Other Forms of Environmental Credit

There is no other form of environmental credit generated by the project because there is no such system within the host country. The projects originate from Turkey do not comply for renewable energy certificates of EU because there is no energy trade between EU and Turkey because of different grid structures.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable.

Commercially Sensitive Information

There is no commercially sensitive information for the project.

Sustainable Development

The project aims to generate electricity by using hydroelectric power to supply the increasing national electricity demand in a cleaner and sustainable manner. It reduces the air pollution caused by the grid-connected power plants, which are mostly fossil fuel fired.

Uzuncayir HPP consists of 3 units, each having an installed capacity of 27.33 MWe. Total installed capacity of the project is 82.0 MWe and the expected electricity generation is 244,438 MWH per annum.

The following is a list of the project's contribution to the UN SDG:

SDG-7 on access to affordable, reliable, and sustainable energy, as the project is not relying on imported fossil fuels.

SDG-8 is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. In this project, occupational trainings and occupational health trainings were given regularly. The project providing decent and secure work environment.

SDG-13 on urgent action to combat climate change, as the project is replacing the fossil fuel based national grid and it is producing emission reductions.

In addition to the above the contribution of the project to sustainable development, social, economic and environmental situation is given explained to be: "The project contributes to sustainable development in Turkey in two major ways:

Hydropower presents significant environmental benefits:

- Generating electricity from hydropower energy does not result in emissions of pollutants into the atmosphere with zero residuals that carry adverse impacts on soil, water etc.
- Regular emissions from conventional electricity generation such as sulphur dioxide, nitrogen oxide and particulates will not occur in this case.
- As a renewable energy source hydropower can be used without jeopardizing the supply of primary energy sources in the future
- The proposed project will significantly contribute to the reduction of GHGs.

Hydropower presents significant economic benefits:

- The region is energy poor and the industry is undeveloped. Although agriculture is not undertaken with advanced methods and the region is poor in agricultural land availability, agriculture is destined to be the main livelihood in the region. Emission of pollutants such as sulphur dioxide through shifting to fossil fuel based electricity generation in the region to satisfy the needs of fast growing industry will result in damaging the quality of agriculture and cause economic harm in the region.

The project pursues significant social benefits to the communities in the project area, such as:

- Tunceli, where the project is located is one of the least developed cities of Turkey with its 86,449 population in 2008 (representing 47% reduction compared to 1975)⁶. There are only 4 businesses, which employ more than 10 workers in the city. Although agriculture and animal husbandry are almost only income sources of the city, they are not developed enough. The unemployment rate in the city was 17.2%⁸(fourth highest in Turkey) in 2008. Although the city is rich in water resources, the production and consumption of fishery products are almost none.
- Construction of Uzuncayir HPP and operation of the plant resulted in extra employment in the local area where unemployment is a big socio-economic problem. The total number of workers to be hired for the construction adds up to 250 where almost 95 percent of those workers are locals. The local workers are given priority during the hiring for plant operation. The project created employment in the region.
- The project will provide a large reservoir area in which fishery products can be grown. This will also increase the fishery products consumption in the region. Local authorities planning to encourage fish farm investments in the reservoir of the project.

Further Information

No further information.

2 SAFEGUARDS

2.1 No Net Harm

The project has positive impact of the project to the social, economic and environmental situation is mentioned as: "...to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The specific benefits of the project are:

- Reducing greenhouse gas emissions in Turkey compared to the business-as-usual scenario,
- Helping stimulate private sector participation in hydropower industry in Turkey,
- Creating employment during the construction and the operation phase of the plant,
- Helping to reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,
- Helping to diminish Turkey's increasing energy deficit,
- Diversify the electricity generation portfolio and reduce dependency on import of other energy sources."

2.2 Local Stakeholder Consultation

Since Limak did not undertake the construction of the project, the company did not hold an official stakeholder participation meeting. However, the project managers had been open to face-to-face communications with local people in order to solve any problem that the project had caused. The ongoing communication is undertaken through stakeholder visits to the site or direct contact via telephone. For this purpose:

- One of the religiously important visit point was moved to a higher location in order to save the location from remaining under the reservoir water.
- The project provided some construction materials to surrounding villages for their infrastructure needs.
- The project constructed some recreational activity centers around the reservoir.

In the last monitoring period, no negative comments about the project have been received. Stakeholders tend to focus on the positive sides of the project such as creation of employment, the touristic activities around the artificial lake, new facilities, sport activities etc. Stakeholders can directly visit or call the power plant when they have a problem. Since the project started, the project owners have not received any negative comments. A remote meeting was held

with stakeholders on February 25, 2021, at which stakeholders stated that they were satisfied with the project and they could easily contact the project owners whenever they wanted.

If the local people have any complaints about the power plant, they can communicate with the power plant manager or the necessary persons by visiting the power plant, by phone or by e-mail. During the last site visits, the plant manager stated that they did not receive any verbal or written negative feedback about the project. One of the feedbacks received in this period was the demand for lowering the dam lake level as a world rafting championship would be held in the region, which is shared with the validated DOE.

Another demand is Uzuncayir police station commander's request to install a camera system on the road. Both requests were answered positively. Anyone who is positively or negatively affected by the project around the power plant can easily reach the project owners and report their demands or grievances.

2.3 Environmental Impact

The project was approved to be implemented in year 1985, way before the EIA concept was born, with the construction to be completed by the State Water Works (DSI, a public body responsible with water project development and application). Hence, the project preparation phase never included an EIA process. When the project owner took over the project in 2007, 99 percent of the construction had already been completed without an EIA and the project owner was exempt from conducting an EIA because their only duty was to reengineer the equipment design and finish the installation (Please see Appendix 1). The project has no trans-boundary environmental and social impacts.

2.4 Public Comments

Not applicable

2.5 AFOLU-Specific Safeguards

The project is a non-AFOLU project

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The following UNFFCC methodology and its related tools are utilized:

Approved consolidated baseline and monitoring methodology ACM0002 “Large-scale consolidated baseline methodology for grid-connected electricity generation from renewable sources.” Version 20.0

Related Tools:

“Tool for the demonstration and assessment of additionality” (Version 05.2.1)

“Tool to calculate the emission factor for an electricity system” (Version 06.0)

“Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 03.0.1)

3.2 Applicability of Methodology

The choice of ACM0002 / Version 20.0 is justified as the proposed project activity meets relevant applicability criteria:

“If the project activity is the installation of a Greenfield power plant, the baseline scenario is 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.

- Uzuncayir 82.0 MW HEPP Project is a grid connected renewable power generation project which adds electricity capacity from hydro power sources and which supplies electricity to a system that is supplied by at least one fossil fuel fired generating unit,
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid.
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity, The project involves construction of new units in a brand new plant, in other words the project does neither involve the addition of renewable energy generation units at an existing renewable power generation facility nor does it foresee to retrofit or modify an expired facility of renewable energy generation.

Table 2: Applicability Conditions

No.	Applicability conditions in Version 20.0 of ACM0002	Project Activity	Criterion Met
1	This methodology is applicable to grid-connected renewable energy power generation project activities that: <ul style="list-style-type: none"> a) Install a Greenfield power plant; b) Involve a capacity addition to (an) existing plant(s); c) Involve a retrofit of (an) existing operating plant(s)/unit(s); d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s). 	The Uzuncayir HPP project activity consists installation of a new grid connected renewable power plants at a site where no renewable power plant was operated prior to the implementation of the project activity (green field plant)	Yes
2	The methodology is applicable under the following conditions: <ul style="list-style-type: none"> a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without 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 new hydropower plant.	Yes
	<ul style="list-style-type: none"> b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit 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, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity. 	The project activity is the installation of a new hydropower plant. It is not included capacity additions, retrofits, rehabilitations or replacements of the existing plant/unit.	N/A
3	In case of hydropower plants, one of the following conditions shall apply: <ul style="list-style-type: none"> a) The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of any of the reservoir; or b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m²; or 	The project involves construction of a new reservoir.	N/A

	<p>c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m²; or</p>	<p>The project involves construction of a new single reservoir and the power density of the Uzuncayir HPP is 6.119 W/m², it is greater than 4 W/m².</p>	<p>Yes</p>
	<p>d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m², all of the following conditions shall apply:</p> <ul style="list-style-type: none"> (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: <ul style="list-style-type: none"> a. Lower than or equal to 15 MW; and b. Less than 10 percent of the installed capacity of integrated hydro power project. 	<p>The project activity is not an integrated hydropower plant</p>	<p>N/A</p>
<p>4</p>	<p>In the case of integrated hydro power projects, project proponent shall:</p> <ul style="list-style-type: none"> (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity 	<p>This project activity is not an integrated hydropower plant</p>	<p>N/A</p>

5	This methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site (b) Biomass fired power plants/ units	It is a renewable energy project with no fuel-switch and biomass fired power plant involved. The project activity is a hydropower plant.	Yes
6	In the case of retrofits, rehabilitations, 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, that is 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”.	The Uzuncayir Hydro Power Plant Project activity is the installation of a new hydropower plant.	N/A

Table 3:Applicability Conditions of Tools

No	Applicability conditions to relevant tools	Project Activity	Criterion Met
1	<p>Tool for the demonstration and assessment of additionality” (Version 05.2.1)</p> <p>This tool provides for s step-wise approach to demonstrate and assess additionality. These steps include:</p> <ul style="list-style-type: none"> • Identification of alternatives to the project activity. • Investment analysis to determine that the proposed project activity is either:1)not the most economically or financially attractive,or 2)not economically or financially feasible, • Barrier analysis,and • Common practice analysis 	<p>In the absence of the proposed project activity, plausible and credible project activities to the proposed project activity are presented.</p> <p>Benchmark Analysis is selected as the analysis method and the Equity IRR is selected as the financial indicator for the demonstration of the additionality of the project.</p> <p>The project is not financially attractive in regular terms because the IRR of the project is estimated to be far less than benchmark expectations</p> <p>Based on the barrier</p>	Yes

		<p>analysis, there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity is not registered as a VCS activity.</p> <p>The low rate of completion of the projects and the low contribution privately held hydro projects confirm the barriers elaborated above and also proves that the electricity generation from HEPP business is not a common practice</p>	
2	<p>Tool to calculate the emission factor for an electricity system” (Version 06.0)</p> <p>This tool may be applied to estimate the OM,BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid.</p> <p>Under this tool, the emission factor for the project electricity can be calculated either for grid power plants only/or as an option can include off-grid power plants.</p>	<p>Although UNFCCC ACM0002 Version 20.0 refers to “Tool to calculate the emission factor for an electricity system” (Version 07.0), the host country (Turkey) published the combined emission factor as 0.5706 tCO₂/MWh on October 2021 by using “Tool to calculate the emission factor for an electricity system” (Version 06.0). The only revision between these versions is to include monitoring requirements for parameters used to determine the emission factor of the isolated grid and Uzuncayir HPP is not an isolated grid.</p>	Yes

<p>3</p>	<p>Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (Version 03.0.1)</p> <p>This tool provides a stepwise procedure to asses the continued validity of the baseline and to update the baseline at the renewal of a crediting period,as required by paragraph 49(a) of the modalities and procedures of the CDM.</p> <p>The tool consists of two steps.The first step provides an approach to evaluate whether the current baseline is still valid for the next crediting period.The second step provides an approach to update the baseline in case that the current baseline in not valid anymore for the next crediting period.</p>	<p>The current baseline scenario complies with all relevant mandatory national and or/sectoral policies. Thus, it can be concluded that the current baseline scenario is in compliance with relevant mandatory national and sectoral policies. The project received the production license from the Turkish Energy Market Regulatory Authority and this license ensures that the project complies with all national regulations. The term of the license is 40 years.</p> <p>There is no impact of circumstances existing at the time of requesting renewal of crediting period on the current baseline emissions for this project. The conditions used to determine the baseline emissions in the previous crediting period are still valid.</p> <p>The equipments and the technology of the project are still valid. Therefore this sub-step is not applicable for this project activity.</p>	<p>Yes</p>
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3.3 Project Boundary

Source	Gas	Included?	Justification/Explanation	
Baseline	Electricity Generation in baseline (Turkey's grid)	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	N.A	N.A
Project	Emission from the reservoir of the proposed project	CO ₂	No	Minor emission source
		CH ₄	Yes	As the power density of the project is less than 10 but higher than 4, CH ₄ emissions of the reservoir is calculated and deducted from emission reductions.
		N ₂ O	No	Minor emission source
		Other	N.A	N.A
	Auxiliary Diesel Generator	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
		Other	N.A	N.A

3.4 Baseline Scenario

According to Verra Standard Version 4.1 section 3.8.9 when renewal of the project crediting period, the following shall apply with respect to the renewal of the project:

“The validity of the original baseline scenario shall be demonstrated, or where invalid a new baseline scenario shall be determined.”

In this project the baseline scenario is valid as follows:

Since the proposed project activity is the installation of a grid-connected hydroelectric, that is renewable power plant and therefore, the baseline scenario is defined as the following based on ACM0002 (Version 20.0):

“If the project activity is the installation of a Greenfield power plant, the baseline scenario is 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.”

Since the proposed project activity is going to be connected to the Turkish national grid, the baseline scenario of the proposed project is the supply of the equivalent amount of annual power output by the existing Turkish national grid, which is the continued operation of existing power plants and the addition of new sources to meet electricity demand.

Based on ACM0002, baseline emissions are equal to power generated by the project activity that is delivered to the Turkish national grid, multiplied by the baseline emissions factor. This baseline emissions factor (EF_y) is calculated as the Combined Margin (CM), by the Turkish Ministry of Energy and Natural Resources.

The steps to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period are conducted following methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1, EB 66, Annex 47).

The validity of the current baseline is assessed using the following sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

In the absence of this project activity, electricity that is connected to the national grid would come from fossil fuel based power plants. The baseline scenario of the project is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected fossil fuel power plants and by the addition of new generation sources.

The current baseline scenario complies with all relevant mandatory national and or/sectoral policies. Thus, it can be concluded that the current baseline scenario is in compliance with relevant mandatory national and sectoral policies. The project received the production license from the Turkish Energy Market Regulatory Authority on 26/08/2010. This license ensures that the project complies with all national regulations. The term of the license is 45 years.

Step 1.2: Assess the impact of circumstances

There is no impact of circumstances existing at the time of requesting renewal of crediting period on the current baseline emissions for this project. The conditions used to determine the baseline emissions in the previous crediting period are still valid.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

The equipments and the technology of the project are still valid. Therefore this sub-step is not applicable for this project activity.

Step 1.4: Assessment of the validity of the data and parameter.

This step requires us to Assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:

"Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC".

"Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity".

In the registered PDD, the grid emission factor was calculated as per the combined margin approach described in the "Tool to calculate the emission factor for an electricity system" Version 02.2.1. The grid emission factor was calculated as the weighted average of OM & BM; and was fixed ex-ante for the entire crediting period.

The emission factors that were determined at the start of the first crediting period are not valid anymore and the data and parameters have been updated accordingly for the second crediting period.

The whole data OM and BM was obtained from official data provided by Turkish Ministry of Energy and Natural Resources published on 06/10/2021. This is the most recent data available during the validation of renewal of crediting period. Considering the guidance provided under this step, calculations of emission factor and baseline emissions are updated for the next crediting period as requested in Step 2.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline.

The current baseline scenario is still valid.

Step 2.2: Update the data and parameters.

All parameters regarding the grid emission factor are updated in this crediting period.

3.5 Additionality

The proposed project activity reduces GHG emissions by substituting fossil fuel based electricity generation by renewable resources (hydro) based electricity generation.

Version 4.1 section 3.8.9 of the VCS Standard states that:

‘A full reassessment of additionality is not required when renewing the project crediting period. However, regulatory surplus shall be demonstrated in accordance with the requirements set out in the VCS Program rules and the project description shall be updated accordingly’

Since Uzuncayır HPP is a registered project, the reassessment of the additionality is not required for renewing crediting period. The following content is kept the same as the registered PDD.

Step 1:Regulatory Surplus:

The project shall not be mandated by any enforced law, statute or other regulatory framework, or for UNFCCC non-Annex 1 countries, any systematically enforced law, statute or other regulatory framework.

Outcome of Step 1:The project is not mandated by any enforced law, statute or other regulatory framework.

Step 2:Positive List: Conformance with the positive list is demonstrated in the Applicability of Methodology section 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

In the absence of the proposed project activity, plausible and credible project activities to the proposed project activity are as follows:

Alternative 1: Construction of a thermal power plant with the same annual power output

Alternative 2: The proposed project activity not undertaken as a VER project activity

Alternative 3 : Construction of some other renewable energy plant with the same annual power output

Alternative 4: The same service of power supply is provided from the grid (Uzuncayir HEPP is not built)

Alternative 1: Construction of a thermal power plant with the same annual power output

Although the coal and natural gas reserves in Turkey is very limited, there are many thermal power plants that have been being commissioned in recent years and Turkey's grid mainly consists of thermal power plants. As they have become common practice in the energy sector due to off-take agreements provided by the government, these projects face easier circumstances in terms of financing and realization. In addition, these projects use imported natural gas or coal, so they can be realized regardless of their geographic proximity to original coal or natural gas supply. Therefore, construction of a thermal plant fuelled with imported coal with the same annual electricity output is a realistic alternative.

Alternative 2: The proposed project activity undertaken without being registered as a VCS project activity.

Alternative 2 is in compliance with legal and regulatory requirements. Therefore, Alternative 2) is a credible alternative.

Alternative 3: Construction of some other renewable energy plant with the same annual power output

The Eastern Anatolia region is not very rich of wind and very steep terrain does not allow for wind power plants. It can be seen in the REPA (Wind Energy Potential Map) of Tunceli, the areas, which have enough potential for economically feasible wind farm investments, are not very evident in the region. As for the geothermal energy, this renewable energy source does not exist in this region of the country. Therefore, at the project area, there is no geothermal source either. As a result, Alternative 3 for the region is eliminated.

Alternative 4: The same service of power supply is provided from the grid (Uzuncayir HEPP is not built)

As mentioned above, the Turkish Electricity Sector is heavily dependent on fossil fuel plants. According to a new bill that passed in 2001 (Electricity Market Law, Law No: 4628, Enactment Date: 20/02/2001) 28, the public funding in energy investments have stopped. The new bill allows incentives for private sector participation in energy investments. In addition to rehabilitation of existing plants, new capacities to be added to meet the increasing demand require mass amount of investments. Because the public funding of energy investments is no more legitimate, new projects need to be accomplished by private sector. Yet, Limak cannot influence the future fuel mix in the energy market, but can only decide to invest on the project, because Limak has no influence on the domestic energy policy of the decision makers.

Under these circumstances, the realistic alternatives are 1, 2 and 4. Analyzing these three alternatives, it is seen that all scenarios are consistent with the baseline definition of ACM0002 / Version 11 where it defines the baseline scenario as the amount of electricity that would be delivered to the grid by the project activity, generated by the operation of existing grid-connected power plants and by the addition new generation sources, as reflected by the combined margin.

Sub-step 1b: Enforcement of applicable laws and regulations

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

Outcome of Sub-step 1b: The plausible and realistic alternatives are Alternative 1 (Construction of a thermal power plant with the same annual power output) , Alternative 2 (The proposed project activity not undertaken as a VER project activity) and Alternative 4 (The same service of power supply is provided from the grid (Uzuncayir HEPP is not built)).

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 VCS project activity may be additional.

The following applicable mandatory laws and regulations have been identified for the proposed project activity:

1. Electricity Market Law³
2. Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy⁴
3. Energy Efficiency Law⁵
4. Forest Law⁶
5. Environment Law⁷
6. Regulation on procedures and principles of signing the agreement of utilization of water resources

³ Law number 4628, enactment date 03/03/2001, <http://www.epdk.gov.tr/english/regulations/electricity.htm>

⁴ Law number 5346, enactment date 18/05/2005, <http://www.eie.gov.tr/duyurular/YEK/LawonRenewableEnergyResources.pdf>

⁵ Law number 5627, enactment date 02/05/2007 http://www.eie.gov.tr/english/announcements/EV_kanunu/EnVer_kanunu_tercume_revize2707.doc

⁶ Law number 6831, enactment date 31/08/1956. This will be made available to the DOE on request.

⁷ Law number 2872. Published in Official Gazette No. 18132 on 11/08/'83. This will be made available to the DOE on request.

for the purpose of electricity production in the electricity market ⁸

7. Regulation on Environmental Impact Assessment⁹

Step 2: Investment Analysis

The purpose of investment analysis is to determine whether the proposed project activity is economically or financially less attractive without carbon revenues than the remaining alternatives. To conduct the investment analysis, the following sub-steps are adhered to:

Sub-step 2a: Determine appropriate analysis method

The „Tool for the Demonstration and Assessment of Additionality’, version 05.2, from EB39, lists three possible analysis methods:

Option I: Simple cost analysis;

Option II: Investment comparison analysis; and

Option III: Benchmark analysis.

Since the proposed project generates financial and economic benefits via the sales of electricity other than carbon revenues, Option I cannot be used.

Option II is only applicable to projects where alternatives should be similar investment projects in terms of generation capacity.

As a result Option III: Benchmark Analysis is selected as the analysis method and the Equity IRR is selected as the financial indicator for the demonstration of the additionality of the project.

Benchmark Analysis is assessed to be appropriate (Option III).

Sub-step 2b: Option III. Apply Benchmark Analysis

The equity IRR is selected as the financial indicator for the Benchmark Analysis. Various professionals who work at financial institutions, which deal with the assessment of energy projects on daily basis, were contacted. As they were briefed about the purpose of questioning, they were kindly asked to testify for IRR expectation of their institutions in general to approve the loan release for renewable energy projects. The survey had to be based on personal testimony rather than intrinsic evidence as most of the professionals in the field are strictly prohibited by their

⁸ National Gazette number 25150, 26/06/2003

⁹ National Gazette number 26939, 17/07/2008

institutions from quoting such guidelines in writing. Almost all bankers who have been asked for an opinion for the minimum IRR that is required for the approval of a similar project expressed some after tax IRR that is in the bandwidth of 16 to 18 percent.

In the meanwhile a separate benchmark calculation was done to confirm bankers' statements mentioned above. The benchmark was calculated as follows: As the Turkish Eurobonds represent a risk-free rate, it must be increased by a suitable risk premium, which reflects the premium that investors demand for an average risk investment. The interest rate for Eurobond with longest duration of 30 years, which is US900123AY60- 17.03.2036, was 6.95% at the time of decision (End of April 2007, please see <http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/asp/eurbond.aspx> for 30th of April 2007). However the maturity of this bond does not match with the investment duration, which is 49 years. Therefore the yield of a synthetic bond with 49 years maturity at the time of decision was calculated using the yield curve derived from <http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/asp/eurbond.aspx> was used. The details of the calculation can be found in a separate excel sheet provided to DOE. Please see Appendix 3 to see the yield curve. According to this calculation the synthetic bond's yield should be around 7.58%.

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

The IRR benchmark value is then calculated using the interest rate delivered from the Turkish Eurobonds rates, 7.85%, plus the risk premium, 9.41%. As explained hereunder:

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

Where:

Table 4: Benchmark Calculation

Parameter		Chosen Value	Source
Rf	Risk-free rate	7.58%	The yield of a synthetic bond with 49 years maturity at the time of decision was calculated using the yield curve derived from http://www.ziraat.com.tr/tr/bankamiz/faiz-ve-ucretler/asp/eurbond.aspx was used. The details of the calculation can be found in a separate excel sheet provided to DOE. Please see Appendix 2 for yield curve.
β	Beta. Used to measure level of risk.	0.939	The average of energy companies traded in ISE 100 derived from one of the most prominent data provider Bloomberg. Please see Appendix 3 for Beta values.

Rm-Rf	Market equity risk premium	9.41%	http://www.stern.nyu.edu/~adamodar/pc/archives/ctryprem 07.xls
Rm	Expected market return	16.99%	-

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

$$7.58\% + 0,939 \times (16.99\% - 7.58\%) = 16.41\%$$

Therefore, a realistic equity benchmark IRR for this type of project should be greater than the base investment threshold (Turkish Eurobonds) plus a risk premium, which given the figures referenced, is greater than 16.41%.

IRR Calculation of the Project

IRR Calculation of the project is based on the feasibility study prepared for the Board of the Company dated April 2007. Aiming to show the effect of income from VERs for the financial performance of the project, two scenarios are presented in this section, one which excludes revenues from the sale of VERs and the second which includes the revenues from the sale of VERs. The assumptions used for this analysis are outlined as follows:

- The financial analysis is performed over the 49 year period from 2007 to 2056, this, therefore includes the investments made by the project owner between 2007 and 2010 and the operational costs along the lifetime of the project.
- The Equity IRR (Internal Rate of Return) of the project cash flow has been calculated.
- A tax rate of 20% is applied to the project in line with Turkish tax laws.
- The depreciation period of machinery and equipment was assumed as 35 years as the local law allows companies to depreciate machinery and equipment in 30 to 40 years (Please see http://www.alomaliye.com/2007/isa_yilmaz_amortismanlar.htm). In the meantime, the other fixed assets" (buildings etc) depreciation life is assumed as 50 years.
- Although it is stated in the energy production license of the facility that the expected average electricity production is 322,000,000 kWh, the annual power generation figure is assumed to be 318,000,000 kWh for the years between 2009 and 2018. This was due to the fact that the production figure in the license is an average figure which can not reflect the fact that the production figure will increase after the construction of another project at

the source side of Uzuncayir HEPP. However, as it is assumed in the company presentation (presented to the board) page 27, after 2019 the production is assumed to be increased to 323,000,000 kWh with the construction of another HEPP at the source side of the project.

- The power purchase price for the project is assumed to be 5 Euro cent (6.5 USD cent) per kWh, which is the minimum purchase guarantee, offered by the State as an incentive to the investment (Please refer to Turkish Renewable Energy Law No: 5346 Article 6.c Ratified on 10 May 2005.)
- The revenues from VERs are excluded from scenario 1, and included in scenario 2. The volume of VERs generated by the project is calculated by multiplying the annual electricity output of the project by the emission factor. For sensitivity analysis, the revenues related to the sale of the VERs are applied by multiplying the volume of VERs by the \$3, \$4 and \$5 price. The VERs are generated and sold between 2010 and 2019 for ten years.

Results The cash flow analysis has been performed on two project scenarios;

- Scenario 1 – excludes revenues from the sale of VER
- Scenario 2 – includes revenues from the sale of VERs

As seen below, the project is not financially attractive in regular terms because the IRR of the project is estimated to be far less than benchmark expectations. Yet, the investor were appealed to subject project because of long term expectations such as a significant increase in energy prices due to increasing demand as well as an expectation of water flow increase and electricity production increase. Under regular assumptions, contribution of carbon finance does not make the project leap over a benchmark that is acceptable to the banks.

Table 5: Project Cash Flow Comparison with and without VER

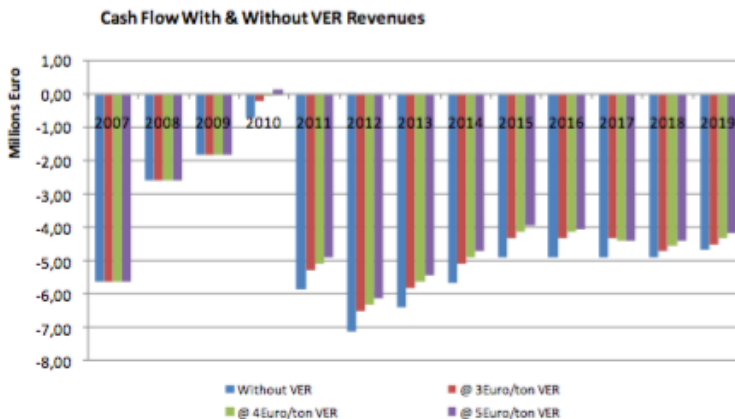


Table 6: Project Cash Flow Details of IRR Calculation

Capacity & Production			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
	Sensitivity Coefficient																						
Energy Production (1000 Kwh/year)		8.833	265.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000
Firm Energy (1000 KWh/year)	0,0%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seconder Energy (1000 KWh/year)	0,0%	8.833	265.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000
Sales Volume & Revenues																							
Loss & Pilferage Rate		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Sales Volume (1000 Kwh/year)		8.833	265.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	318.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000	323.000
	Sensitivity Coefficient																						
Sales Prices (Eur/Kwh)																							
Firm Energy	0,0%	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050
Seconder Energy	0,0%	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050
Price increase (%)		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sales Revenues (Eur)		441.667	13.250.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000
Firm Energy		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seconder Energy		441.667	13.250.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000	16.150.000
Cost of Goods Sold																							
General production expenses	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Depreciation	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250
DSI Contribution (0,031 € per kWh)	0	0	273.833	8.215.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000
Total (Eur/year)	2.202.003	2.862.343	3.601.277	12.802.268	14.445.268	14.445.268	14.445.268	14.445.268	14.445.268	14.445.268	14.445.268	14.445.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268	14.600.268
(Eur /Kwh)			0,408	0,048	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	0,045	
Working Capital																							
Days of Receivables	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Receivables			24.537	736.111	883.333	883.333	883.333	883.333	883.333	883.333	883.333	883.333	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222	897.222
DSI Payable			273.833	8.215.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	9.858.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000	10.013.000
Costs of Goods Sold & Operating Expenses Calculation Details																							
General Production Expenses	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
			0	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018	1.146.018
Costs of Goods Sold & Operating Expenses Calculation Details																							
VAT Reserve			2.914.131	2.834.631	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VAT to be refundable			79.500	2.385.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.862.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000	2.907.000
VAT to be refunded			0	79.500	2.385.000	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investment Details (Eur)																							
	2007	2008	2009	2010	Total	Weight	Sensitivity Coefficient																Weight
Equipment	4.998.571	11.663.331	13.329.521	3.332.380	33.323.804	54%	0,0%					33.323.804	4.998.571	11.663.331	13.329.521	3.332.380							58%
Construction	3.034.552	11.448.563	8.708.044	911.162	24.102.321	39%	0,0%					24.102.321	3.034.552	11.448.563	8.708.044	911.162							42%
Others (Commissions&Interest)	3.343	1.402.619	3.368.990		4.774.952							0											
Total Investment Amount	8.036.465	24.514.513	25.406.556	4.243.543	62.201.077	100%						57.426.125											

Depreciation	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Depreciation																						
Depreciation of New Investment																						
Equipment																						
Depreciation period (years)	35																					
Balance @ beginning	0	4.855.754	16.043.031	28.515.655	30.895.927	29.943.818	28.991.709	28.039.601	27.087.492	26.135.383	25.183.274	24.231.166	23.279.057	22.326.948	21.374.840	20.422.731	19.470.622	18.518.514	17.566.405	16.614.296	15.662.188	14.710.079
Additions	4.998.571	11.663.331	13.329.521	3.332.380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	142.816	476.054	856.898	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109	952.109
Balance @ end	4.855.754	16.043.031	28.515.655	30.895.927	29.943.818	28.991.709	28.039.601	27.087.492	26.135.383	25.183.274	24.231.166	23.279.057	22.326.948	21.374.840	20.422.731	19.470.622	18.518.514	17.566.405	16.614.296	15.662.188	14.710.079	13.757.970
Construction																						
Depreciation period (years)	49																					
Balance @ beginning	0	2.972.622	14.032.153	22.266.909	22.686.187	22.194.303	21.702.419	21.210.535	20.718.651	20.226.766	19.734.882	19.242.998	18.751.114	18.259.230	17.767.346	17.275.462	16.783.578	16.291.694	15.799.809	15.307.925	14.816.041	14.324.157
Additions	3.034.552	11.448.563	8.708.044	911.162	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	61.930	389.031	473.289	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884	491.884
Balance @ end	2.972.622	14.032.153	22.266.909	22.686.187	22.194.303	21.702.419	21.210.535	20.718.651	20.226.766	19.734.882	19.242.998	18.751.114	18.259.230	17.767.346	17.275.462	16.783.578	16.291.694	15.799.809	15.307.925	14.816.041	14.324.157	13.832.273
Amount To be Paid to DSI	97.865.581																					
Depreciation period (years)	49																					
Balance @ beginning	0	95.868.324	93.871.068	91.873.811	89.876.554	87.879.297	85.882.041	83.884.784	81.887.527	79.890.270	77.893.014	75.895.757	73.898.500	71.901.243	69.903.987	67.906.730	65.909.473	63.912.216	61.914.959	59.917.703	57.920.446	55.923.189
Additions	97.865.581	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257	1.997.257
Balance @ end	95.868.324	93.871.068	91.873.811	89.876.554	87.879.297	85.882.041	83.884.784	81.887.527	79.890.270	77.893.014	75.895.757	73.898.500	71.901.243	69.903.987	67.906.730	65.909.473	63.912.216	61.914.959	59.917.703	57.920.446	55.923.189	53.925.932
Total	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250
Income Statement (Eur)																						
Net Revenue	0	0	521.167	15.635.000	16.349.631	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000
Net Sales	0	0	441.667	13.250.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000	15.900.000
VAT Refunded	0	0	79.500	2.385.000	449.631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VER Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cost of Sales	-2.202.003	-2.862.343	-3.601.277	-12.802.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268	-14.445.268
Gross Profit	-2.202.003	-2.862.343	-3.080.110	2.832.732	1.904.363	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732
EBITDA	0	0	247.333	6.273.982	5.345.613	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982	4.895.982
EBITDA Margin	0%	0%	56%	47%	34%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%
Financing income / (expense), net				-3.509.965	-2.679.604	-1.965.043	-1.250.482	-535.921	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Income / (Expenses)- net				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income before Tax	-2.202.003	-2.862.343	-3.080.110	-677.233	-775.240	-510.310	204.251	918.812	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732
Taxation on income				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deferred Taxation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Income before Monetary Gain (Loss)	-2.202.003	-2.862.343	-3.080.110	-677.233	-775.240	-510.310	204.251	918.812	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732
Monetary gain/(loss)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Income for the period	-2.202.003	-2.862.343	-3.080.110	-677.233	-775.240	-510.310	204.251	918.812	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732
Cash Flow Statement (Eur)																						
Net Income	31.12.2007	31.12.2008	31.12.2009	31.12.2010	31.12.2011	31.12.2012	31.12.2013	31.12.2014	31.12.2015	31.12.2016	31.12.2017	31.12.2018	31.12.2019	31.12.2020	31.12.2021	31.12.2022	31.12.2023	31.12.2024	31.12.2025	31.12.2026	31.12.2027	31.12.2028
Net Income	-2.202.003	-2.862.343	-3.080.110	-677.233	-775.240	-510.310	204.251	918.812	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732	1.454.732
Depreciation	2.202.003	2.862.343	3.327.444	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250	3.441.250
Working Capital Requirement																						
Change in Trade Receivables			-24.537	-711.574	-147.222	0	0	0	0	0	0	0	-13.889	0	0	0	0	0	0	0	0	0
Change in Trade Payables			273.833	7.941.167	1.643.000	0	0	0	0	0	0	0	155.000	0	0	0	0	0	0	0	0	0
Change In Other Assets			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change Liabilities			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investments	-8.036.465	-24.514.513	-25.406.556	-4.243.543	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equity	5.606.150	2.570.236	2.331.914	652.707	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt - Loan	2.430.316	21.944.276	23.074.642	3.590.836	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Debt Repayments																						
Loan				-10.030.328	-10.030.328	-10.030.328	-10.030.328	-10.030.328	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI Payment	0	0	0	0	0	0	0	0	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558	-9.786.558
Cash Generated During the Year	0	0	496.630	-36.719	-5.868.541	-7.099.389	-6.384.828	-5.670.267	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.890.576
Cumulative Cash Generated	0	0	496.630	459.910	-5.408.631	-12.508.020	-18.892.848	-24.563.115	-29.453.691	-34.344.268	-39.234.844	-44.125.420	-48.779.885	-53.575.461	-58.667.828	-63.773.350	-68.878.873	-73.984.396	-69.303.360	-64.622.325	-59.941.289	-55.260.254
Cash Flow to Equity	-5.606.150	-2.570.236	-1.835.284	-689.426	-5.868.541	-7.099.389	-6.384.828															

VER Revenues																						
Baseline EF	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Expected CO ₂ Reduction (tons)				162.710	195.252	195.252	195.252	195.252	195.252	195.252	195.252	195.252	198.322									
Default VER Price	0																					
Cash Flow with Different VER Prices (Euro)																						
0	-5.606.150	-2.570.236	-1.835.284	-689.426	-5.868.541	-7.099.389	-6.384.828	-5.670.267	-4.890.576	-4.890.576	-4.890.576	-4.890.576	-4.654.465	-4.795.576	-5.092.366	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
3	-5.606.150	-2.570.236	-1.835.284	-201.296	-5.282.785	-6.513.633	-5.799.072	-5.084.511	-4.304.820	-4.304.820	-4.304.820	-4.706.606	-4.488.439	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
4	-5.606.150	-2.570.236	-1.835.284	-38.586	-5.087.533	-6.318.381	-5.603.820	-4.889.259	-4.109.568	-4.109.568	-4.409.151	-4.556.716	-4.329.781	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
5	-5.606.150	-2.570.236	-1.835.284	124.124	-4.892.281	-6.123.129	-5.408.568	-4.694.007	-3.914.316	-4.033.596	-4.400.515	-4.400.515	-4.171.124	-5.105.523	-5.105.523	-5.105.523	-5.105.523	-5.105.523	4.681.035	4.681.035	4.681.035	4.681.035
IRR Calculation without VER																						
IRR - 49 Years (License duration)		2,3%																				
IRR Calculation with VER																						
IRR - 49 years (License Duration)																						
@ 3Eur/ton VER		2,5%																				
@ 4Eur/ton VER		2,6%																				
@ 5Eur/ton VER		2,7%																				

Sub-step 2c: Calculation and Comparison of Financial Indicators

1. Parameters required for calculation of key financial indicators

According to the financial feasibility study of the proposed project, the parameters required for the calculation of key financial indicators are in Table 7.

Table 7: Basic Parameters for Financial Analysis

Parameter	Value
Installed capacity (MW)	82.0
Grid connected output (MWh) ¹⁰	From 2009 to 2018 318,000 From 2019 Onwards 323,000
Capital investment (Euro)	62,201,077
Income tax rate (%)	20.0
Expected tariff (€/MWh)	5 €/MWh
Expected VER price (Euro/tCO ₂ e)	3-5
O&M (€/year)	1,146,088
Project lifetime (years)	49.0
Benchmark rate (%)	16.41

Results of the Financial Analysis

Table 5 includes the results of the financial analysis for the Project, at the time that the decision to go ahead was made, both with and without VER financing. The IRR of the Project without VER financing was lower than the applicable benchmark rate of return. This therefore indicates that in comparison to alternative investments, the Project was financially unattractive in the absence of VER financing.

Table 8: Summary of Project investment analysis without and with VER financing

	Without VER	@ 3€/ton VER	@ 4€/ton VER	@ 5€/ton VER
Equity IRR (%)	2,3%	2,5%	2,6%	2,7%

¹⁰ The expected electricity production is expected to increase after 2019 with the construction of another HEPP at the source side of Uzuncayir HEPP. Please also note that these figures are different from the expected energy production figure mentioned in the license as the license mentions an expected average figure.

3.Comparison of IRR for the proposed project to the financial benchmark

In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the project IRR, are lower than the benchmark, the proposed project is not considered financially attractive.

Table 6 distinguishes the equity IRR with and without carbon revenues. Without the additional income to the project developer resulting from VER sales, the Equity IRR is only 2.3%, which is lower than the financial benchmark. Thus, the proposed project is not financially attractive.

Taking VER revenues into consideration, the Equity IRR increases to 2.7% (with 5 €/ton VER price).

While the IRR with VERs remains lower than the financial benchmark of 16.41%, the Project Developer will also benefit from the following intangible benefits that VERs provide:

- A third party technical review of project documents will give extra confidence to both investors and financiers.
- Enhanced corporate green image of the project developer through its contribution to a clean source of electricity and the diversification of electricity sources in Turkey, which broadens stakeholder confidence.

Sub-step 2d: Sensitivity Analysis

Sensitivity analysis was applied to Investment Costs, Energy Production and Electricity Sales Price. Applying variations on investment costs, the range was considered to be in a bandwidth of +10% and – 10% as advised in “Tool for the demonstration and assessment of additionality (Version 05.2).”

The sensitivity in the investment amount was applied to the investment items, which represent equal, or above 20% of the total investment amount as suggested by “Tool for the demonstration and assessment of additionality (Version 05.2).”

Table 9: Sensitivity to Variation in Investment Costs

Change in %	IRR Sensitivity with Investment Costs				
	-10%	-5%	0%	5%	10%
Without VER	2,25%	2,25%	2,24%	2,24%	2,23%
IRR @3 €/ton VER	2,52%	2,52%	2,51%	2,51%	2,50%
IRR @4 €/ton VER	2,62%	2,61%	2,60%	2,60%	2,59%
IRR @5 €/ton VER	2,71%	2,71%	2,70%	2,69%	2,69%

Variation on energy production was also applied in a bandwidth of +10% and –10% on the secondary energy production, which reflects the volatility in calculations. Please note that “primary” part of the production reflects the electricity production, which is 90%, guaranteed amount. Therefore no sensitivity was applied to this part.

Table 10: Sensitivity to Variation in Energy Production

Change in %	IRR Sensitivity with Electricity Production				
	-10%	-5%	0%	5%	10%
Without VER	1,33%	1,79%	2,24%	2,70%	3,17%
IRR @3 €/ton VER	1,54%	2,03%	2,51%	3,01%	3,51%
IRR @4 €/ton VER	1,62%	2,11%	2,60%	3,11%	3,63%
IRR @5 €/ton VER	1,69%	2,19%	2,70%	3,22%	3,75%

Due to the fact that the feed in tariff price is fixed in Turkey, the unit energy price is not considered to be an exogenous variable. However, sensitivity stemming from increasing price was also applied to see the effect of price changes.

Table 11: Sensitivity to Variation in Energy Production

Change in %	IRR Sensitivity with Electricity Price				
	-10%	-5%	0%	5%	10%
Without VER	na	na	2,24%	3,38%	4,53%
IRR @3 €/ton VER	na	na	2,51%	3,69%	4,90%
IRR @4 €/ton VER	na	na	2,60%	3,80%	5,03%
IRR @5 €/ton VER	na	na	2,70%	3,91%	5,16%

The above sensitivity analysis reveals the fact that no alternative scenario without VER revenues can make the project pass the benchmark IRR expectation which is in 16% to 18% range. Therefore, the project is still financially not attractive.

Step 3: Barrier Analysis

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

It is important to note that the participation of Turkish private sector in the renewable energy business is a very new concept. Before the subject Energy Law, companies had never been responsible for the whole process -planning and financing of the project, choosing the technology and operating of HEPPs- of the investment and had never taken all the risks related to the entire investment process. Hence, most of the private companies in Turkey have little experience and know-how in the management and operation of HEPPs. As part of its energy policy during late 80's, Turkey started a liberalization process in its electricity market. The liberalization process commenced with electricity production and is expected to be completed early 2010's when full privatization of state-owned distribution and production assets are completed. Formerly, all energy plants but especially the HEPPs have been built and operated by the State. While the privatization of energy production through licenses for HEPPs and wind farms offers lucrative investment opportunities, the Turkish private sector still has limited experience in this field.

Despite somewhat reasonable figures in the financial feasibility studies, banks and other financial institutions are very cautious in providing loans to these projects for various reasons. When they do, the rates are significantly high due to risk premiums that stem from lack of full confidence in the projects because of limited technical knowledge and experience of the project owners. Hence, most of the projects are presumed to be feasible but not bankable because combined with uncertainty about the future national policy on renewable energy, currency risks and opportunity costs, the banks cannot fully confide in such projects.

On the other hand, the financial institutions in the country lack the technical capacity and know-how to assess such projects to ensure the output from them. Verification of output from an independent third party and the resulting financial support from international buyers of carbon emission reduction would be a leap of faith for the banks and financial institutions, which hesitate to be on the long-term financing side of such projects. The support would not only ease the crediting process for the project owners but would also give a stronger hand in negotiating for less expensive loans. Consequently, even if such projects achieve some financing from the banks; the project owners are seldom content with the credit terms regarding the tenor and the price.

Other Barriers

Security Sensitive Investment Region and Transportation Problems

The region itself where the project is located presents specific barriers as the region is a highly sensitive area in terms of security. The project has many risks because of the security problems and also the transportation difficulties related to the security problems. The president of TUSIAD, which is the largest employer organization in Turkey, declares that making investment in South East Anatolia Region (where the project is located) is very difficult due to security issues and the insufficient infrastructure. In addition, the Minister of Industry and Trade also confirms this statement in one of his interview and says that the investors can only “gropingly” enters the East and south East regions of the country because of the security problems and lack of infrastructure¹¹. The Minister gives marble reserves in the region as an example as these reserves cannot be utilized due to security problems¹².

Due to security issues Tuncel was managed under state of emergency rules for 15 years.¹³ Although the state of emergency was lifted in 2002 the security problems in Tunceli still continue. In 2010, 35 terrorist incidents have occurred in Tunceli according to the General Staff of Turkish Army records.¹⁴ In the neighbor provinces (Elazig, Bingol and Erzincan) the total number of terrorist incidents is 27. In addition, overall number of terrorist incidents in East and south East Anatolia was 508 only in 2010. All these facts show that the region in which the project is located is not secure for such an investment.

¹¹<http://www.hurriyet.com.tr/ekonomi/15210810.asp>

¹²<http://www.hurriyet.com.tr/ekonomi/15210810.asp>

¹³<http://www.habervitrini.com/haber.asp?id=60205>

¹⁴<http://www.tsk.tr/HABERLER ve OLAYLAR/5 Bolucu Teror Orgutuyle Mucadele/bolucu teror orgutuyle mucadele 2010.htm>

On the other hand, when the other hydroelectric projects are considered, it can be seen that there is not any other comparable project as far as the technology and size are concerned. In Tunceli and its neighboring cities (which are Elazig, Erzincan and Bingol) there are 9 comparable projects. However, only one project is close to completion other than Uzuncayir HEPP. However this project (Konaktepe HEPP) is owned by public.¹⁵Therefore, the Project proves to be the only private project with a reservoir, which is close to completion.

Also, the security problems in the area exacerbates with the fact that the project location is away from the city centre where the security problems are lesser. All these factors make investors to take difficult investment decisions in the region. Despite all handicaps, the owner of the company decided to realize this investment by taking the security risk. As mentioned above, the project is the largest infrastructure investment realized by private sector in Tunceli.

In addition to this, the closest port is 361 km (Trabzon) and the closest airport to the project area is 120 km (from Elazig) away. The Tunceli-Elazig road is also a security sensitive area in which many security problems such as armed and bombing attacks have been occurred¹⁶. Because of these security and transportation problems, the project experiences significant barriers in transportation of machinery and equipments for the construction and the power plant itself¹⁷. In addition, the transportation and accommodation of experts during the design, construction and the operation phases is a significant challenge for the project as there is only one small hotel in the city of Tunceli. Therefore, any possible equipment malfunction in the future may cause long delays in operation due to both security and insufficient social infrastructure issues. Long process for delivery of equipment and difficulty in reaching maintenance services increase the risk of underperformance for the project.

In the light of all these issues, it can be said that the company has many security and transportation problems,because of the lack of security and infrastructure in the region.

Outcome of Sub-step 3a: Based on the above analysis, there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity is not registered as a VCS activity.

Sub-step 3b: The identified barriers would not prevent the implementation of at least one of the alternatives (except for the proposed project activity)

The barriers explained above are specific to renewable energy projects in general and to HEPPs in particular. They do not apply to thermal power plants (Alternative 1). The project is located away from access points to the country which leads extra problems in transportation of imported equipments

¹⁵http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm

¹⁶<http://www.8sutun.com/haberdetay.asp?tarih=08.09.2010&Newsid=11350&Categoryid=7>

¹⁷<http://www.e-hayat.net/dogu-anadolu-bolgesi/>

whereas usually locations of thermal power plants are near sea or large pipelines as large coal fire plants in Turkey.

In conclusion, sub-step 3b is satisfied because the identified barriers do not apply to Alternative 1. Therefore, subject to outcome of Common Practice Analysis (Step 4), the project may be additional

Step 4: Common Practice Analysis

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

Hydro energy production is heavily dependent on the amount of water coming to the facility which is in return in relation to meteorological and regional conditions. Therefore, Uzuncayir project should be compared with hydro projects with similar installed capacity in the same region. Analyzing similar activities in the region that means the same city where the subject project is located, it is seen that there are various hydro projects of all sizes. However, only 1 project ¹⁸is similar to the subject project in terms of project size: Tatar HEPP 131.16 MW which is also owned by Limak. This project is also planned to benefit from carbon revenues. Yet, the project has a very different structure compared to Uzuncayir as Limak is involved with the project development from the start of the project whereas Uzuncayir was taken over from DSI in the middle of the project.

As also mentioned above, participation of private sector in the electricity generation from hydropower plants is a very new concept in Turkey. Facing the growing demand for electricity and lacking the capital to realize hydro investment, the State outsourced the construction of those plants through licenses. As seen in the table below¹⁹, the number of projects that are close to completion is very low (only 57 projects out of 477 were completed more than 50% as of now). The low rate of completion of the projects confirms the barriers elaborated above and also proves that the electricity generation from HPP business is not a common practice.

Table 12: Number of HPP Facilities completed over a certain completion ratio

Completion Ratio (%)	Number of Facilities
>10% Completed	143
>20% Completed	108
>30% Completed	92
>40% Completed	70
>50% Completed	57
>60% Completed	40
>70% Completed	34

¹⁸ <http://www.epdk.gov.tr/lisans/elektrik/proje/yenilenebilir.xls>

¹⁹ http://www.epdk.gov.tr/lisans/elektrik/ilerleme_proje.htm (Accessed on 3 September 2009)

In addition, the new capacity from privately owned hydro facilities represents a friction of new facilities added to Turkey's capacity every year. As displayed in the table below, on average, the new privately owned hydro facilities represents only 2.3% of new additions. Similarly, new additions from privately held hydro projects represents only 0,1% of Turkey's installed capacity in the last 6 years.

Table 13: Annual privately held hydro projects' capacity additions, total additions and total installed capacity²⁰

	2007	2006	2005	2004	2003	2002
Total Additional Installed Capacity from Private Hydro* (MW)	36,1	105,4	45,6	9,5	36,6	28,0
Total Additional Installed Capacity (MW)	1.059,6	1.817,6	2.019,5	1.236,9	3.741,3	3.513,4
Turkey's Total Installed Capacity	40.835,7	40.564,8	38.843,5	36.824,0	35.587,0	31.845,8
Private Hydro / Total Addition	3,4%	5,8%	2,3%	0,8%	1,0%	0,8%
Private Hydro / Total Capacity	0,1%	0,3%	0,1%	0,0%	0,1%	0,1%

*: Excluding Concessionary Rights and BOT Projects

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

As it was demonstrated in Sub-step 4b, there are no similar activities occurring concurrently. This could be explained because of the serious barriers that this kind of projects must overcome in order to be financially attractive to investors.

Therefore, nowadays, the VCS-VER project activity is the most suitable solution to increase the project's financial attractiveness and raising it to a reasonable level.

All in all, the low rate of completion of the projects and the low contribution privately held hydro projects confirm the barriers elaborated above and also proves that the electricity generation from HEPP business is not a common practice. Therefore Step 4 is satisfied.

3.6 Methodology Deviations

Not Applicable

²⁰<http://www.teias.gov.tr/ist2007/8.xls><http://www.teias.gov.tr/ist2006/8.xls><http://www.teias.gov.tr/istatistik2005/7.xls><http://www.teias.gov.tr/istat2004/7.xls><http://www.teias.gov.tr/istatistik/7.xls>

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Explanation of methodological choices:

The host country (Turkey) published the combined emission factor as 0.5706 tCO₂/MWh on October 2021 by using “Tool to calculate the emission factor for an electricity system” (Version 06.0). The only revision between the version 6 and 7 is to include monitoring requirements for parameters used to determine the emission factor of the isolated grid and Uzuncayir HPP is not an isolated grid. Hence there is no change between versions 6 to 7 which will impact the emission factor calculation relevant for the project activity. This methodological tool determines the CO₂ emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the “combined margin” emission factor (CM) of the electricity system.

The Project therefore applies the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” Version 06.0 as follows:

Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, 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 project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO₂ emissions factor in year y (tCO₂/MWh) And

And

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

$EG_{Facility,y}$ = Quantity of net electricity generation supplied by the project plant to the grid in year y (MWh/yr)

The Emission Factor of Turkey for 2019 was calculated and published by Turkish Ministry of Energy and Natural Resources on 06/10/2021²¹ using Version 06.0 of TOOL 7: "Tool to calculate the emission factor for an electricity system". Both operating margin emission factor and build margin emission factor data are separately specified by the Turkish Ministry of Energy and Natural Resources. The document in which this data is written separately has been shared with the validated DOE. Data is as follows:

The operating margin emission factor: $EF_{grid,OM,y} = 0.7258 \text{ tCO}_2/\text{MWh}$

And build margin emission factor: $EF_{grid,BM,y} = 0.4153 \text{ tCO}_2/\text{MWh}$

The combined emission factor is calculated as follows:

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

Where:

w_{OM} : Weighting of OM emission factor (%)

w_{BM} : Weighting of BM emission factor (%)

and

$$w_{OM} = 0.50$$

$$w_{BM} = 0.50$$

$$EF_{grid,CM,y} = 0.50 \times 0.7258 + 0.50 \times 0.4153 = 0,5706 \text{ tCO}_2/\text{MWh}$$

In the above report which is calculated by Turkish Ministry of Energy and Natural Resources applied the weighting factors of both OM and BM emission are 0.5, which is not applicable for the renewal crediting period according to both version 06.0 and 07.0 of "Tool to calculate the emission factor for an electricity system". According to the Version 06.0 of "Tool to calculate the emission factor for an electricity system", which the methodology referred the following default values have to be used in the renewal crediting period:

$$w_{OM} = 0.25 \text{ and } w_{BM} = 0.75$$

So, since this is the renewal of the period, the CM emissions factor is as follows:

$$EF_{grid,CM,y} = 0.25 \times 0.7258 + 0.75 \times 0.4153 = 0.4929 \text{ tCO}_2/\text{MWh}$$

²¹ https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Hence, the calculation of baseline emission is calculated as follows:

Where:

BE_y	Baseline emissions in year y(tCO ₂ /yr)
$EG_{\text{facility},y}$	Electricity supplied by the Uzuncayir Hydropower Electricity Power Plant to the grid and equal to 244,438 MWh/yr
$EF_{\text{grid,CM},y}$	Combined margin CO ₂ emission factor for the grid and equal to 0.4929 tCO ₂ /MWh

Therefore:

$$BE_y = 244,438 \times 0.4929 = 120,483 \text{ (tCO}_2\text{/yr)}$$

4.2 Project Emissions

As ACM0002, Version 20.0 para 31 states for most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

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

PE_y	=	Project emissions in year y (t CO ₂ e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (t CO ₂ /yr)
$PE_{GP,y}$	=	Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO ₂ e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (t CO ₂ e/yr)

In this case,

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

Since for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected according to the methodology. There are 5 auxiliary diesel generators in the project activity and the emissions resulting from the occasional use of these generators.

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

Since this is not a dry or flash steam geothermal project activity.

$$PE_{HP,y} = 21,999 \text{ tCO}_2\text{e/year}$$

Where: $PE_{HP,y}$ = Project emissions from water reservoirs (tCO₂e/yr)

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

Where:

- $PE_{HP,y}$ = Project emissions from water reservoirs (t CO₂e/yr)
 EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants (kg CO₂e/MWh)
 TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

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

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

Where:

- PD = Power density of the project activity (W/m²)
 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 (m²)
 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 (m²). For new reservoirs, this value is zero

$$Cap_{PJ} = 82,000,000 \text{ W}$$

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

$$A_{PJ} = 13,400,000 \text{ m}^2$$

$$A_{BL} = 0 \text{ (Justification: The project is a new hydro power plant)}$$

Therefore;

$$PD = (82,000,000 - 0) / (13,400,000 - 0) = 6.119 \text{ W/m}^2$$

Therefore;

PE_y cannot be assumed to be 0. 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:

If the power density of the project activity using equation (7) or in case of integrated hydro power project using equation (8) is greater than 4 W/m² and less than or equal to 10 W/m² :

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

Where:

$PE_{HP,y}$ = Emission from reservoir expressed as tCO₂e/year

EF_{Res} = Is the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO₂e /MWh

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

Therefore;

$$PE_{HP,y} = 244,438 \times 90 / 1000 = 21,999 \text{ tCO}_2\text{e/year}$$

In conclusion,

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

$$PE_y = 0 + 0 + 21,999$$

$$PE_y = 21,999 \text{ tCO}_2\text{e/year}$$

Hence,

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

$$ER_y = BE_y - PE_y$$

$$98,484 = 120,483 - 21,999$$

4.3 Leakage

The main emissions potentially giving rise to leakage are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). However according to ACM0002 Version 20.0 para 53, these emission sources can be neglected, therefore $LE_y = 0$. Hence, there are no leakage emissions related to project activity.

4.4 Net GHG Emission Reductions and Removals

Year	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)
2019(02.12.2019 to 31.12.2019)	10,040	1,833.00	0	8,207
2020	120,483	21,999.00	0	98,484
2021	120,483	21,999.00	0	98,484
2022	120,483	21,999.00	0	98,484
2023	120,483	21,999.00	0	98,484
2024	120,483	21,999.00	0	98,484
2025	120,483	21,999.00	0	98,484
2026	120,483	21,999.00	0	98,484
2027	120,483	21,999.00	0	98,484
2028	120,483	21,999.00	0	98,484
2029(01.01.2029 to 01.12.2029)	110,443	20,166.00	0	90,277
Total	1,204,830	219,990.00	0	984,840

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system”
Source of data	Data published by Turkish Ministry of Energy and Natural Resources

	on 06/10/2021 ²²
Value applied	0.7258
Justification of choice of data or description of measurement methods and procedures applied	The $EF_{grid,OM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources on 06/10/2021 using Version 06.0 of TOOL 7:“Tool to calculate the emission factor for an electricity system”,
Purpose of Data	For calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Building margin CO ₂ emission factor for grid connected power generation in year y calculated using the “Tool to calculate the emission factor for an electricity system”
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021 ²³
Value applied	0.4153
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,BM,y}$ was calculated and published by Turkish Ministry of Energy and Natural Resources using Version 06.0 of TOOL 7:“Tool to calculate the emission factor for an electricity system”.
Purpose of Data	For calculation of $EF_{grid,CM,y}$
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh

²² https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

²³ https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Description	Combined margin Emission Factor of Turkey
Source of data	Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021 ²⁴
Value applied	0.4929
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,CM,y}$ was calculated using the published data by Turkish Ministry of Energy and Natural Resources. Calculated data of $EF_{grid,OM,y}$ and $EF_{grid,OM,y}$ were used.
Purpose of Data	Calculation of baseline emission (BE_y).
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	Cap_{PJ}
Data unit	MhW
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Turbine Supplier information on the equipment
Frequency of monitoring/recording	Yearly
Value applied	82 MW
Monitoring equipment	N/A
QA/QC procedures to be applied	Supplier information on the related equipment and existence of the equipment will be checked
Purpose of data	Data is used to calculate baseline emission.

²⁴ https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular/Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Calculation method	N/A
Comments	-

Data / Parameter	A _{PJ}
Data unit	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project site
Description of measurement methods and procedures to be applied	Pre-calculated area figures in relation to the depth of the reservoir will be used. The graphic that exhibits the correlation between the depth of the reservoir lake and its area is determined based on the correlation between the topographic elevation contour lines and depth of the reservoir. A Hydrostatic Level Measurement device, with a Pressure sensor, measures the water depth at the reservoir. The device installed at the project reservoir is “Deltapilot S DB”. The depth measurements are kept in the logbook as daily lake depth measurement. Later the maximum value obtained during the year is utilized to determine the maximum extent of the reservoir area (Please see Appendix 4).
Frequency of monitoring/recording	Yearly
Value applied	13,400,000 m ²
Monitoring equipment	N/A
QA/QC procedures to be applied	The depth readings will be done on daily basis from
Purpose of data	Data to be used for the calculation of Project Emissions.
Calculation method	N/A
Comments	N/A

Data / Parameter	EG _{PP-Import, y}
Data unit	MWh
Description	Quantity of electricity imported by the power plant from the Grid, in year y

Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity imported from the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAS. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	Will be determined at the monitoring stage.
Monitoring equipment	<p>Calibrated between 2019-2029</p> <p>EMH-LZQJ-XC</p> <p>0.5 S</p> <p>8923709-Measures generation by turbine I(main)</p> <p>8923710-Measures generation by turbine I(control)</p> <p>8923711- Measures generation by turbine II(main)</p> <p>8923712- Measures generation by turbine II(control)</p> <p>8923713- Measures generation by turbine III (main)</p> <p>8923714- Measures generation by turbine III(control)</p> <p>Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market²⁵. They have an accuracy class of Class 005 indicating an accuracy range of 0.5%.</p>
QA/QC procedures to be applied	Meter readings will be cross-checked with the PMUM/MFRC data obtained from the screen shots of the MFRAC System.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

²⁵ The latest version of the communiqué (in Turkish) can be found in the following link: <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44>

Data / Parameter	EG _{PP-export, y}
Data unit	MWh
Description	Quantity of electricity exported by the power plant to the grid, in year y
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEİAŞ. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	Will be determined at the monitoring stage.
Monitoring equipment	Calibrated between 2019-2029 EMH-LZQJ-XC 0.5 S 8923709-Measures generation by turbine I(main) 8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control) Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market ²⁶ . They have an accuracy class of Class 005 indicating an accuracy range of 0.5%.
QA/QC procedures to be applied	Measurements are carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class02, that is to say should be within the $\pm 0.5\%$ (± 0.005) range. The monthly reported readings will also be cross-checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof

²⁶ The latest version of the communiqué (in Turkish) can be found in the following link: <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44>

	for quality and reliability of data.
Purpose of data	Data will be used to calculate net electricity supplied to the grid.
Calculation method	Direct continuous measurement
Comments	-

Data / Parameter	EG _{PP-net, y}
Data unit	MWh
Description	Quantity of the net electricity supplied to the grid by the power plant, in year y
Source of data	The Primary source of data will be the Main TEIAS meter recorded at the monthly reading protocols, the column related to electricity exported to the Grid.
Description of measurement methods and procedures to be applied	Measurements are to be made by electricity meters. That belong to the grid operator TEIAS. The meters are in compliance with the collected data. Data will be used to calculate the net electricity supplied to the grid.
Frequency of monitoring/recording	Recorded continuously, reported monthly on TEIAS Meter Reading Protocols, Reported annually on the VCS Monitoring Report.
Value applied	Will be determined at the monitoring stage.
Monitoring equipment	Calibrated between 2019-2029 EMH-LZQJ-XC 0.5 S 8923709-Measures generation by turbine I(main) 8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control) Both meters are in compliance with the communiqué for Metering Devices to be used in the Electricity Market ²⁷ . They have an accuracy class of Class 005 indicating an accuracy range of 0.5%.

²⁷ The latest version of the communiqué (in Turkish) can be found in the following link: <http://www.epdk.gov.tr/web/elektrik-piyasasi-dairesi/44>

QA/QC procedures to be applied	Measurements are carried out in compliance with the communiqué for Metering Devices to be used in the Electricity Market. The minimum accuracy of the meters are Class05, that is to say should be within the $\pm 0.5\%$ (± 0.005) range. The monthly reported readings will also be cross-checked against the monthly PMUM/MFRC screen shots. The PMUM/MFRC data of electricity sales will also be a proof for quality and reliability of data.
Purpose of data	Data will be used to calculate emission reduction calculations.
Calculation method	$EG_{PP-net, y} = EG_{PP-export, y} - EG_{PP-import, y}$
Comments	-

5.3 Monitoring Plan

The following is the description of the monitoring plan as outlined in the validated VCS-PDD. 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.

All the data will be collected and stored by Limak not only during the crediting period but also two years after the last issuance of VERs to Uzuncayir HEPP project for that crediting period.

The emission factors are calculated ex-ante for the period of ten years. The combined margin will be recalculated through ACM0002 / Version 20, any time the crediting period is renewed. The monitoring is performed in-house by the project proponent:

1. Electrical Engineers undertake the specific actions required by the monitoring plan, i.e. they measure the electricity generation, the electricity supplied to the Turkish grid by the power plant, the electricity imports and the amount of fuel consumed, if fuel is consumed.
2. Mechanical Engineers ensure that all the instrumentations and devices to perform the monitoring are working properly.
3. Accounting Manager is in charge of providing the electricity sales receipts to the Operations Manager of the plant.
4. Operations Managers the VER coordinator. He is in charge of:
 - a) Ensuring that instrumentations and devices are available and properly suited to perform efficiently the monitoring.
 - b) Communicating and coordinating the monitoring tasks of all business units.
 - c) Developing, executing, analyzing and improving the VER Monitoring/Reporting Procedures. This includes the crosschecking and consolidation (with multiple sources whenever possible) of

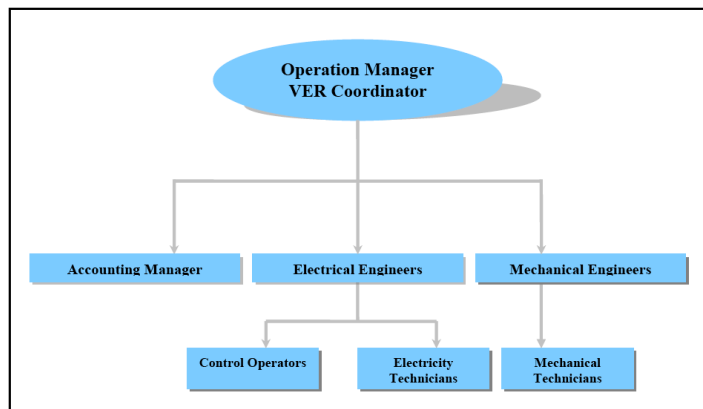
the data obtained from the electrical engineers and the accounting manager.

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 2 where the site organizational chart is presented.

Figure 2:Organizational Structure



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

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

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

Measuring

The Electrical Engineers obtain the readings from the meters, report them in the spreadsheet for measurement control and store the data discharged from the meters electronically.

All the measuring equipments are in line with the EMRA requirements. The recalibration of these equipments done in line with the equipment requirements but re-calibration periods are defined by national metrology institutes country by country and in Turkey this period is defined as 10 years²⁸. All the meters installed within the project are inline with EMRA requirements.

Table 14:Information About Meters

Meter	Main Meters			Backup meters		
Function	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3
Located	At the plant	At the plant	At the plant	At the plant	At the plant	At the plant
Serial No.	53035201	53035202	53035203	53035204	53035205	53035206
Calibration date	10/11/2009	10/11/2009	10/11/2009	10/11/2009	10/11/2009	10/11/2009
Valid Until ²⁹	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019
Meter	Main Meters			Backup meters		
Function	Unit 1	Unit 2	Unit 3	Unit 1	Unit 2	Unit 3
Located	At the plant	At the plant	At the plant	At the plant	At the plant	At the plant
Serial No.	8923709	8923711	8923713	8923710	8923712	8923714
Calibration date	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019	30/11/2019
Valid Until	30/11/2029	30/11/2029	30/11/2029	30/11/2029	30/11/2029	30/11/2029

²⁸ <http://www.mevzuat.adalet.gov.tr/html/21179.html>

²⁹ Within the scope of the regulation in Turkey (<https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=6381&MevzuatTur=7&MevzuatTertip=5>), the stamp year is taken as basis year and the year it is stamped(2009) is counted as the first year, regardless of the date and the remaining period is calculated from the year it was stamped(2009+10 years).

TEIAS conducts the calibration and maintenance of the meters and thus, ensures the accuracy and quality of the measurements.

Besides, in order to measure the electricity production figure of the plant accurately, there are two sets of meters in the powerhouse. One is the main meter for measuring and the other is the check meter for control. Both of these meters are metering the energy in two directions (consumption and production). If there is a measuring difference between these two meters and one of the parties (TEIAS or the company) requests for calibration of the meters, in this case, the meters are calibrated without waiting for the periodic calibration date. (TEIAS System Usage Agreement, Art 3, B./2./b))52. This calibration process is done by another third party under the control of TEIAS. The company is not responsible for calibration of the meters in Turkey according to the local standards.

On the other hand, the emission reductions will be calculated according to the measurements of the main electricity meter, since the electricity production invoices are made out based on this meter. During the each monitoring period, the invoices will be presented to the DOE, together with the calculation details. The Electrical Engineers will receive sufficient and continuous training in terms of monitoring and verification on aspects such as meter's reading and calibration and readings recording, adjustment 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.

APPENDIX 1:EIA REQUIREMENT

The documents below explain that the project and quarries defined under the feasibility dated October 1987 are all exempt from EIA requirement in line with the regulation dated 23.06.1997 numbered 23087 and the regulation dated 16.12.2003 numbered 25318

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T.C.
ÇEVRE VE ORMAN BAKANLIĞI
Devlet Su İşleri Genel Müdürlüğü Etüd ve Plan Dairesi Başkanlığı

Sayı : B 18 1 DSI 0 10 16 00 / 130.Ç.02/ 13048
Konu : Uzunçayır Barajı ve HES Projesi
Malzeme Ocakları

29 Kasım 2007

LİMAK İNŞ. SAN. TİC. A.Ş.
Hafta Sokak No:9 G.O.P./ANKARA

İLGİ : 26.11.2007 tarihli dilekçeniz.

İlgi dilekçenizde, Tunceli İli sınırları içerisinde yapımı devam eden Uzunçayır Barajı ve HES Projesinin inşasında kullanılacak yurtdışından temin edilecek malzemelere Yatırım Teşvik Belgesi alınması için tesisin ÇED Raporu gerektiğinden bahisle ÇED durumuyla ilgili bilgi talep edilmektedir.

Uzunçayır Baraj ve HES Projesine yönelik ÇED muafiyeti 2000 yılında, malzeme ocaklarına yönelik ÇED muafiyeti ise 2004 yılında alınmış olup yazımız ekinde tarafınıza sunulmaktadır.

Bilgilerinizi rica ederim.

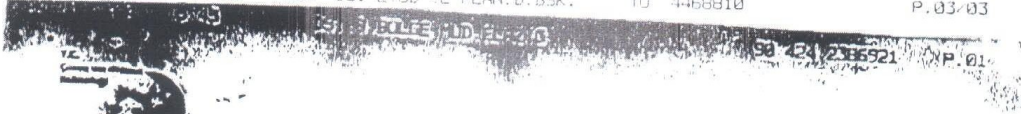

Akif ÖZKALDI
Genel Müdür a.
Genel Müdür Yardımcısı

EK:
-ÇED muaf yazısı(1 sayfa)

DSİ Genel Müdürlüğü Etüd ve Plan Daire Bşk
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Ayrıntılı Bilgi İçin İrtibar,
Tel: (0312) 417 83 00

29-NOV-2007 15:36 FROM DSI ETUD VE PLAN.D.BSK. TO 4468810 P.03/03



T.C. ÇEVRE VE ÖRMAN BAKANLIĞI
ÇEVRESEL ETKİ DEĞERLENDİRMESİ VE PLANLAMA GENEL MÜDÜRLÜĞÜ
Endüstriyel Yatırımlar ÇED Dairesi Başkanlığı

SAYI : B 18 0 ÇED 0 13 00 03/ 3376
KONU : Uzunçayır Barajı ve HES Projesi
Malzeme Ocakları.

03 HAZİRAN 2006

29041

DEVLET SU İŞLERİ GENEL MÜDÜRLÜĞÜNE

İLGİ: Devlet Su İşleri Genel Müdürlüğü'nün 10.05.2004 tarih ve B.15.1.DSI 0.10.18.00/123.Ç.-2239 sayılı yazısı.

İlgide kayıtlı yazıda; Tunceli ili sınırları içerisinde yapımı devam eden Uzunçayır Barajı ve HES Projesi için gereken malzemenin temin edilmesi amacıyla 3 (üç) adet Geçirimsiz, 2 (iki) adet Geçirimli ve 5 (beş) adet de Kaya Malzemesi Ocağı olmak üzere 10 (adet) Malzeme Ocağının ÇED Yönetmeliğinin Geçici 3. maddesi kapsamında değerlendirilip değerlendirilmeyeceği hususunda görüş talep edilmektedir.

Uzunçayır Barajı ve HES Projesi 01.05.2000 tarihinde, 23.06.1997 tarih ve 23028 sayılı ÇED Yönetmeliğinin Geçici 4. maddesi gereğince Yönetmelik kapsamı dışında değerlendirilmiştir.

İlgide kayıtlı yazı ve eklerinin incelenmesi neticesinde, 07.02.1993 tarihinden önce projeye dahil (entegre) olması nedeniyle, sözkonusu proje için gereken malzemenin temin edilmesi amacıyla açılması planlanan ve projenin Ekim 1987 tarihli "Doğal Yapı Gereçleri Raporu" bölümünde isim ve yerleri belirtilen 10 adet malzeme ocağı, sözkonusu baraj ve HES projesi ile birlikte, yürürlükte bulunan 16.12.2003 tarih ve 25318 sayılı ÇED Yönetmeliğinin Geçici 3. maddesi gereğince Yönetmelik kapsamı dışında değerlendirilmiştir.

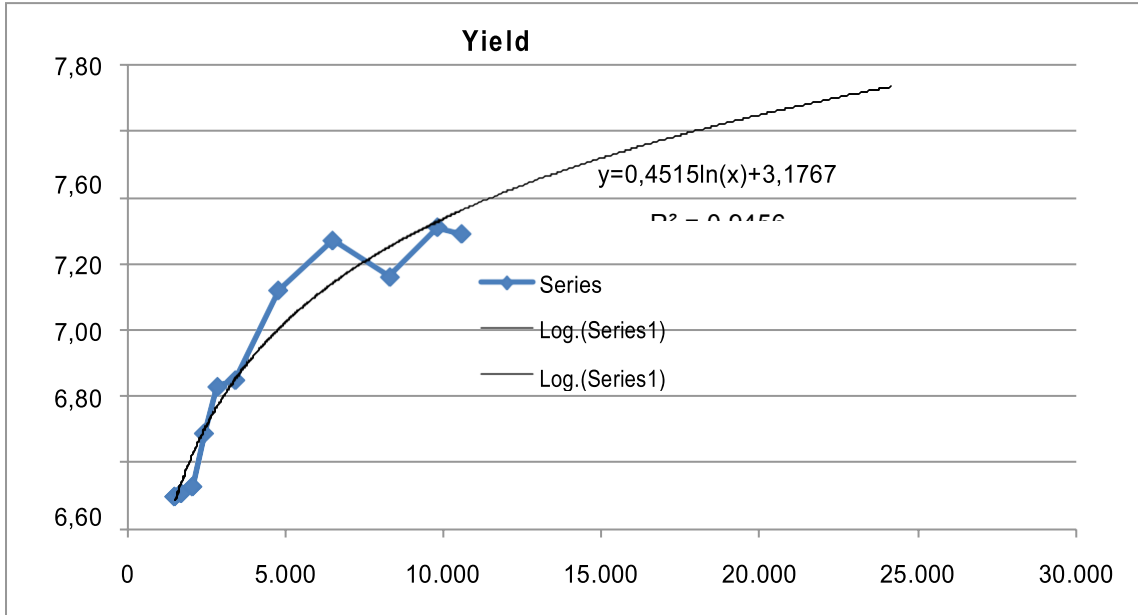
Bilgilerinizi ve gereğini rica ederim.


Osman TÜZÜN
Bakan a.
Genel Müdür

DAĞITIM:

- Tunceli Valiliği
- (il Çevre ve Orman Müdürlüğü)
- Devlet Su İşleri Genel Müdürlüğü

APPENDIX 2:YIELD CURVE

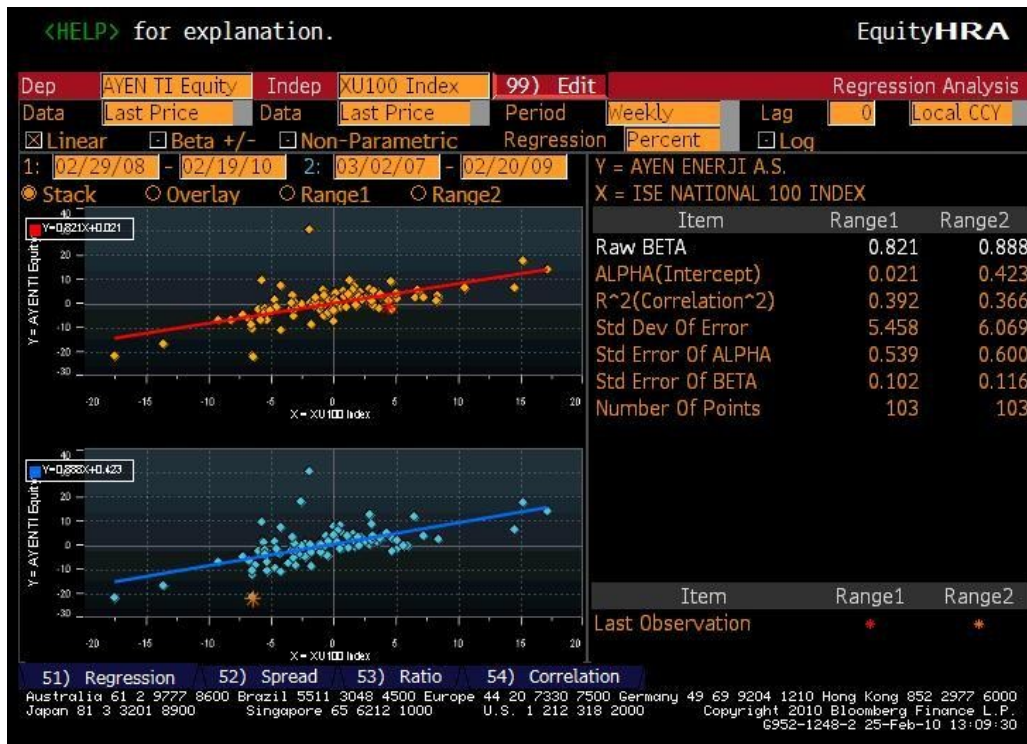


APPENDIX 3: BETA VALUES OF THE ENERGY COMPANIES

AK ENERJI



AKSU ENERJI

AYEN


ZORLU ENERJI



APPENDIX 4: RESERVOIR AREA

