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

CONTENTS

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Hydropower Plant Otilovići
Version 01
Date: 01/10/2011.

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

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Hydropower Plant Otilovići (hereafter referred to as "the project" or "the proposed project" or "the project activity") consists in building a small Hydropower Plant (sHPP) on the Ćehotina River, a right tributary to the Drina river, in the north of Montenegro, near the town of Pljevlja.
The hydropower plant will be a run-of-river plant, according to European Small Hydropower Association (ESHA).

The total installed capacity of the proposed project is 2.961 MW, splitted in two turbines (2.635 MW the bigger and 0.326 MW the smaller). The project is expected to generate an electricity output of 11.52 GWh/year. The net electricity will be supplied to the power Montenegrin grid, allowing to reduce both the electricity production by thermal power plant in Montenegro and import from other countries.
Small hydropower plants, particularly the run-of-river plants, have the double advantage to generate electricity from renewable source and to have small impacts over the environment, as the impacts raising from the building of the reservoir and the flooding of great areas are avoided. For the project, no new reservoir is built, so this impact is avoided.
The project activity will contribute to climate change mitigation efforts through the reduction of Green House Gases (hereinafter referred to as GHG) emissions from electrical energy generation. The estimated annual GHG emission reductions will be 13,200 t CO_2 per year.

The purpose of the project activity

The purpose of the project is to generate electricity by exploiting a renewable hydro energy source through the unused hydro potential for power generation capacity of the Ćehotina River. The power plant will utilize the flow of water after the small dam in a site called Otilovići built in 1980 and provide water to TPP Pljevlja, the city of Pljevlja and a wood factory. Otilovići power plant will be realized by EPCG (Elektroprivreda Crne Gore AD Nikšić) and it will be the first new investment hydro power plant realized in Montenegro since 1989[1] as planned in the Montenegro strategy for climate change and in the "Initial national communication on climate change of Montenegro to the United Nations Framework Convention On Climate Change (UNFCCC)".
Montenegro ratified the Kyoto protocol on 27th of March 2007 and is classified as Non-Annex I Country. Its government expressed strong interest in developing CDM projects as its potential in reducing GHG emissions in the energy sector is relevant. One of the strategic areas for the development of CDM projects and the consequent reduction of GHG emissions is the hydropower generation from small hydropower

[1] SHPP Lijeva Rijeka

plants. The project, thus, fits in the national strategy to reduce anthropogenic Greenhouse Gases (GHG) emissions through the promotion of construction of small hydropower plants with no relevant impact on the territory.

Contribution to sustainable development

The Ministry of Sustainable Development and Tourism (former Ministry of Spatial Planning and Environment protection) adopted on 25th of March 2010 the “Instruction on the procedure and methods of work, content and form of patterns and other issues of importance to the work of the Technical Council and the Operating Body For Clean Development Mechanism“[2] that contains a tool to evaluate the contribution of a CDM project to sustainable development.
The assessment of the project has been conducted investigating relevant areas: Macro-economic development, Regional development and employment, Public administration and public participation in making decision, Water, Energy, New technologies.
The assessment established that the project activity meets all criteria to assure a positive contribution to sustainable development. In particular:

- Environmental - The project will generate electricity from non emissive technology contributing to reduce power generation based on fossil fuel, in particular the Thermal Power Plant of Pljevlja, nearby the site of Otilovići, which uses lignite and then it will reduce Greenhouse Gas emission. Apart from this, the project will cause no negative environmental impact locally as well as globally, as it will consist mainly in the construction of a short penstock, the powerhouse and the grid connection;
- Social - The purposed project will be a significant investment in Pljevlja municipality, where the most important economic activities are the coal mine nearby the town of Pljevlja , the lignite thermal Power Plant of Pljevlja, the wood factory (WF) Vektra-Jakić, and the cement factory which stopped to work. Moreover the project envisages the involvement of local stakeholders, such as the population of Pljevlja and Otilovići, to support the activity. Involving people in the CDM project activity and informing about the purpose of the project is an important consciousness raising about the problems related to Global Warming and sustainable behaviours;
- Economical/Energy – In Montenegro, more than 20% of total electricity production is imported from other countries. The Hydropower Plant Otilovići will contribute to reduce the dependence of Montenegro from import of energy in a sustainable way to bridging the gap between supply and demand of power.

So, the project will also assist in creating employment in the project area for either skilled or unskilled labourers during the construction and operation of the project and it will mitigate air pollution and its adverse impacts on human health.

Companies involved in the project activity

The companies participating in the project are Elektroprivreda Crne Gore AD Nikšić (EPCG), from Montenegro Host Party, and A2A S.p.A., from the Annex I Party, Italy. Both the companies carry out activities in the area of electricity generation, transmission, distribution and supply. A2A has strong

2 http://www.mrt.gov.me/ResourceManager/FileDownload.aspx?rId=60676&rType=2

experience in electricity production, consolidated by more than 100 years of activity and EPCG celebrated 100 years of existence in 2010.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Montenegro (host)	**Public entity:** Elektroprivreda Crne Gore AD Nikšić (EPCG)	No
Italy	**Private entity:** A2A S.p.A.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Table 1 Project Participants of the CDM project

Contact details as listed in Annex 1

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

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

A.4.1.1. Host Party(ies):

>> Republic of Montenegro, *Republika Crna Gora*

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

>> Montenegro

A.4.1.3. City/Town/Community etc:

>> Otilovići, Pljevlja

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

Hydropower Plant Otilovići is located on the Ćehotina River, a 125 km long river, a right tributary to the Drina River, passing through Montenegro and Bosnia and Herzegovina.

The geographical coordinates of the location where the project will be built are43º18'14,76" North, 19º24'03,95" East. The project is located in the north of the country, near the border with Serbia, 10 km far towards east, and near the city of Pljevlja, as it can be seen from the maps below. Otilovići hydropower plant will be located approximately 10 km far from Pljevlja, in the south of the city.

Figure 1 Detailed map of Montenegro: the city of Pljevlja is in the red circle

Figure 2 Satellite image of the area of Otilovići, Pljevlja. The precise location of the project is in the red circle.

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

Sectoral scope I: Energy Industries (Renewable/non-renewable sources)
Type I: Renewable Energy Sources
Category I.D. - Grid connected renewable electricity generation

The proposed project is a small-scale CDM project activity which generates electricity from a renewable energy source with a total installed capacity of 2.961 MW and estimated annual net electricity generated of about 11,520 MWh/y to be exported to the Montenegrin grid. Since the total capacity of the proposed project does not exceed the eligibility limit of 15 MW, the project is qualified as a small-scale CDM project to which simplified modalities and procedures indicated by UNFCCC can be applied. Taking into account that the project involves energy generation from hydro potential and export the power to a grid, based on small scale CDM modalities, the project activity falls under Type I, Renewable Energy Project and Category I.D. Grid Connected Renewable Electricity Generation.

Technology of the small-scale project activity

The proposed project activity is a run-of-river small-scale hydropower generation project based on a Preliminary Technical Documentation realized in 2001 from the company Energoprojekt. The technology utilizes water as a resource and converts the potential energy available in the water flow into mechanical energy using turbines and then to electrical energy using generators. The generated electricity will be supplied to the nearest grid sub-station.

Otilovići power plant is a small run-of-river hydropower plant exploiting the discharge of the Otilovići reservoir. This reservoir was built in 1980 to provide water to the city of Pljevlja and other industrial uses (within the Thermal Powerplant (TPP) of Pljevlja and the wood factory (WF) Vektra-Jakić) through an intake that collects the water in a penstock. The average annual flow in the Otilovići reservoir is 4.68 m^3/sec and the water needed for all the uses (TPP Pljevlja, partly city of Pljevlja and wood factory) is 0.53 m^3/sec, which is derived upstream the dam through a grip.
The rest of the water is, before the project activity, released from the dam in the river. The project activity will use water flow depending on the state of reservoir and of incoming water flow, which it will be taken from the reservoir through a short penstock.

The power plant is a run-of-river one as no regulation is envisaged to modulate the energy generation. Power generation will occur as and when the water is available and provided by the river, as for run-of river scheme. When the river dries up, the generation ceases.[3]

Project description

The power station consists in a building with two generation system: the First and main production unit with Francis turbine (2.635 MW) and a Second, small production unit with Francis turbine (0.326 MW), which uses minimum ecologic flow equal to about 0.8 m^3/sec. The two aggregates could work at the same time depending on flowing water.

The details of the project site are:

- Existing intake to the reservoir
- One penstock of 105 m with 1.8m diameter;
- First turbine with 2.635 MW (Francis turbine);
- Second turbine with 0.326 MW (Francis turbine);
- Power house.

The nominal head of the main generation unit is 36.5 m and the one of the auxiliary unit is 39 m. The main technical parameters about the plant are showed in Table 2.

[3] European Small Hydropower Association – ESHA, *Guide on How to Develop a Small Hydropower Plant*

Average multi-annual flow available for the plant	4.15 m^3 /sec
Total volume of reservoir	18.0 x 10^6 m^3
Usable volume of reservoir	13.0 x 10^6 m^3
Normal operating level	837.0 m asl
Minimum operating level	822.0 m asl
Maximum head	43.0 m
Minimum head	27.5 m
Lenght of penstock Ø 1,8 m	105 m
Number of generating units:	2 (main and auxiliary)
Total installed capacity	2.961 MW
Main generating unit	
Installed capacity of generator	3.2 MVA
Generator voltage	6.3 kV
Installed capacity of turbine	2.635 MW
Installed discharge	8.00 m^3/s
Nominal head	36.50 m
No. of revolutions of turbine	500 min^{-1}
Auxiliary unit (for biological minimum)	
Installed capacity of generator	0.5 MVA
Generator voltage	0.4 kV
Installed capacity of turbine	0.326 MW
Installed discharge	1.00 m^3/s
Nominal head	39 m
No. of revolutions of turbine	1,500 min^{-1}
Planned generation of Energy	
For average available discharge of 4,15 m^3/s	11.52 GWh

Table 2 Technical parameters of the power plant.

The figures from 3 to 5 show the scheme of the plant: disposition, vertical section of the plant and a view of the power house in which the main and auxiliary units are visible.

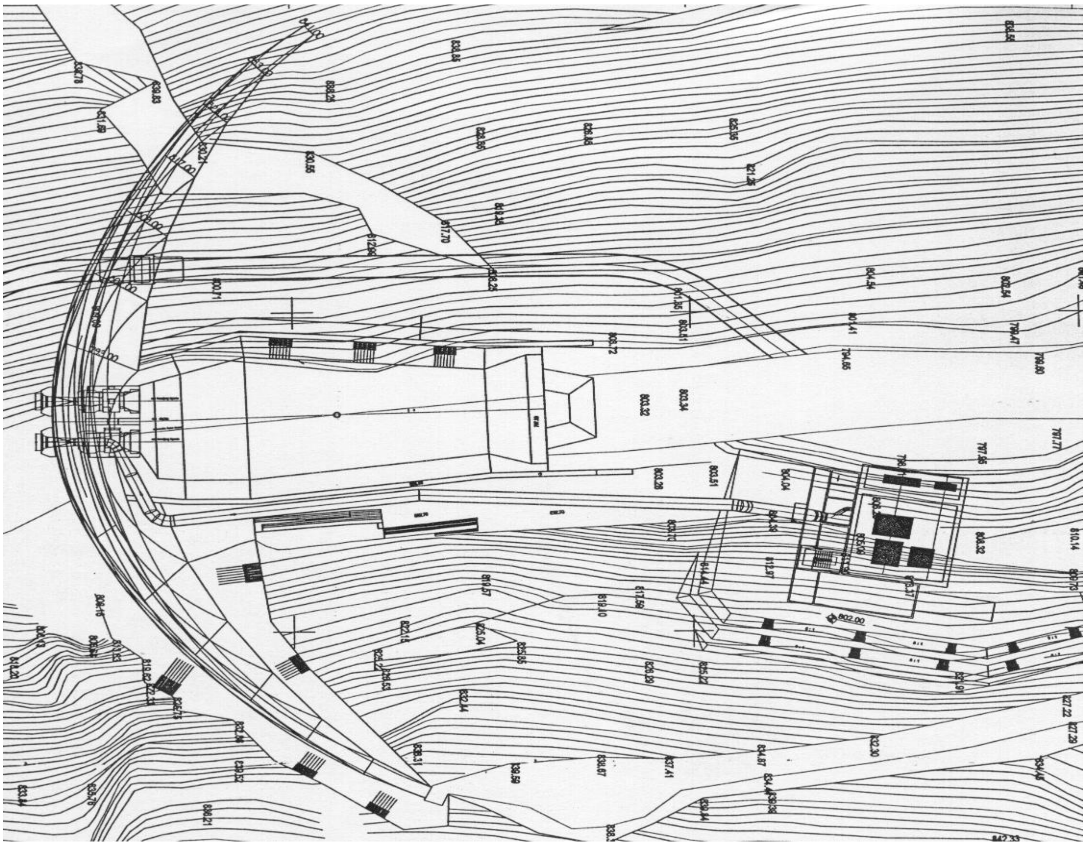

Figure 3 Disposition of the plant

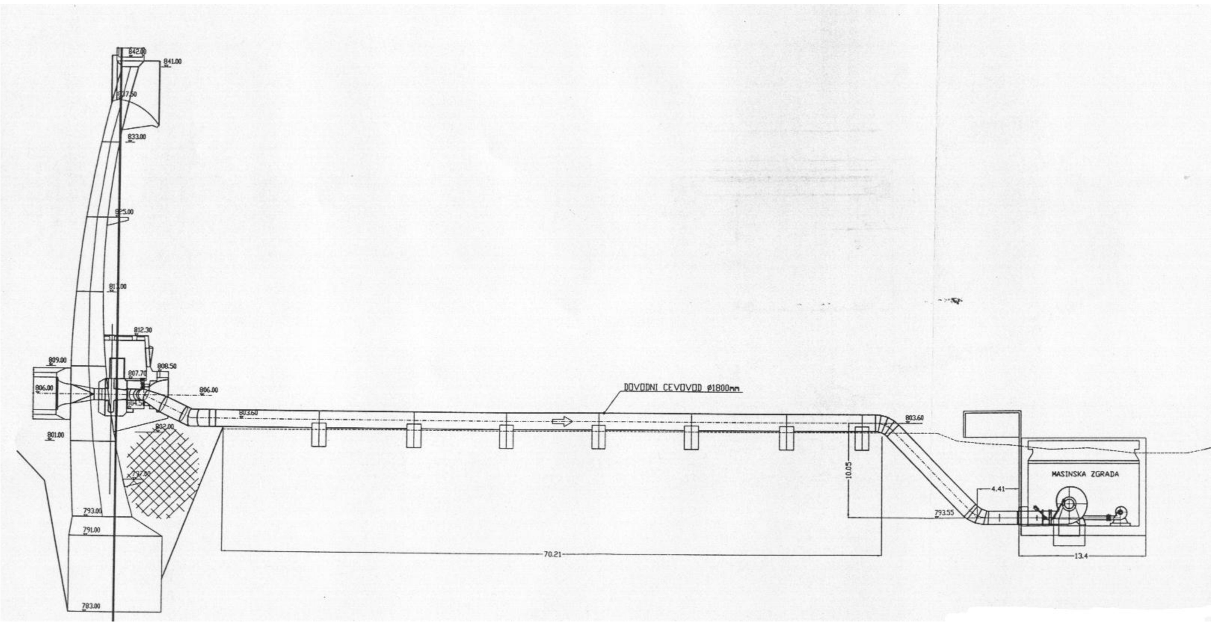

Figure 4 Intake penstock for powerhouse – vertical section

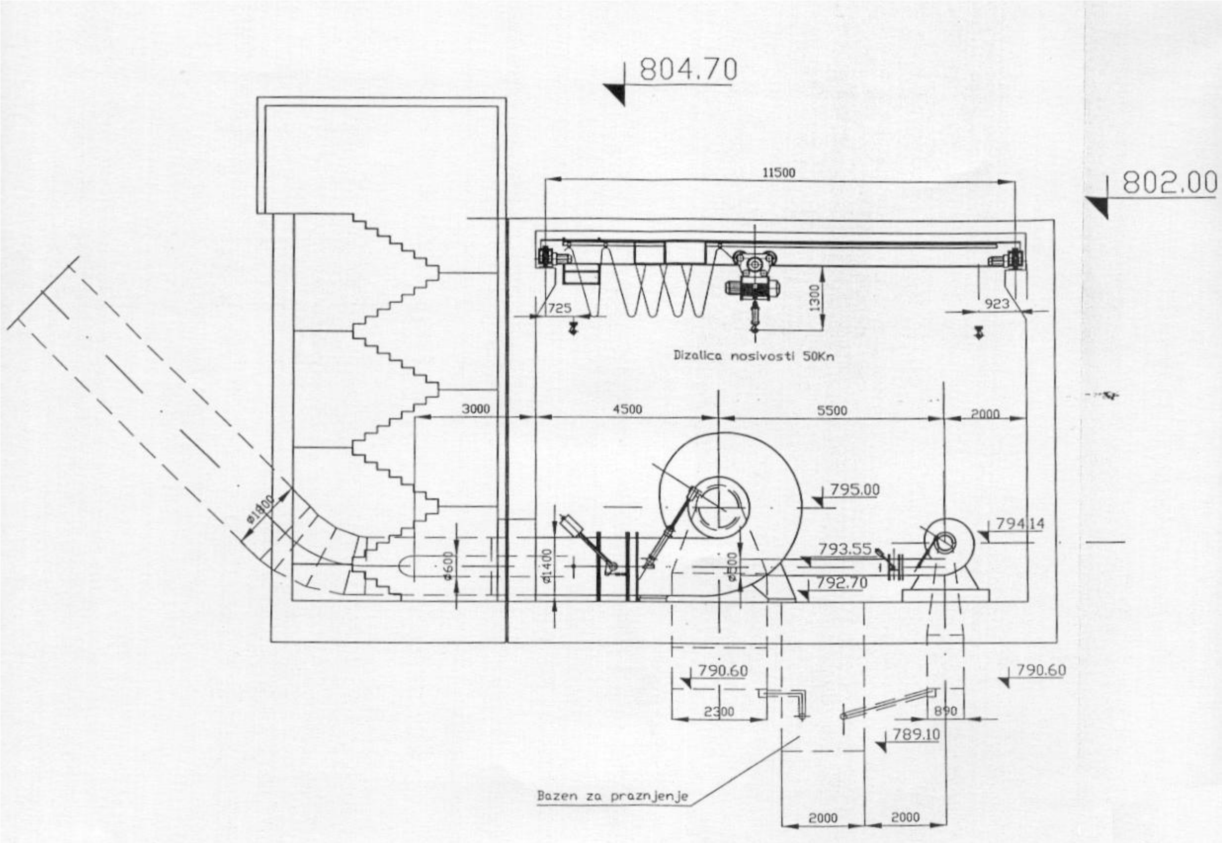

Figure 5 Power house - vertical section.

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

The chosen crediting period is seven years to be renewed a maximum of 2 times, thus 21 years totally The emissions due to the project are considered equal to 0.

Using a baseline emission factor of 1.146 tCO_2/MWh, the annual emission reduction of the project is estimated to be 13,200 tonnes CO_2e (Table 3). The total GHG emission reduction over the first crediting period (from 2014 to 2020) is 85,797 tCO_2

For the two renewed crediting period it is not possible to estimate the emission reduction, as the baseline emission factor has to be updated.

Year	Estimation of annual emission reductions (tCO_2e)
2014	6,600
2015	13,200
2016	13,200
2017	13,200
2018	13,200
2019	13,200
2020	13,200
Total estimated reductions (tonnes of CO_2e)	85,797
Total number of crediting years	7
Annual average of the estimated emission reductions over the crediting period (tCO_2e)	12,257

Table 3 Estimated ex-ante emission reduction for the first 7-years crediting period.

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

The project is completely financed by EPCG itself. Thus no public funding from Annex I countries, nor loans from banks are envisaged.

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

In accordance to EB 54 Report Annex 13, Guidelines on Assessment of Debundling for Small Scale Project Activities, debundling is defined as the fragmentation of a large project activity into smaller parts. A small scale project activity shall be deemed to be a debundled project activity if there is a project activity or an application to register another small-scale project activity:

(a) with the same project participants;
(b) in the same project category and technology/measure,
(c) registered within the previous 2 years; and
(d) whose project boundary is within 1 km of the project boundary of the proposed SSC at the closest point.

As there is no other project or application with the same project participants, the project is not a debundled component of a large scale project activity and is eligible to use the simplified modalities and procedures for Small Scale Project Activities.

SECTION B. Application of a baseline and monitoring methodology

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

The category of the project according to Appendix B of the UNFCCC's published simplified procedures for the small scale project is:
Type: TYPE I - Renewable Energy Projects
Project Category Title: Category I.D. Grid Connected Renewable Electricity Generation

The methodology applied for the project is the approved methodology for small-scale CDM project "AMS – I.D. Grid connected renewable electricity generation --- Version 17.0". For more information regarding the methodology, please refer to the link:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html
The approved "Tool to calculate the emission factor for an electricity system (version 02.2.1)" will be employed for the calculation of emission factor.
For more information, please refer to the following website:
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

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

Paragraph 1 of the methodology states that *"This category comprises renewable generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid"*
The project consist in a hydropower plant that will supply electricity to the national grid, so it falls in the category which the methodology is applicable to.

Paragraph 2 of the methodology states that *"project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s)."*
The project consists in a new power plant where there was no renewable energy power plant operating prior to the implementation of the project activity and can be classified as a Greenfield Plant

Paragraph 3 of the methodology states that *"Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:*

- *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;*
- *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2;*
- *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2."*

The reservoir of Otilovići is not modified by the project activity, so the reservoir is not included in the project boundaries, thus this condition is not applicable.

Paragraph 5 of the methodology states that *"If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel5, the capacity of the entire unit shall not exceed the limit of 15 MW"* and *"Combined heat and power (co-generation) systems are not eligible under this category. "*
The project consists only in renewable generation (2.961 MW) in the power station and does not consist in co-generation, so these conditions are not applicable.

It can therefore be concluded that the project activity qualifies as AMS.I.D methodology.

B.3. Description of the project boundary:

According to the paragraph 9 of the methodology, the project boundary is delineated by the physical and geographical site of the renewable generation source.
The project boundary includes, thus, the intake and the penstock, the power house and the main transformer.
The proposed project will be connected to the Montenegrin national grid (CGES) through the distribution grid.

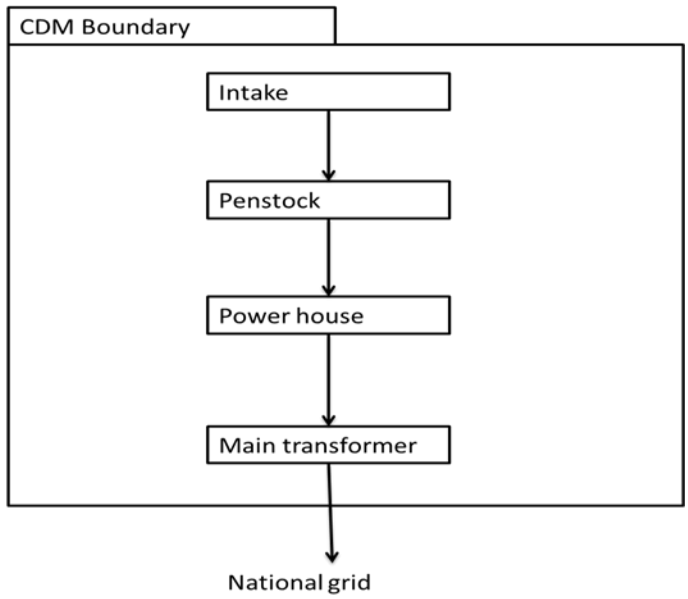

Figure 6 CDM project activity boundary

The geographical boundary for small-scale CDM projects are defined as all structures related to the project. As a result, it is justifiable to identify the Montenegrin grid as the project boundary for the project activity.
For the purposes of this project activity, the relevant grid is defined as the electricity system of Montenegro and the power generating units serving the grid as Hydropower Plant Otilovići.
The electricity system, is defined according to “Tool to calculate the emission factor for an electricity system (version 02.2.1)”.

In terms of gases, the project boundary is restricted to CO_2.

	Source	Gas	Included ?	Justification / Explanation
Baseline	Montenegro power system (CGES)	CO_2	Yes	Main GHG emissions source. Electric energy generation in Montenegro includes the use of Thermal Power Plants whose fuel is lignite.
		CH_4	No	Excluded for simplification. This is conservative.
Project Acitivity	Otilovići	CO_2	No	Not produced by renewable energy.
		CH_4	No	Not considered as the boundary of the proposed project activity.

Table 4 Sources and gases included in the project boundary

Table 4 shows the GHG to be considered: for the baseline only CO_2 emissions from the Pljevlja Thermal Power plant have to be considered, while the emissions from the project activity are null, as the project activity consists in a non emissive power plant.

For calculation of emission factor, all power plants physically connected to the same electricity system than the CDM project power plant have to be considered.

Other GHG emissions for the baseline are Methane (CH_4) and Nitrous Oxide (N_2O), but according to IPCC emission factors and Global warming potential they contribute, totally, to less of 1% (0,7%) to total emissions. They are excluded from the baseline emissions. This choice is also a conservative assumption.

Fuel emission factors and global Warming potentials			
	CO_2	CH_4	N_2O
Lignite (kg GHG/TJ)	101000	1	1.5
GWP	1	25	298

Table 5 Fuel emission factors and global warming potentials (GWP) of lignite

B.4. Description of baseline and its development:

Three alternative baseline scenarios are identified:

1. The project activity is implemented without CDM, so a new 2.961 MW hydropower plant is built and connected to the national grid;
2. The electricity is supplied by other renewable sources power generation plant in the same area with equivalent annual power generation;
3. Continuation of the current situation: electricity continues being generated by the existing generation mix in Montenegro power line.

The alternative 1 is not feasible: it is shown in section B.5 that the investment barrier prevents the implementation of the project without the CDM benefits.

The alternative 2 of developing other renewable sources, such as geothermal, wind, biomass is not feasible:

- Geothermal: geothermal exploration in Montenegro has been minimal. Most of the country is covered by high and extensive mountain massifs intersected by river gorges and deep valleys. At the moment no public research have been conducted in exhaustive way on geothermal so this kind of plant is not plausible.
- Wind: wind potential is relatively low in Montenegro, and only a little area in the central and coastal regions of the country. In the east of Montenegro and in the area of Pljevlja the wind is poor and the mountains make not convenient the installation of a wind farm;
- Biomass: notwithstanding the presence of mountain in the area of Pljevlja, the installation of a biomass power plant with a capacity similar to Otilovići is not convenient because of the uncertainty in the procurement of the biomass (there is not an organized market for wood) and because Montenegro didn’t established yet a feed in tariff for biomass power plant which costs are bigger than the other renewables.

The alternative 3 represents a plausible baseline scenario, facing no barriers.

For the analysis of alternative 3, the Montenegro power grid has been taken as the baseline and baseline emissions have been calculated in accordance with the methodology.

According to the paragraph 10 of the approved methodology, AMS-I.D., as the project activity is the installation of a new grid-connected renewable power plant, “*the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources”.*

Paragraph 11 of the methodology states *“The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.*

$BE_y = EG_{BL,y} * EF_{CO2, grid,y}$

Where:

BE_y *Baseline Emissions in year y (t CO_2)*

$EG_{BL, y}$ *Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)*

$EF_{CO2, grid,y}$ *CO_2 emission factor of the grid in year y (t CO_2/MWh)*

The Emission Factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the “Tool to calculate the Emission Factor for an electricity system.”

OR

(b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used

Calculations shall be based on data from an official source (where available) and made publicly available”

The Baseline Emission Factor is calculated using method (a) as a combined margin (CM), consisting of the combination of Operating Margin (OM) and Build Margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system", Version 2.2.0). All the information regarding the calculation for baseline emissions and the basic data used for calculating baseline emissions are provided in section B.6.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

An overview of key CDM events scheduled for leading up to the implementation of the project is showed in Table 6.

Date	Key events
2001	Preliminary Technical Design by Energoproject
November, 2010	EPCG Board approved the project Hydropower Plant Otilovići. The presentation underlined the need for registering the project as a CDM project activity in order to make it feasible
15th March 2011	Prior Consideration form was submitted to the UNFCCC secretariat.
5th April 2011	EPCG submitted the request to EPA in order to determine the need of environmental impact assessment for the implementation SHPP Otilovići project.
27th April 2011	EPA replied to EPCG to prepare an EIA Elaborate
2nd June 2011	Contract for Project of Geological Research - Starting date of the project activity
1st July 2011	Contract for Environmental Impact Assessment Elaborate
6th July 2011	Stakeholders' meeting in Pljevlja
9th August 2011	EPCG sent EIA elaborate to EPA
12th September 2011	Public discussion of EIA Elaborate

Table 6 Overview of key events in the development of the project activity

Demonstration and assessment of additionality of the project shall be carried out following the "Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities"[4] and "Tool for the demonstration and assessment of additionality" (Version 05.2.1)[5].
The "additionality tool" shall be applied to describe how the anthropogenic emissions of GHG are reduced below those that would have occurred in the absence of the project. The additionality tool provides a general step-wise framework for demonstrating and assessing additionality. These steps include:

1. Identification of alternatives to the project activity
2. Investment analysis
3. Barrier analysis
4. Common practice analysis

[4] http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf
[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

The following barriers are presented to demonstrate that the project will not have occurred in a business-as-usual case and, therefore, is additional.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations. The methodology requires a number of sub-step to provide realistic and credible alternatives to the project activity.

Sub-step 1a: Define alternatives to the project activity:
There are only a few alternatives that are realistic and credible in the context of Pljevlja area in Montenegro:

- Scenario 0 – business as usual or baseline: the electricity is supplied by the CGES Montenegro grid (no capacity addiction).
- Scenario 1: the electricity is supplied by the proposed activity without CDM registration.
- Scenario 2: the electricity is supplied by other renewable source power generation plants in the same area with equivalent annual power generation.

From the country's perspective, the alternative for producing a similar amount of energy would be to use current generation system, which is electricity supplied by thermal power station and imported by neighboring countries, increasing the dependence from fossil fuel and other countries.
In the area of the project, there is a working mine which provides the lignite for the 218,5 MW Thermal Power Plant of Pljevlja. However lignite thermal power plants are not economically feasible with a capacity similar to the capacity of the proposed project activity and gas fired power plant is not feasible because in Montenegro there is no gas transportation network.
As regards the Scenario 2, this alternative is not plausible.

Sub-step 1b: Consistency with mandatory laws and regulations:
All proposed alternatives included in the previous sub-step comply with local laws and regulations.
All the alternatives are in compliance with the law and regulations and the project activity may be additional.

Step 2: Investment analysis
According to the additionality tool, the project developer shall conduct an investment analysis to determine whether *the project is not (a) the most economically or financially attractive or (b) economically or financially without the revenue from the sale of certified emission reductions (CERs).*

Sub-step 2a: Determine appropriate analysis method

The analysis will be conducted through the option III of the additionality because:

- <u>Option I</u>: Simple cost analysis does not apply as the project generates economic return through the sale of electric power to the grid.
- <u>Option II</u>: Investment comparison analysis is not appropriate because the most recent power plant in Montenegro has been built in 1989 so there is no data to conduct this kind of comparison.
- <u>Option III</u>: benchmark analysis is appropriate because in this project activity the relevant decision is whether or not invest in renewable power plant and in the electricity generation business is a common practice to use internal rate of return (IRR) for new project.

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

As mentioned above, the benchmark analysis is the option through which the project developer assess and demonstrates the additionality of Otilovići Project. Project IRR has been selected as the financial indicator and it has been calculated in order to provide a comparison with expectation in Montenegro for comparable investment projects.

According with the "Guidance on the assessment of Investment analysis" of the Tool for Demonstration and assessment of additionality, the project developer has identified Weighted Average Cost of Capital (WACC) as the benchmark which has been derived based on the required return on capital. The rate used to discount the business cash flow (WACC) converts the future cash flow into a present a value, considering that both creditors and stakeholders expect compensation towards the opportunity cost of investing resources in a specific business instead of investing such resources in another business of equivalent risk.
The WACC is considered an appropriate benchmark as the project is financed by only equity and this benchmark would represent the cost of returns required by equity investors.

According to the Methodological Tool, discount rates and benchmarks shall be derived from Government bond rates, the estimated cost of financing, the required return on capital, or company internal benchmarks. The project sponsor, EPCG, didn't established an internal Weighted Average Cost of Capital (WACC) to serve as a benchmark to measure the feasibility of its projects because, at the time of investment decision, the company didn't realized investments since a long time.

By nature, the investment analysis of greenfield power generating projects are specific to each project and there is no commonly accepted financial benchmark. Equity investment in a greenfield, run-of-river hydroelectric generating plant, involves much more risks including, but not limited to, equity risk, water resource risk, early stage development risk, counterparty payment risks and specific country risk. These risks force the project equity investors to require significantly higher returns than the risk-free government bond. As many of these risks are project and investor specific, it is difficult to provide a commonly calculated benchmark "risk premium", except for applying non specific commonly used investment risk premium. In general, a **risk-free rate** is established and **risk premium** added on to account for investment specific risk because of the country risk.
If country risk is not diversifiable, either because the marginal investor is not globally diversified or because the risk is correlated across markets, the country risk should be measured and also the consequences for equity risk premiums (ERP).
Once established, country and equity premiums are added to the risk-free.

For the purposes of this PDD, given the above assumptions, for the calculation of risk free rate the project developer refers to 7.85%[6], which corresponds to the 10-year Montenegro Government Bond rate, at the time of investment decision. As this is an objective rate offered in the Montenegro, this serves as the risk-free return benchmark. For a renewable energy project with greater uncertainty than a conventional energy project, but to remain conservative, a risk premium is added, which is taken from the historical country risk classification rates published since 1999 by the Organization for Economic Cooperation and Development (OECD), and is given as **6%**[7] at the time of investment decision. As a result, an investor in the Montenegro equity market should require a minimum return before specific project risks (i.e. resource, development, counterparty, etc.) of **13.85%**.

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[6] 6 http://www.eubusiness.com/news-eu/montenegro-economy.61e/?searchterm=None

[7] http://www.oecd.org/dataoecd/9/12/35483246.pdf

Project Internal Rate of Return (Project IRR)

The following parameters are used to calculate the Project IRR of the proposed project with and without the CDM revenue.

ASSUMPTIONS		
Installed capacity of turbine and generation		
Start operation date	July 2014	
Technical Life of the Project	n.years	25
Project Size	MW	2.961
Main generating unit:	MW	2.635
Auxiliary unit (for biological minimum)	MW	0.326
Total Expected Generation	GWh	11.52
Financial Assumption		
Equity	%	100
Debt	%	0
Total Project costs [CAPEX to be incurred in years (60 months	k€	4,100
O&M	% of CAPEX	2.4
Depreciation Rate	%	4%
Corporate Tax Rat	%	9%
Project Revenues		
Feed in tariff (12 years)	€/MWh	79.277
Average Price for sale of electricity after feed in tariff period	€/MWh	49.66
Escalation/Inflation		
Salary	%	2.13
Electricity Tariff	%	1.1

Table 7 Assumptions for financial analysis

The Project IRR is compared to the benchmark to examine the financial attractiveness of the project. From Table 8, the Project IRR of 11.92 % compares to the 13.85% expected return. The low IRR without CDM revenues illustrates that the Project is not financially attractive without CDM assistance and that the low return does not justify taking high risks associated with implementing this new renewable energy project. Based on this analysis in November 2010, the project sponsors determined that they could not proceed with the project in the absence of CER revenues to increase the financial viability.

	Project IRR without CDM revenue (%)	**Benchmark (%)**	**Project IRR with CER income (%)**
Project IRR	11.92	13.85	14.23

Table 8 Summary of the investment analysis, project IRR with and without CDM revenue

Sensitivity analysis

As it states in the additionality tool (version 5.2.1), the investment analysis shall include a sensibility analysis to show if the financial attractiveness is robust to reasonable variations in the critical assumptions. If the project's financial attractiveness is not consistent with reasonable variations i.e. the project becomes not a financially attractive option, it may be concluded that the project is likely to become financially additional under some scenarios.

A sensitivity analysis was performed to measure the impact of positive or negative changes in the specific performance parameters related to the project's performance. For proposed project, following variables were selected as uncertain factors for sensitivity analysis of financial attractiveness and as being the most likely to fluctuate over time:

1. Annual net generation
2. Sales Revenue
3. Total investment cost
4. O&M cost

Though O&M cost doesn't constitute more than 20% of either total project costs or total project revenues, according to *Guidelines on the Assessment of Investment Analysis (Version 05*), it is also analyzed which is common for hydropower projects.
Financial analyses were performed altering each of these parameters by +/- 10% and assessing what the impact on the project IRR would be. The use of 10% of variation in the costs and revenues of the project activity was chosen as per the *Guidelines* as a general point of departure variations.

The sensitivity analysis results of the proposed project are shown in the Table 9 and in the Figure 7

	-10%	-5%	0%	5%	10%
Annual net generation	10.04%	11.00%	11.92%	12.81%	13.68%
Sale revenues	10.04%	11.00%	11.92%	12.81%	13.68%
Capex	13.44%	12.65%	11.92%	11.25%	10.62%
O&M costs	12.16%	12.04%	11.92%	11.80%	11.68%

Table 9 Sensitivity Analysis of the Otilovići project (IIR values)

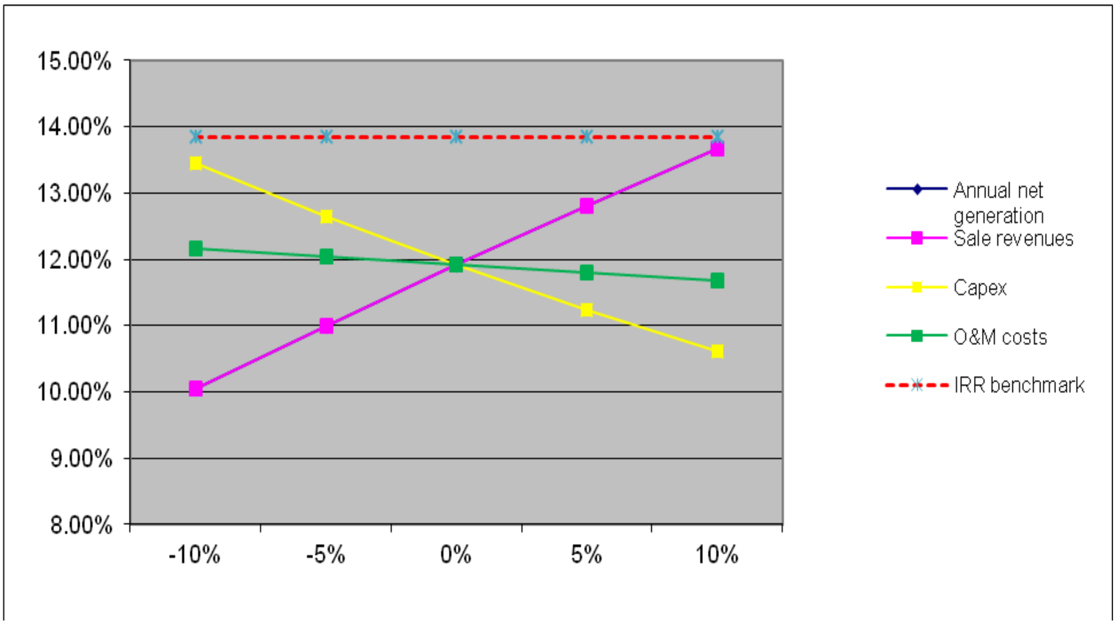

Figure 7: Sensitivity Analysis

As shown in the figure, for each of these individual parameters, the probability for project IRR of reaching the benchmark value is not possible to occur:

1. The project investment cost was calculated taking into account an estimation according to the Preliminary Technical Design (PTD) made by Energoprojekt in year 2001 and updated in 2010 by engineering department. A reduction in the investment cost is unlikely due to a substantial increase of the construction material prices due to the uptrend of the inflation of the last years. In any case, the sensitivity analysis shows that in both cases +/-10%, the project isn't feasible without CDM revenues

2. Revenues from sale of electricity is associated with the tariff and the electricity price on the power market. At the moment of the decision of investment the most recent tariff for energy producers published by ERA[8] (Energy Regulatory Agency of Montenegro) was equal to 79.277 €/MWh and it was valid for 2009. After that publication, no other price has been published by ERA. According to the Energy Law adopted in June 2003, the ERA shall define periodically a price for the renewable energy production. This tariff, which is strictly related to the cost of import, is applied for 12 years, as deduced into the new energy law adopted in 2010. After 12 years, the power plant shall sell the production to the energy market price, which isn't liberalized. The sensitivity analysis shows that in both cases +/-10%, the project isn't feasible without CDM revenues.

3. The power generation used in the additionality analysis has been calculated using the hydrological study by Energoprojekt based on the on-site historical flow records over 54 years [9] average monthly statistic data. The scenario of an increasing production due to an increase of the

[8] http://www.regagen.co.me/odlukaoutvrotkucijeneelenizmalihHE2.html

[9] Period 1947-2000

water flow is not realistic because of both the long period of the hydrological analysis and the Montenegro energy strategy that planned the realization of a new lignite power plant in Pljevlja that will reduce the water flow for Otilovići. In any case, the variation of +/-10% shows the project isn't financially attractive without CDM revenues.

4. The impact of the annual O&M cost is relatively slight. Even with a decrease in the Annual O&M cost, the project isn't feasible without CDM revenues.

It can be concluded that the Project is not financially attractive for the project developer without CDM benefits, and requires additional revenues from sale of CERs to become viable.
The sensitivity analysis is designed to highlight the risks associated with the projects and the fact that the project activity being undertaken was not the most attractive investment option available to the project proponent.
Hence, the CDM revenue are critical to the successful implementation and operation of the project activity.

The project developer has decided to proceed with the hydropower plant Otilovići as a CDM activity not only because CDM revenues would make the Project more financially attractive but also because the CDM status would highlight the Project's environmental attributes in Montenegro.

Step 3: Barrier analysis
Even though the project is financially additional, as a complement to it, a barrier analysis is carried out in order to demonstrate that there are other barriers that the project has to cope with. Those barrier are difficult to quantify in the financial analysis notwithstanding an important role in the decision making process of the investment.
The barrier analysis has been carried out according to the methodological tool and the "Guidelines for the objective demonstration and assessment of barriers"[10]. The objective of this analysis is to determine if the project activity faces barriers that prevent the implementation of the proposed project and do not prevent the implementation of at least one of the alternatives.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project Activity:

The following barrier is identified as a barrier that prevent the project activity:
- Technological barriers,
- Regulatory risk

Technological barrier

The republic of Montenegro was born on 3 June 2006, when the Montenegrin Parliament declared the independence from State Union of Serbia and Montenegro[11] along with Serbia. Before, Montenegro has been part of Socialist Federal Republic of Yugoslavia (Yugoslavia) until 1992. Since the 3rd of June 2006, Montenegro has to cope with the formal organization of all the status apparatus of and the general legal framework.

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[10] http://cdm.unfccc.int/EB/050/eb50_repan13.pdf

[11] http://en.wikipedia.org/wiki/Serbia_and_montenegro

Before the independence the economy of Montenegro was a part of the economy of Yugoslavia and, after, of State Union of Serbia and Montenegro. In this period no investment was realized in general and, in particular, in energy sector. The most recent power plant built in Montenegro is the Power Plant of Lijeva Rijeka built in 1989.
Moreover, yugoslavian, serbian and, after, montenegrin energy sector was organized with one company for each State of the Federation to operate the power grid but with a unique and centralized headquarter of engineering and development based in Belgrade called "Energoprojekt".
TPP Pljevlja and all the other hydro power plants of Montenegro have been projected from "Energoprojekt" creating, in this way, a sort of lack of competence in power plant business development in each single State. As a consequence, the first project of Otilovići in 2001 has been realized directly from Energoprojekt.

Regulatory risk

The creation of an investment-friendly environment with regard to the energy legal framework is based on regulations prescribing: energy, organization of companies and the tax system, property law, water management and forestry, investments, spatial planning, environment protection, and construction in a broader sense.
The legal infrastructure represents a good basis for the implementation of investments in this sector. However, the removal of normative barriers and improvements of regulations via their harmonization with EU regulations are under way, so the following laws are waiting for the enactment or being drafted.
The legal framework is a important element in a investment decision.
As described in the Technological barrier, after the independence Montenegro had to organize the legal framework in all the sector of the economy with no exemption for energy and environment sector.
The first step of the re-organization of legal framework in power sector was the Energy Law adopted in June 2003 that established, among others, the Energy Regulatory Agency of Montenegro (ERA or in Montenegrin language, Regulatorna Agencija za energetiku - REGAGEN). This law has been published before the start of the liberalisation of energy sector.
This law established that ERA shall define periodically a price for the renewable energy production equal to the weighted average price of thermal and import cost production. ERA established this price at 79.227 €/MWh until 2009 and then new price didn't set up by ERA.
In 2010 the Montenegrin Parliament approved the new Energy Law where a new framework for energy sector was established, with interest elements to attract new investments. On the authorization side the new Energy Law establishes that new decrees shall define the procedures to connect the new power plants to the network and the procedure to obtain the required authorizations. Moreover, on economic side, the new Energy Law establishes that a renewable production should benefit from a feed-in tariff that a new Law Decree will soon define. Since the decision of investment no decree has yet been approved; for this the investment decision is affected by certain level of incertitude.

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

- ***Technological barriers***

According to the white book "Energy development strategy of Montenegro by 2025"[12] adopted in December 2007, the strategy of Montenegro in energy sector is to increase the total capacity to reduce the import that represent the 30% of yearly energy balance.

[12] http://www.minekon.gov.me/files/1202471750.pdf

The Strategy envisages the exploitation of hydro resources through big hydro power plant and the use of coal only from Pljevlja region, with its dominant use in the thermo power plants for generation of electricity. In addition to hydro potential, coal is the most important energy resource in Montenegro. Coal reserves in Montenegro are located in Pljevlja and Berane basin. The strategy consist also in developing small hydro power plant.
Notwithstanding this strategy, none investment in new power capacity has been done in Montenegro and no new power plants were built, neither thermal neither renewable since 1989.
All the power plant built in Montenegro (2 large hydro power plant, 1 thermal power plant and 7 small hydro) has been projected when Montenegro was part of Yugoslavia by the company Energoprojekt that is based in Belgrade. Energoprojekt was the company of Yugoslavia commissioned to develop energy sector.
After the independence of Montenegro, EPCG remained without a well-structured and efficient engineering department for developing new projects.
Moreover the main priority of Montenegro is to increase power capacity through the construction of new big power plants (one more generation group in TPP Pljevlja and other hydro power plant on the Moraca river and Komarnica).
By way of example of existing barriers in development of new project in Montenegro is the implementation of the Strategy for Small Hydro Power Plants Development in Montenegro adopted by Montenegro Parliament in April 2006. Notwithstanding two auctions to award concessions for the construction of small hydro power plants (executed in 2007 and 2009, where 13 concessions[13] were awarded to private investors), at the moment of investment decision for the project activities, none of these power plants began the construction.
The lack of an engineering department skilled to the construction of new power plants means that the most probable scenario that would occur in future is the scenario 0 (business as usual), as it does not need the employment of engineers and technicians to build new plants.

Scenario 0 (business as usual) is not affected by the technological barrier: the operation of the power plants present in the country and the importation of energy from other countries is not affected by the lack of technicians skilled to power plant building activity.

The access to CDM mechanism could help in attracting investment interest in Montenegro and help this country to increase the knowledge about sustainable economy and take advantage of the environmental potential

- ***Regulatory risk***

Notwithstanding Government of Montenegro willing in developing energy sector and attract new investments to build new renewable capacity, the legal framework about this topic is uncertain.
In Montenegro a renewable power producer has two possibilities to sell the energy: selling the production to the energy market at a price that is strictly related to the tariff paid by costumers and that is defined by the ERA or sell the energy at the price defined by ERA for the renewable. In both cases the power producer shall cope with an uncertainty in the revenues and the market risk: in the first case because the revenues are directly linked to the energy market price and in the second case because the tariff calculated by RAE is indexed to import price that contribute for the 30% to the energy consumption in Montenegro.
Furthermore Montenegro energy authority RAE is not regular in the publication of energy tariffs for renewable producers: the last updated calculation refers to December 2009.

[13] http://www.oie-cg.me/srp/mHE_Javni_pozivi.asp

The new energy law adopted in 2010 should have solved many open points from the previous one but this law states that several decrees of the competent Ministry shall be adopted to discipline technical issues, like rules for the grid connections and price for renewable energy producers.
At the moment of investment decision no Decree has been adopted.
From the investor point of view, the uncertainty in the legal framework represents a big barrier for new investments because of the possible economic impacts and the uncertainty in other important aspects (for instance the grid connection rules) can delay the generation of energy.
It can be stated that if the project is developed in the CDM framework, the clean development mechanism will mitigate this barrier.

As for the technological barrier, the baseline scenario (scenario 0 - business as usual) is not prevented to continue under the regulatory risk.

Conclusion
The negative impact of technological barrier, regulatory risk and country risk are evident in renewable power sector in Montenegro: no new renewable power capacity has been realized in Montenegro in the last 20 years. Only one investment has been realized in lignite TPP of Pljevlja. At present, there is a sort of consolidated equilibrium among production from low-cost/must-run hydropower plants, the TPP Pljevlja and the import make the system strongly stable.
In order to apply a new approach to investments and to reach the sustainability in economy, environment and public sector, a boost from exogenous factor such as the implementation of CDM project activities is needed. CDM project activities could open a process of renewing of the energy production factors in the country, such as skills and knowledge, technological innovation, financial capital and diffuse awareness about environmental and energy issues.
Notwithstanding the Strategy for Small Hydro Power Plants Development in Montenegro adopted by Montenegro Parliament in April 2006 and two auctions to award concessions for the construction of small hydro power plant, in fact, at the moment of investment decision of the proposed project, none of these power plants began the construction.

In any case, identified barriers will not prevent the scenario 0 (business as usual) because no new hydro power plant will be built in this scenario.

Step 4: Common practice analysis
According to the methodological tool, the common practice analysis shall show the diffusion of similar activity in the territory of the project and the existing common practice.

Sub-step 4a: Analyze other activities similar to the proposed project activity:
In Montenegro activities similar to Otilovići project are two: new hydroelectric power plant that can be built using new concession auctioned in 2007 and 2009 and old small hydro power plant owned by EPCG.

Sub-step 4b: Discuss any similar Options that are occurring:
Notwithstanding the potential hydropower production in Montenegro there are no similar project under construction. The most recent small hydro power plant is Lijeva Rijeka, a 55kW unit built in 1989.
Montenegro Parliament adopted the Strategy for Small Hydro Power Plants Development in Montenegro in March 2006 and gave 13 concession to private company in order to develop new small hydro power plants but in none of this concession area there are project under construction.
The existing seven small hydropower plants are sometimes not operative or are abandoned. Their technologies are obsolete. When they were built no technological or economical barrier was present, as

explained above, because of a different political, economical and institutional situation in the whole region (see sub-step 3a). Nowadays, the barriers showed in sub-step 3a make the project not feasible without the support of CDM status.

The proposed project activity is a new type of power plant in Montenegro because it uses unexploited flow from an existing reservoir built for supplying water to the thermal power plant, wood factory and to Pljevlja household.

B.6 Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the methodology, AMS-I.D (version 17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid connected power plants and by the addition of new generation sources.

As described in the Section B.4, the baseline emissions are calculated as the product of the electrical energy baseline $EG_{BL,y,}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor, calculated as the following formula:

$BE_{y,h}= EG_{BL,y}*EF_{CO2,grid,y}$

Where:
BE_{yh}: Baseline emissions in year y (t CO_2)
$EG_{BL,y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,grid,y}$: CO_2 emission factor of the grid in year y (t CO_2/MWh)

The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is calculated using the procedure reported in “Tool to calculate the emission factor for an electricity system” by calculating the “combined margin” emission factor (CM) of the electricity system

The emission reduction are calculated as:

$ER_y = BE_y – PE_y - LE_y$

Where:
ER_y: Emission reductions in year y (t CO_2/y)
BE_y: Baseline emissions in year y (t CO_2/y)
PE_y: Project emissions in year y (t CO_2/y)
LE_y: Leakage emissions in year y (t CO_2/y)

According to the methodology, the project emissions (PE_y) are equal to zero, as no fossil fuel is burnt in the project activity and no reservoir is built to for the plant which is a run of river one.
In accordance with the paragraph 22 of the methodology, leakage emissions (LE_y) is to be considered if energy generating equipment is transferred from another activity, that is not the case of the current project..

Consequently the emission reduction of this project activity are equal to $ER_y = BE_y$.

Baseline emissions factor

AMS.I.D (version 17) offers two choices for calculating the emissions factor for this type of project activity in a transparent and conservative way as follows:

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

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option (a) above will be applied for this project, which uses a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (version 02.2.0)

The CM is the result of a weighted average of the Operating Margin emission factor (OM) and the Build Margin emission factor (BM). The OM is the emission factor of the existing power plants whose electricity generation would be affected by the CDM project activity. The BM is the emission factor of the prospective power plants whose construction and future operation would be affected by the CDM project activity.

The tool consists in six steps to identify the electricity system, the power plants to be included in it and the emission factor of the system:

STEP 1. Identify the relevant electricity system
STEP 2. Chose whether include off-grid power plants in the project electricity system (optional)
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor
STEP 6. Calculate the combined margin (CM) emission factor

Step 1: Identify the relevant electricity system

A project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity. A connected electricity system is defined as an electricity system connected by transmission lines to the project electricity system.
Montenegro electricity system is managed by the company CGES (Crnogorski Elektroprenosni Sistem AD) and the Figure 8 shows a map of the transmission lines of the national grid. The project activity is connected near the town of Pljevlja to CGES grid through the distribution grid.

It can be seen that the national grid is one single electricity system, connected with other national electricity systems: Bosnia and Herzegovina, Serbia, Kosovo and Albania.

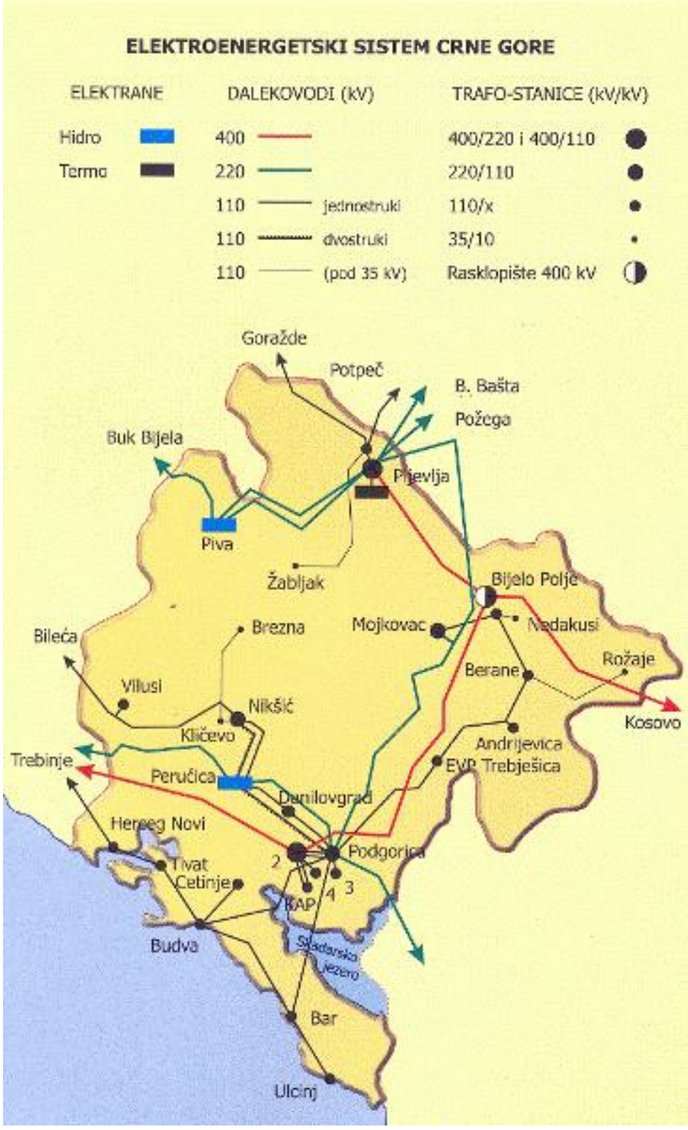

Figure 8 Map of Montenegrin electricity grid.

In Montenegro the electricity is generated by: one thermal power plant, Pljevlja; two big hydro power plants, Piva and Perucica, and seven small hydropower plants. The power plants and their installed capacity are reported in table 10.

Power plants	Installed Capacity (MW)
TPP Pljevlja	218.5
HPP Piva	342
HPP Perucica	307
Other SHPs (7)	9

Table 10 Montenegrin electricity system power plants

In years of bad hydrological conditions, the thermal plant covers up to 30% of total electricity consumption.
The rest of the electricity is imported: imports reach almost 2 TWh/year.

For imports from connected electricity systems located in another host countries, the emission factor is 0 tons CO_2 per MWh.
Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

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

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

The electricity system in Montenegro does not include any off-grid power plants, as all the generation is done by the abovementioned power plants, so the option I has been chosen.

Step 3: Select a method to determine the operating margin

The calculation of the operating emission factor ($EF_{grid,OM}$) is based on the following methods:
(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM.

The option (a) can be used only if low-cost/must-run resources are less than 50% of total grid generation. Low cost/must run power plants are those plants with low marginal generation costs or that are dispatched independently of the daily or seasonal load of the grid. Typically hydropower plants are included in this category. In Montenegro the generation from low cost/must run plants in the five most recent years represents approximately the 65% of internal electricity production and the 63% from 2000 to 2010 (last year for which data are available). So option (a) is not suitable for the project.
Option (c) cannot be used if off grid power plants are included in the system. No off grid power plant is present in the Montenegrin system.
The options (b) and (d) can be calculated using both ex-ante and ex-post data vintages. In the first case, the emission factor is determined once at a validation stage, using a 3-year-weighted average, based on the most recent available data; in the second case, the emission factor is updated annually during monitoring.

The most suitable methodology is the option (b) because the option (d) is an oversimplification and, due to the fact that hourly data are available, it does not reflect at all the impact of the project activity in the operating margin.
Therefore, the simple adjusted operating margin, option (b), is used with reference to the 3 most recent year: 2008-2010.

Step 4: Calculate the operating margin emission factor according to the selected method
According to the selected method, the operating margin emission factor ($EF_{grid,OM-adj,y}$) is calculated as the generation-weighted average CO_2 emission per unit net electricity generation (tCO_2/MWh) where the power plants/units (including imports) are separated in low-cost/must-run power sources (k) and other sources (m) basing on the net electricity generation of each power plant/unit and an emission factor as follow:

$$EF_{grid,OM\text{-}adj,y} = (1-\lambda_y)\cdot\frac{\sum_m EG_{m,y}\times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y\cdot\frac{\sum_k EG_{k,y}\times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where:
$EF_{grid,OM-adj,y}$ = Simple adjusted operating margin CO_2 emission factor in year *y* (tCO_2/MWh);
λ_y = Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year *y;*
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);
$EG_{k,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *k* in year *y* (MWh);
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
$EF_{EL,k,y}$ = CO_2 emission factor of power unit *k* in year *y* (tCO_2/MWh);
m = All grid power units serving the grid in year *y* except low-cost/must-run power units;
k = All low-cost/must run grid power units serving the grid in year *y;*
y = The relevant year as per the data vintage chosen in the step 3: 2008-2010

The emission factor for each power plant ($EF_{EL,m,y}$), is determined as follow:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y}\cdot 3.6}{\eta_{m,y}}$$

Where:
$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);
$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ);
$\eta_{m,y}$ = Average net energy conversion efficiency of power unit *m* in year *y* (ratio);
m = All power units serving the grid in year *y* except low-cost/must-run power units;
y = The relevant year.

$EF_{EL,k,y}$ is calculated in the same way as $EF_{EL,m,y}$.

Pljevlja is the only emissive power plant in Montenegro. The value of the $\eta_{m,y}$ of Pljevlja has been calculated referring to the tool as the “average net energy conversion efficiency of power unit” and is equal to 0.303 on 2008, 0.306 in 2009 and 0.291 in 2010. The CO_2 emission factor $EF_{EL,m,y}$ has been calculated using "2006 IPCC Guidelines for National Greenhouse Gas Inventories"[14]. In table 11 the emission factors and the Global Warming Potential of each greenhouse gas emitted by lignite, that are CO_2, CH_4 and N_2O,, are reported.

Fuel emission factors and global Warming potentials			
	CO_2	**CH_4**	**N_2O**
Lignite [kg GHG/TJ]	101,000	1	1.5
GWP	1	25	298

Table 11 Emission factor of lignite

As already explained in chapter B3, CH_4 and N_2O are not included in the calculation of the Emission Factor, as they represent less than 1% of the total emissions and because it is a conservative assumption. The resulting Emission Factor, taking into account for the efficiency of the power plant and the emission factor of lignite is equal to the values reported in table 12.

Emission factor of Pljevlja [tCO_2/MWh generated]		
2008	**2009**	**2010**
1.200	1.188	1.249

Table 12 Pljevlja emission factors

The procedure for the calculation of λ_y consists in four steps.

- **Sub-step (i):** Plot a load duration curve
  According to the chosen methodology a load duration curve has been plotted for the years 2008, 2009 and 2010 from the Montenegrin transmission grid operator CGES. The figures from 9 to 11 show the load duration curve for each of the years used in the calculation of the OM.

[14] http://www.ipcc.ch/meetings/session25/doc4a4b/vol2.pdf

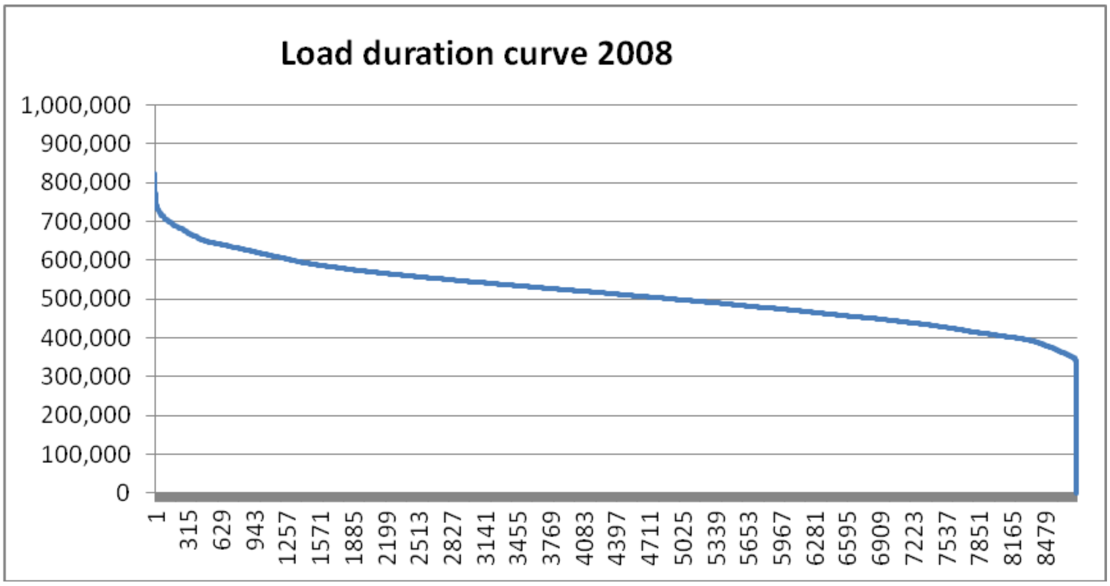

Figure 9 Load duration curve 2008

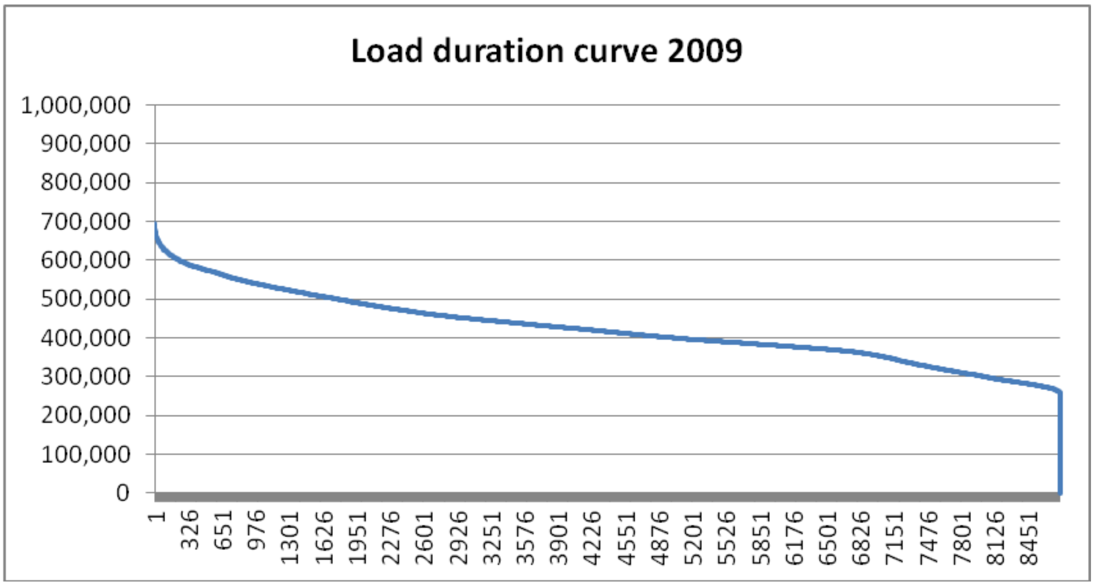

Figure 10 Load duration curve 2009

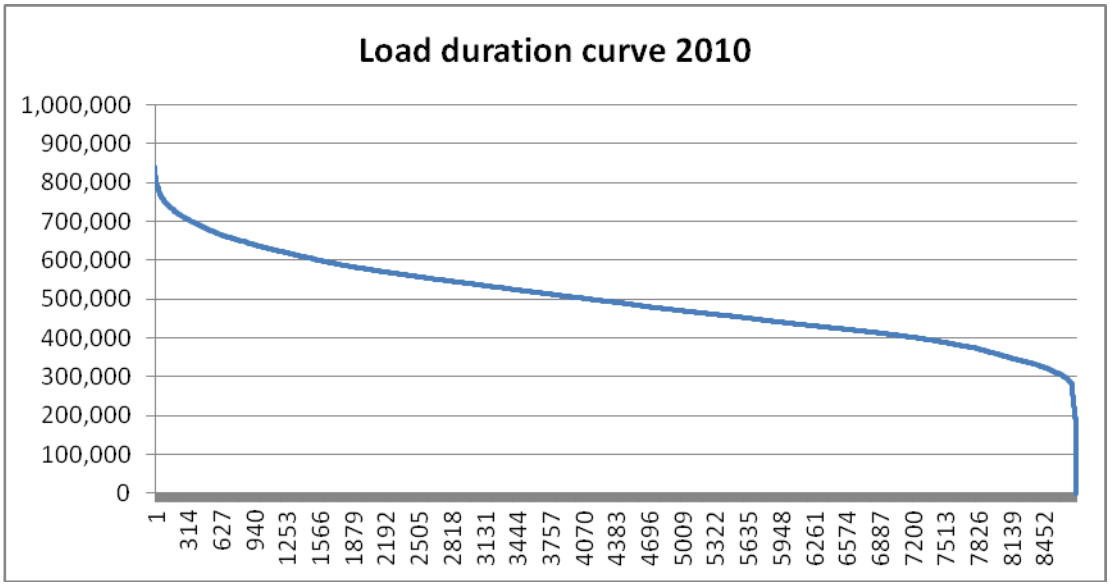

Figure 11 Load duration curve 2010

- **Sub-step (ii):** Calculate of the total annual generation from low-cost/must-run power plants/units. Using the CGES data for years 2008-2010 the total annual generation low-cost/must-run power plants/units, including imports, has been calculated.

- **Sub-step (iii)**: The fill of the load duration curve.

  According to the chosen methodology, in order to calculate the OM emission factor, a horizontal line across the load duration curve such that the area under the curve (MW times hours) is equal to the total generation (in MWh) from low-cost/must-run power plants/units has been plotted. The figures from 12 to 14 show the load duration curve of the grid and the horizontal line built as explained above.

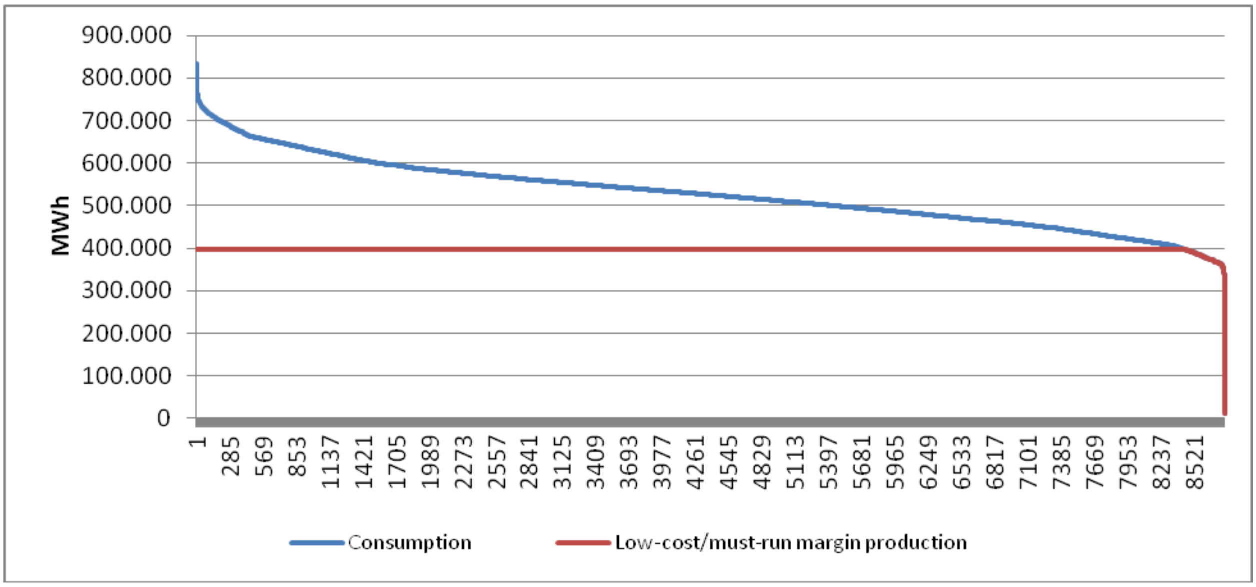

Figure 12 Load duration curve and margin production of low-cost/must-run units 2008

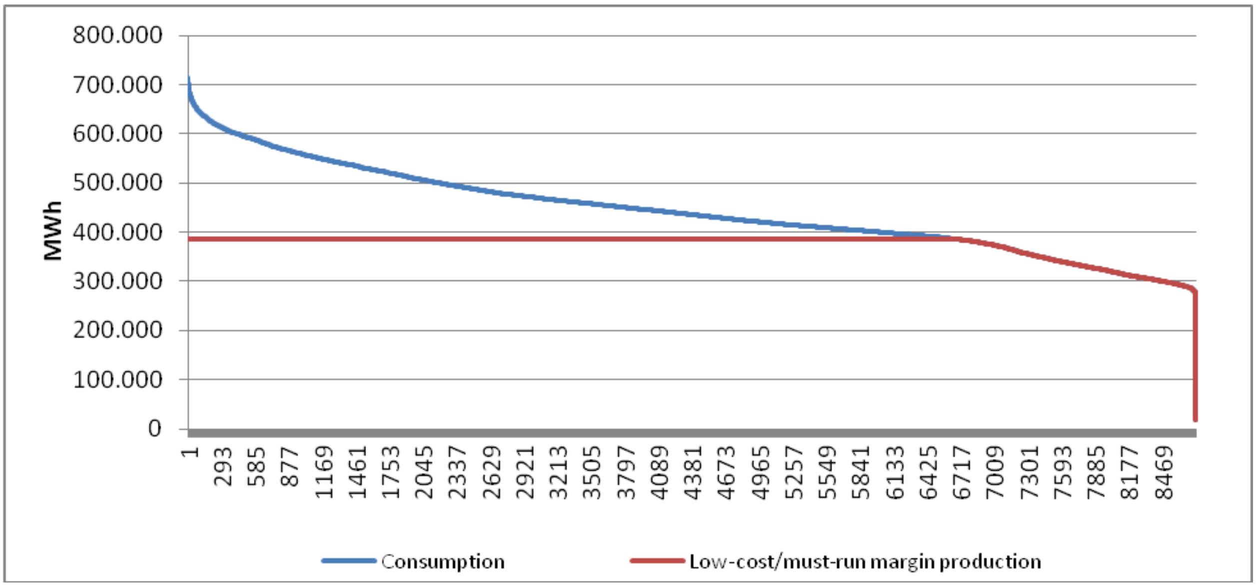

Figure 13 Load duration curve and margin production of low-cost/must-run units 2009

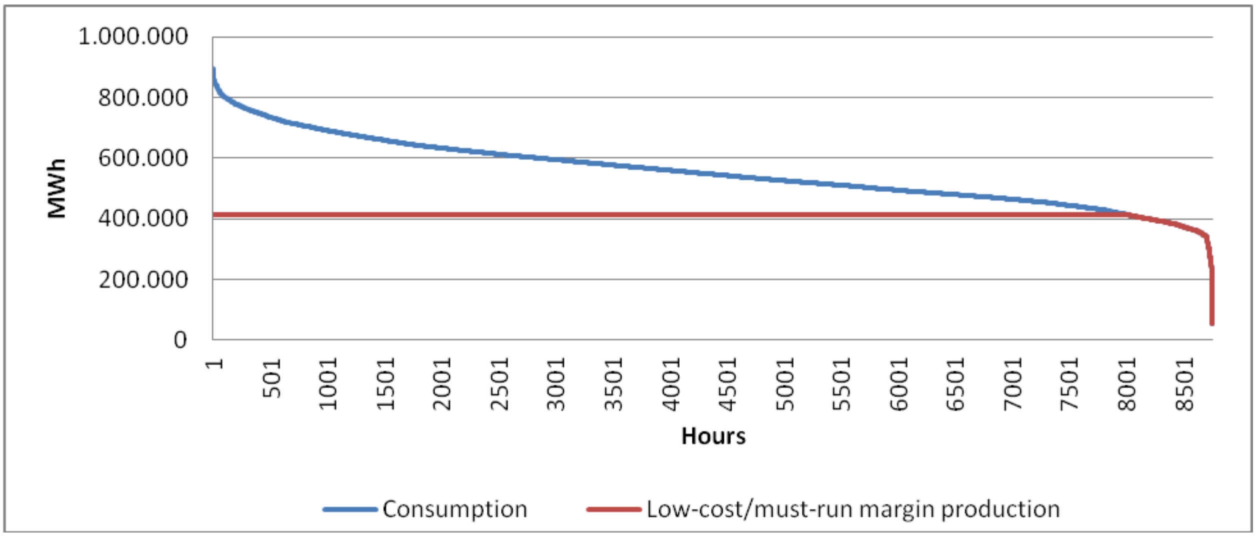

Figure 14 Load duration curve and margin production of low-cost/must-run units 2010

- **Sub-step (iv):** Determine the number of hours for which low-cost/must-run sources are on the margin in year y. According to the selected methodology, the value of x-axis (Hours) corresponding to the interception between the horizontal line plotted in sub-step 3 and the load duration curve determines the percentage, $\lambda_{y,}$ of hours for which low-cost/must-run sources are on the margin in year y. The number of hours on the right of the interception are those for which low-cost/must-run sources are on the margin in year y. Vice versa the number of hours on the left of the interception, are those for which non-low-cost/must-run sources are on the margin in year y.

	2008	2009	2010
Number of hours per which the low-cost/must-run units are on the margin	341	2064	741
λ	3.9%	23.6%	8.5%
1-λ	96.1%	76.4%	91.5%

Table 13 Values of λ_y for year 2008, 2009 and 2010

Once the percentage of hours for which low-cost/must-run sources are on the margin in years 2008, 2009 and 2010, λ_y, the Operating Margin emission factors for each year have been calculated as weighted average, where the weights are the λ and (1-λ) factors, respectively for low-cost/must-run units and other units.
The OM resulting as the weighted average of the OM of each year, where the weights are the total energy generation for each of the considered years, is 1.078 tCO_2/MWh.

Years	2008	2009	2010
OM [tCO_2/MWh]	1.153	0.908	1.144

Table 14 CO_2 emissions in Pljevlja and Operating Margin emission factor

Step 5: Calculate the build margin (BM) emissions factor

- The first part of the Step 5 of the tool to calculate the emission factor for an electricity system asks the project participant to choose between one of the two options in terms of vintage of data:

    - *Option 1.* For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
    - *Option 2.* For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

    Project participants have chosen Option 1, which requires the project participant to calculate the build margin emission factor *BM*, *ex-ante* based on the most recent information available already built for sample group *m* at the time of PDD submission.

- The second part of Step 5 of the tool asks to the project developer to identify the *sample group of power units m* to be used to calculate the build margin consistently with the data vintage selected above and proposes a procedure. According to this procedure the project participant shall start from the analysis of all the thermal power plants active in the electricity system and, through the sub-steps, identify the SET of power plants for the Build margin calculation. In particular, the sample group of power units used to calculate the build margin is the $SET_{sample\ –CDM->10\ yrs}$, which are the power units that started to supply electricity to the grid more than 10 years ago

In the electricity system of Montenegro, according to the CGES documentation[15], about the power grid, there is just one active thermal power plant, which can be used in the procedure of identification of the sample group of power units *m*. This power plant is TPP Pljevlja, which constitutes more than the 30% of the internal production of electricity, and has been refurbished in 2009.

In conclusion TPP is the only plant to be included in the calculation of the build margin.

- The third part of the tool is about the calculation of the build margin consistently with the data vintage and the sample group of power units *m* selected above.

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

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

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

It should be noted that, since the power unit included in the build margin corresponds to the sample group SETsample –CDM->10 yrs, the mentioned Tool states that, as a conservative approach, only option A2 from guidance in Step 4 (a) can be used and the default values provided in Annex 1 shall be usedto determine the parameter ηm,y (efficiency of the plant).
Project participants verified that the default values of $\eta_{m,y}$ included in Annex 1 are not applicable to the TPP Pljevlja power plant and then the $\eta_{m,y}$ values shown in Step 4 were used in the Build Margin calculation

As the only power plant included in the BM is Pljevlja, the BM Emission Factor correspond to the weighted average of the Emission Factors of Pljevlja for the year 2008, 2009 and 2010, where the weights are the electricity generation of the grid. The result is equal to 1.214 tCO_2/MWh.

[15] http://www.tso-epcg.com/nono/ekarta.php

Step 6: Calculate the combined margin emission factor

The combined margin (CM) emission factor is calculated as the weighted sum of the OM and BM emission factors:

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

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

The defaults weights value for hydropower plants projects are used as specified in the "*Tool to calculate the emission factor for an electricity system*" (w_{OM} = 0.5 ; w_{BM} = 0.5). Those values are used for the first crediting period. For the second and third crediting period default values are: (w_{OM} = 0.25; w_{BM} = 0.75).

Applying the default weights and the calculated emission factors, a combined margin emission factor of **1.146 t**CO_2**e/MWh** has been calculated.

Therefore, the Combined Baseline Emission Factor of the project corresponds to 1.146 tCO_2e/MWh.

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

Data / Parameter:	**$EF_{Pljevlja, Lignite, y}$**
Data unit:	tCO_2/GJ
Description:	Fuel Emission factor used in thermal power plants present in the grid.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.101 tCO_2/GJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is chosen according to the "Tool to calculate the emission factor for and electricity system".This is an IPCC default value for the evaluation of CO_2 emitted for every GJ of fuel used.
Any comment:	It is needed to calculate the OM and the BM.

Data / Parameter:	**$EF_{Pljevlja, Lignite, y}$**
Data unit:	tCH_4/GJ
Description:	Fuel Emission factor used in thermal power plants present in the grid.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	$1 \cdot 10^{-5}$ tCH_4/GJ
Justification of the choice of data or description of	The data is chosen according to the "Tool to calculate the emission factor for and electricity system". This is an IPCC default value for the evaluation of CH_4 emitted for every GJ of

measurement methods and procedures actually applied :	fuel used. It is not included in the calculation of the emission factor if it represents less than 1% of the emissions from lignite.
Any comment:	It is needed to calculate the OM and the BM.

Data / Parameter:	$\mathbf{EF_{Pljevlja, Lignite, y}}$
Data unit:	tN_2O/GJ
Description:	Fuel Emission factor used in thermal power plants present in the grid.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	$1.5 \cdot 10^{-6}$ tN_2O/GJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is chosen according to the “Tool to calculate the emission factor for and electricity system”. This is an IPCC default value for the evaluation of N_2O emitted for every GJ of fuel used. It is not included in the calculation of the emission factor if it represents less than 1% of the emissions from lignite.
Any comment:	It is needed to calculate the OM and the BM.

Data / Parameter:	$\mathbf{GWP_{CH4}}$
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane valid for the relevant commitment period.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	25 tCO_2e/tCH_4
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is an IPCC default value.
Any comment:	It is needed to calculate the emission factor of the fuel in terms of CO_2equivalent.

Data / Parameter:	$\mathbf{GWP_{N2O}}$
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential of nitrous oxide valid for the relevant commitment period.
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	298 tCO_2e/tN_2O
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is an IPCC default value
Any comment:	It is needed to calculate the emission factor of the fuel in terms of CO_2equivalent.

Data / Parameter:	**$\eta_{m,y}$**
Data unit:	Ratio
Description:	Power plant efficiency
Source of data used:	EPCG
Value applied:	30.3% for 2008, 30.6% for 2009, 29.1% for 2010
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is chosen according to the "Tool to calculate the emission factor for and electricity system". For the plants included in the OM calculation under step 4, sub-step (a) option A2 and in the BM calculation under step 5 it is used the average net energy conversion efficiency of power unit *m* in the year *y*.
Any comment:	It is used to calculate the quantity of CO_2 emitted by the Montenegrin electricity system.

Data / Parameter:	**λ_y**
Data unit:	Ratio
Description:	Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y
Source of data used:	CGES
Value applied:	Refer to table 13
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is chosen according to the "Tool to calculate the emission factor for and electricity system" It is used to calculate the OM emission factor of the electricity system.
Any comment:	It is used to calculate the quantity of CO_2 emitted by the Montenegrin electricity system.

Data / Parameter:	**$EG_{m,y}$**
Data unit:	GWh/year
Description:	Net electricity generated and delivered to the grid by power plant "m" in year "y".
Source of data used:	Net Electricity data production as reported by Montenegrin TSO CGES (Crnogorski Elektroprenosni Sistem AD).
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is chosen according to the "Tool to calculate the emission factor for and electricity system" Electricity imports have to be treated like electricity generated from a power plant "m". These data are used also to determine the power plants to be included in the Build Margin.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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Baseline emission for year "y" are calculated as:

$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$

Thus, as the generation of the plant is envisaged to be 11.52 GWh/year and the Emission factor is 1.146 tCO_2/MWh, the baseline emissions for each year are 13,200 tCO_2eq./year.

According to the methodology AMS-I.D., the emissions due to the project activity are equal to 0 and no leakage occurs. The emission reduction are thus equal to the baseline emission. For the first seven years crediting period, the emission reduction, are thus equal to: 85,797tCO_2eq.

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

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Year	**Estimation of project activity emission (tCO_2e)**	**Estimation of baseline emission (tCO_2e)**	**Estimation of Leakage Emission (tCO_2e)**	**Estimation of emission reductions (tCO_2e)**
2014	0	6,600	0	6,600
2015	0	13,200	0	13,200
2016	0	13,200	0	13,200
2017	0	13,200	0	13,200
2018	0	13,200	0	13,200
2019	0	13,200	0	13,200
2020	0	13,200	0	13,200
Total estimated reductions (tonnes of CO_2e)	0	85,797	0	85,797
Total number of crediting years	7	7	7	7
Annual average of the estimated emission reductions over the crediting period (t of CO_2e)	0	12,257	0	12,257

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

B.7.1 Data and parameters monitored:

In order to calculate emission of baseline, we need to monitor the electricity supplied to the grid ($EG_{s,y}$) and the electricity supplied to the project by the grid ($PR_{g,y}$), according to the two data, the net power supplied to the grid (EGy) will be calculated ($EG_y = EG_{s,y} - PR_{g,y}$).

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Electricity supplied to the grid by the project in year y
Source of data used:	Measured and verified against sales data
Value applied:	11,520
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations; electricity supplied to the grid and double checked according to sales invoices.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PR_{g,y}$
Data unit:	MWh
Description:	Electricity supplied to the project by the grid in year y
Source of data used:	Measured and verified against sales data
Value applied:	0
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations; electricity supplied to the grid and double checked according to sales invoices.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project in the year *y*
Source of data used:	Calculated according to the equation $EG_y = EG_{s,y} - PR_{g,y}$
Value applied:	11,520
Description of measurement methods and procedures to be	Calculated from the above measured parameters and recorded on a monthly basis

applied:	
QA/QC procedures to be applied:	This data is calculated, so does not need QA/QC procedures.
Any comment:	Refer to B.7.2. Description of the monitoring plan

B.7.2 Description of the monitoring plan:

The objective of the monitoring plan is to ensure the complete, consistent, clear and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner is mainly responsible for the implementation of the monitoring plan, and Grid Company will cooperate with the project entity.
The monitoring plan (MP) is established to be applied on the project activity pursuant the requirement of Approved Methodology for Small Scale Activities, AMS.I-D – "Grid connected renewable electricity generation".

1. Monitoring Objective

The monitoring consists of metering the power generation supplied to the grid in order to calculate the emissions reduction.

2. Monitoring Organization

The project owner will apply to the project activity the same procedure that is used at the moment by the project owner to monitor the other power plants to take the responsibility of collecting data, supervising and verifying the procedure of measurement and record.
The organization of the EPCG is shown in the following chart. EPCG monitoring workgroup will be established before SHPP Otilovići starts operation. The technical staff in FU Distribution is responsible for managing the metering equipment. The statistic staff in FU Generation is responsible for recording and archiving the monitoring data and for managing equipment that is located after metering equipment. The CDM manager will check the monitored data. The Project manager will recheck the data and completing verification report for the verification.

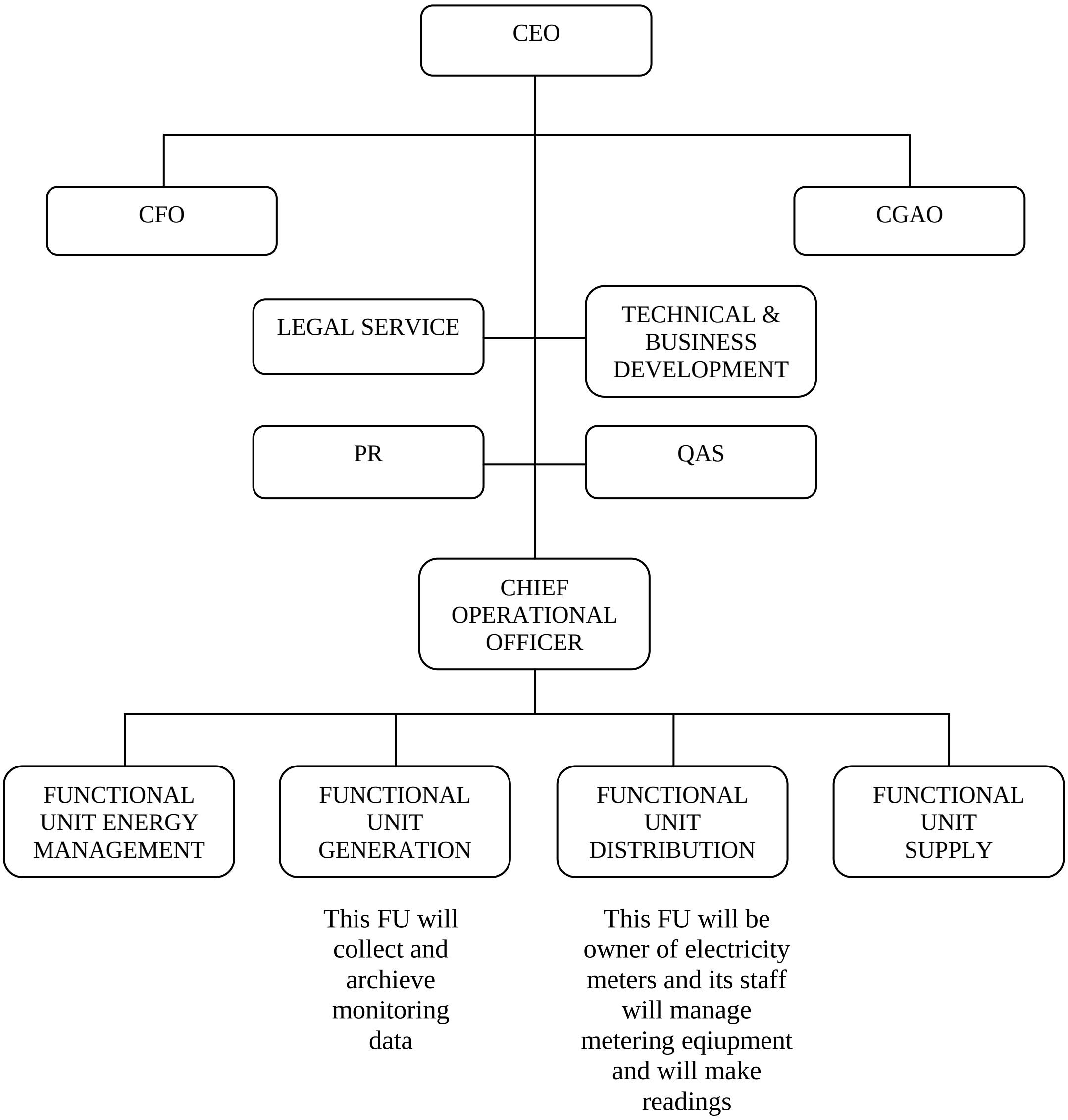

Figure 15: Organizational scheme of EPCG[16]

3. Monitoring equipment and installation

SHPP Otilovići will have two units. One will be the small unit, with output voltage 0,4kV, which will over 0,4/35kV block transformer give produced electricity to the grid. Electricity from this unit will be also used for self consumption of power plant. In case that small unit is not working, self consumption will be supplied from 35kV grid over 0,4/35kV block transformer. Second unit is big unit with output voltage 6kV, which will over 6/35kV block transformer give produced electricity to the grid.
In SHPP Otilovići, two electricity meters will be installed: both units will have its own electricity meter. Those bi-directional meters will measure the quantity of electricity that the Project will be paid for, which

[16] EPCG web site: http://www.epcg.com/en01_04.html

means electricity from power plant to the grid, deduct the electricity from the grid to the power plant in period when small unit is not running.
Total production of power plant will be sum of measured data from these two meters.
The electricity meters for recording the electricity delivered to the grid through the 35 kV line will be installed on 35kV side, after block transformer, just before connection point to 35kV grid, in order to avoid transformer losses.

The meters will be installed by the grid company according to the Montenegrin Energy Law (published in Official Gazette no. 28/10 on the 14th of May 2010) and Regulations on technical conditions for connecting of SHPPs to power distribution network (published in Official Gazette no. 25/2007 on the 11th of May 2007).

4. Data Collection

SHPP Otilovići will run in full automatic mode. In TPP Pljevlja will be installed equipment for monitoring and control of Otilovići power plant.
Installed meters will send information to the EPCG servers in Otilovići power plant and in TPP Pljevlja, so that software packages will process measured data and will make database. This database will be used for Project monitoring.
As soon as SHPP Otilovići starts operation, from that moment EPCG's Functional Unit (FU) Generation will be responsible for it, so its staff will collect production data. Statistic staff for collecting data about producing of electricity from it will be in FU Generation based in EPCG headquarter in Pljevlja.

The Grid Company will be the owner of meters and will guarantee the measuring equipment is in good operation and completely sealed.
The readings of the meters will be used for revenues based on production.
For calculating the emission reductions data from servers in EPCG headquarter in Pljevlja will be used.

5. Calibration
The calibration of electric energy meters should be periodically carried out according to Regulations on technical conditions for connecting of SHPPs to power distribution network (published in Official Gazette no. 25/2007 on the 11th of May 2007) and to Temporary Distribution Code from 28th of December 2004. The suppliers with more than 10GWh/y electricity production should have electricity measurement units with at least 0,2 accuracy degree. After calibration, meters should be sealed. Both meters shall be inspected and sealed by the Grid Company and shall not be accessible by the other party.
Calibration test records will be maintained for verification.

6. Data Management
Data will be archived at the end of each month using electronic spread sheets.
All data records will be kept for a period of 2 years following the end of the crediting period.

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

The Baseline and Monitoring Plan was completed on September 30th, 2011

Name of persons determining the baseline study and monitoring methodology:

Company:	Elektroprivreda Crne Gore AD Nikšić (EPCG)
Address:	Vuka Karadžića 2
Zip code + city address:	81400, Nikšić
Country:	Montenegro
Contact Person:	Mr. Roberto Castellano
Telephone Number:	+382 40 20 41 62
Fax Number:	+38240212869
Email:	roberto.castellano@epcg.com

Company:	A2A Spa
Address 1:	Via Lamarmora 230 - 25124, Brescia
Address 2:	Corso di Porta Vittoria, 4 – 20122 Milano
Country:	Italy
Contact Person:	Mr. Francesco Carlini
Telephone Number:	+39.02.7720.4300
Fax Number:	+39.02.7720.3267
Email:	Francesco.carlini@a2a.eu

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

2nd June 2011

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

25 years

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

C.2.1. Renewable crediting period

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

July 2014 or the registration date, whichever is later

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not Applicable

C.2.2.2. Length:

Not Applicable

SECTION D. Environmental impacts

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

According to the section D of the Guidelines the project proponent of a simplified project design document (CDM-SSC-PDD) must report the results of the Environmental Impact Assessment of the project, if required by the host party. The Environmental Impact Assessment (EIA) must be carried out according to the legislation of the host party:

- The project that are mandatorily subject to EIA must be identified;
- The EIA must be done respecting the procedure, the rules and the guidelines of the host party.

According to the Montenegrin legislation, a project proponent is requested to investigate the environmental impact of an activity with reference to rules:

1. internal procedure on criteria and timeframe under which submitted clean development mechanism projects are evaluated and approved ("Assessment of CDM Project: criteria for sustainable development and indicators table")
2. Law on Environmental Impact Assessment (EIA) [17];

With regards to the "Assessment of CDM Project: criteria for sustainable development and indicators table", the project proponent prepared and sent to DNA this assessment to evaluate and report on the benefit to sustainable development in Montenegro due to Otilovići project. In the section A.2 a summary of this assessment is reported.

With regards to second issue, the Montenegrin Environmental Impact Assessment law states that "(EIA) covers intended and ongoing projects that may have significant impact on the environment or human

[17] Published on official gazette 85/05.
http://www.epa.org.me/images/zakoni/zakon%20o%20procjeni%20uticaja%20na%20zivotnu%20sredinu.pdf

health." The proponent of any project that involves the construction, installation, expansions and operation of any activity capable of causing environmental degradation is required to prepare an environmental assessment report, prior to obtaining construction and operation permits. Moreover, if the project activity is presented as a CDM project, an environmental sustainability analysis must be done and a sustainability matrix must be compiled by the project proponent and attached to the Project Design Document to show the contribution of the Project Activity to the sustainable development of the country.

Montenegrin Law on Environmental Impact Assessment envisages that the EPA, when receives official communication of a new project concerned by this law, must inform the public and the organizations about the content of the project. Once the EIA study is redacted by the project proponent, EPA informs authorities, organizations and public concerned about the manner, time and venue for public viewing, submission of opinions and remarks, as well as the time and venue for holding the public debate on the Study

Otilovići project activity consists in an activity - construction of an hydropower plant - that can be subject to EIA: the legislation explicitly requires that the project proponent sends to the EPA an application in order to ask if an EIA is needed.
EPCG sent to EPA the application on 5th of April 2011 (protocol number N. 11-40-6400).
EPA, with decision number 02 N. UPI-573/6 on 27th of April 2011, decided that the project activity Hydropower Plant Otilovići is subject to EIA and EPCG shall prepare an EIA Elaborate.
EPCG sent the EIA Elaborate to EPA on 9th of August 2011 and on the 12th of September a public debate has occurred in Pljevlja. There was no public comments about EIA Elaborate.
At the moment of submission of the PDD, EIA Elaborate is subject to EPA procedures

As regards the Environmental Impact Assessment of the project, the Elaborate shows that no big impact will occur if all the measures to mitigate potentially dangerous activities will be taken. The site where the project will be constructed and implemented is very small and is located in a not sensitive natural area and it is located approximately 100 m downstream the dam in Otilovići.
Firstly it must be considered that the project activity doesn't involve Otilovici dam and reservoir that was built in 1980 but, on the contrary, the project activity consent the production of new renewable electricity exploiting the existing structures without creating any hydrogeological concern. So the impact is strictly limited to the road, the penstock and the power house.
In any case, the dam is located approximately 2 km far from the closest human settlement. The area has small sensitivity to human impacts:

- No wetlands or wooded areas are present;
- No protected areas (natural or cultural heritage) are present.

As regards the environmental impacts of the project activity, the area affected by land occupation is very small. In relation with the considered area, the impacts of the project are very small and are mainly likely to occur during the construction phase, rather than in the operation phase:

- The project is located in an area where no human settlement and natural or cultural heritage are present.
- No cross-border impact will occur;
- There is no impact over coastal areas;
- Roads for the access to the construction area are already present since the dam was built. It is envisaged anyway to build a 175 m long road to connect the existing ones to the site where the construction will be done.
- The operation of the plant will not have negative effect on the quality of the air, water and would not affect negatively the ground as no hazardous substances will be emitted.

- Due to the small size and the simplicity of the design, the impact over the landscape is negligible, and the project activity perfectly fits in the environment in which it is introduced.

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

Montenegrin Law on Environmental Impact Assessment (EIA) predicts EIA procedure in three phases:

1) Decision on the need for conducting EIA;
2) Defining the scope and contents of the EIA Study (hereinafter referred to as: the Study);
3) Decision on approval of the Study.

In the first phase, after EPCG sent Request for determination of need for environmental impact assessment for the implementation SHPP Otilovići Project (5th April 2011), EPA Montenegro in next five days has informed interested agencies, organizations and stakeholders about it. Within next seven days EPA was receiving comments. In next seven days EPA determined about need for environmental impact assessment, that EPCG has obligation to make EIA Elaborate.

Scope and content of the EIA Elaborate is determined by the Rulebook on contents of EIA Elaborate made by Ministry of Sustainable Development and Tourism (former Ministry of Tourism and Environmental Protection), published in Montenegrin Official Gazette no. 80/05.

In the third phase, within five days after receiving EIA Elaborate and request for approving of it, EPA announcing interested agencies, organizations and stakeholders about it. On 15th of August 2011, EPA Montenegro published announcement in daily newspaper "Pobjeda" and on web site: http://www.epa.org.me about the manner, time and place of public access, submission of comments and opinions, as well as the time and place of holding a public debate on the EIA Elaborate. The public debate held on 12th of September in 2011 in Pljevlja. The participants on the Public debate were representatives of:

- EPA Montenegro
- Pljevlja Municipality (Sector for Construction & Development and Sector for Environmental Protection)
- Elaborate Designer
- EPCG

On the Public debate in Pljevlja there were no any public comments about EIA Elaborate.

EIA establishes the Commission for impact assessment, which may require from the developer to perform certain amendments to the Elaborate. Within 30 days (without taking into account time needed for performing amendments) upon receiving comments from public debate, Commission for impact assessment must deliver Assessment Report to the EPA. Within five days after receiving Assessment Report, EPA decides on granting approval or rejection of the request for approval of the EIA Elaborate.

SECTION E. Stakeholders' comments

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

Along with the abovementioned public consultations and debate established by Montenegrin EIA law, the CDM procedure[18] envisages a public debate about the project with the stakeholders - organizations, authorities, public and private entities, governmental entities, local populations and all the public concerned - in order to make them questions, comments and suggestions about the CDM project activity.

So as to inform the local stakeholders of the economic and social benefits of the implementation of the hydropower plant, as well as to explain CDM as mechanism to reduce both anthropogenic GHG emissions and the dependence of the grid on combustion fossil fuel and power import and to stimulate the renewable production in Montenegro, EPCG project owner carried out a public meeting in the Academic Center of Pljevlja on July 6th 2011, where following stakeholders, involved in and affected by the project activity at various stages, had a part in:

- Municipality of Pljevlja (Local Community Members)
- Ministry of Economy
- Ministry for Tourism & Sustainable Development
- Environment Protection Agency (EPA)
- Employees of EPCG
- Ministry for Environment, Land and Sea, Republic of Italy
- NGO (UNDP, NGO Breznica¸ NGO Green home

An invitation letter has been sent to the central and local authorities at the end of June 22th**,** 2011.
In order to obtain a complete understanding of the public opinions about the implementation of the proposed project and to make public the stakeholder meeting, EPCG published the news of the public presentation on the local newspaper Pobjeda on 22nd of June 2011 and on EPCG website in 22nd of June 2011[19].

During the public meeting, Global Warming, Kyoto Protocol and CDM issues have been presented by project proponent's representative, in order to make the stakeholders aware of the purpose of the project activity. The presentation was followed by a description of the project activity carried out by EPCG in the field of renewable energy.

In the course of the stakeholder consultation process, the invited stakeholders made questions and comments about the project, expressing their issue and concerns. Taking into account all the comments received, the stakeholders expressed their overall support to the implementation of the Project.
In order to collect all the comments, question and suggestions, a questionnaire was distributed during the public meeting. The questionnaire contains questions concerning the perception and the knowledge about positive and negative impacts of the project activity.

The results of the meeting were published on EPCG website[20]. Moreover, four local newspapers and the news on five local television channels commented the meeting (copies are available upon request).

[18] http://cdm.unfccc.int/Reference/COPMOP/08a01.pdf#page=6

[19] http://www.epcg.co.me/en08_01_0017.html

[20] http://www.epcg.co.me/en08_01_0020.html

E.2. Summary of the comments received:

During the stakeholder meeting, thirty-two questionnaires were handed out and thirty-two of them were filled out and returned.
In terms of general information, five of the interviewees are younger than 30; eleven of them are between 30 and 40 years old; thirteen of them are between 40 and 50 years old and only three people are older than 50. The most of the interviewees are man (twenty-one) and the rest (eleven) are women. Nineteen of the interviewees are official, two of them are workers, the rest of them answered “other” or did not answer to the question about their occupation. All of them, except of four of them who did not answer to the question about education, attended at least a technical school or a junior college.
The most of them (twenty-five people) were already familiar with CDM. All of them support the proposed project except of one person that answered “not to matter”.

The opinions of the respondent towards the implementation of the proposed project are summarized as follows:

a) Positive impacts

For what concern the positive impacts on natural environment and ecosystem, the most of the people think that the project will contribute to increase the production of energy from renewable sources to be in compliance with the national strategy and that the project activity will reduce CO_2 emissions and it will contribute to promote technological development in order to reduce GHG impacts. Some of the interviewees also thinks that the project will contribute to reduce the local pollution due to the operations of Pljevlja TPP. Only five people believe that the environmental impact of the mining activities would be reduced thanks to Otilovići power plant.
The most of the interviewees thinks that, among the positive impacts on social economical and institutional environments, Otilovići power plant will contribute to the achievement of the targets of energy production from renewable resources into the national strategy and the project activity will create the conditions for higher utilization of renewable energy resources. Twenty interviewees think that the employment will increase during construction and operation of the plant and half of the interviewees find the project as a contribution to the reduction of energy dependence from other countries. Only few interviewees think that the impact of pollution on human health will be mitigated. A fourth of the interviewees think that the social welfare will improve and that the electricity tariff will decrease. One interviewer added, as comment, that the proposed project will contribute to increase both technical education and the exploitation of natural resources with minimum of additional negative impact on environment

b) Negative impacts

The perception about negative impacts is lower than that for positive impacts: many interviewees did not answer to the questions about negative impacts as they think that no negative impact will occur due to the activity. Anyway, less than half of the interviewees believe that most important impact will occur on fluvial ecosystem and less than a fourth of the interviewees reported that the hydro-geological stability could be affected. Four people think that water quality can suffer from the activity and three of them think that flood events could increase.
From the social, economical and institutional point of view, four people found both noise during conctruction period and economical cost for the community as negative impacts. Only one interviewer thinks there could be problems for employment or social welfare and another interviewer thinks that the electricity tariff will increase. One interviewer found as additional negative impacts the occupation of

areas with transmission lines and a potential danger for the supplying of drinking water due to Uncontrolled consumption.

The questionnaire also have a section about suggestions on which kind of measurement should be taken to reduce the negative impacts. One interviewer answered that the measurement should be those that will be indicated in EIA report. Two interviewees suggested to take care of fish and to make a hatchery of the endemic fishes in all the rivers of Pljevlja municipality. Another interviewer suggested water quality studies and monitoring should be carried out and the land planning of Pljevlja municipality should be respected.

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

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In general, the majority of the interviewees expressed strong support for the implementation of the proposed project, as they think the project will bring much more positive impacts than negative impacts. However, comments and suggestions received are related to the impacts which have been already analysed in EIA study and the measurements to reduce potential negative impacts are actually those that the project owner will take as for EIA study results.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Thus no public funding from Annex I countries, nor loans from banks are envisaged.

Annex 3

BASELINE INFORMATION

Montenegrin Electricity production data

-	2008	2009	2010
TPP Pljevlja [GWh]	1152.42	614.21	1268.49
HPP Piva [GWh]	636.57	946.14	1288.54
HHP Perucica [GWh]	**869.11**	**1100.74**	**1441.53**
SHPPs [GWh]	**19.10**	**19.90**	**28.86**
Total Montenegrin electricity generation [GWh]	**2677.20**	**2680.99**	**4027.42**

Source: Montenegrin TSO CGES (Crnogorski Elektroprenosni Sistem AD)

Annex 4

MONITORING INFORMATION

Details of data monitored

This table show the detail of monitoring plan with reference to the two units of Otilovići Plant.

$EG_{s,y}$ = Electricity supplied to the grid by the project in year y is the sum of the electricity supplied by the two units.

ID Number	*EGs*,y, small unit	*EGs*,y, big unit	*EGs,y*
Data type	Electricity from renewable SHPP small unit	Electricity from renewable SHPP big unit	Electricity exported to grid
Data variable	Electricity exported to grid	Electricity exported to grid	Electricity exported to grid
Data unit	MWh	MWh	MWh
Measured (m), Calculated (c) or estimated (e)	measured	measured	Calculated EGs,y= EGs,y,small unit + EGs,y,big unit
Recording frequency	Monthly	Monthly	Monthly
Proportion of data to be monitored	100%	100%	100%
How will the data be archived? (electronic/paper)	Electronic	Electronic	Electronic
For how long is archived data to be kept?	Two years following the end of crediting period	Two years following the end of crediting period	Two years following the end of crediting period
Comments	Meters are regularly calibrated by Metrology staff	Meters are regularly calibrated by Metrology staff	