

*Project title*  
*Ref. Nr. 1*

## **BIOMASS UTILIZATION CDM PROJECT ACTIVITY IN THE MUNICIPALITY OF MAKEDONSKA KAMENICA**

*Project description*

This project activity foresees an installation of a cogeneration plant within the existing thermal power plant (TPP) in order to produce electricity, 2 MW installed capacity, and heat 10 MW installed capacity. The electricity will be transferred to the national grid and the heat will be transferred to the existing distribution grid in Makedonska Kamenica in order to introduce central heating.

The city of Makedonska Kamenica is located in the Eastern part of Macedonia app. 160 km from Skopje and is one of the largest mining centers in the country where the mine "SASA" for lead and zinc is situated. The city has app. 1000 households, public buildings and an industrial zone. The main energy sources for heating are wood (for the households) and heavy oil, coal and electricity (for the public buildings and the industrial zone). The TPP, which is property of the Municipality of Makedonska Kamenica, is located 2.5 km from the city and was built in 1990. The construction of the TPP was planned in three phases. In the first two phases "heating" part suppose to be finished where with capacity to cover maximum of 80.000 m<sup>2</sup> district heating (which corresponds to 20 – 25 MW installed heating capacity) and for the third phase electricity production suppose to be introduced. Only the first stage was completed where the existing TPP with capacity of 10 -12 MW was constructed, app. 50 % of the main line and connections for app. 25 % of the households. The TPP used coal as main source but ceased to function in 1998.

Considering the fact that this Macedonian region is rich with wood resources, the project activity foresees the use of fire wood, waste wood from cutting and waste wood from primary and secondary treatment of the wood as a main feedstock. The main centers for fire wood supply should be Delcevo (22 km) and Berovo (40 km), more exactly the branches of the public enterprise "Macedonian forests" in the abovementioned cities. Available fire wood from these two branches is app 40.000 m<sup>3</sup>, 15.000 m<sup>3</sup> from Delcevo and 25.000 m<sup>3</sup> from Berovo. These figures are the difference between the forestry management plans and the actual cuttings in these regions. Considering the waste wood as additional feedstock, for energy production, it is important to state that there is no common practice of collection or utilization of it in the regions, so at this stage of development of the project, it is difficult to predict the available amount. To underline, for definition of available waste wood additional investigations on a local level are necessary to be performed.

In order to implement this project activity successfully it is necessary to develop detailed analysis of the city's heat demand including all the potential consumers (households, public buildings and industrial buildings) as well as detailed analysis of the possible installed capacity for electricity production.

Besides the other obligations, the candidate status for entrance in the European Union of the Republic of Macedonia imposes obligations also in the energy sector, especially in the field of energy efficiency improvement and renewable energies resources use. The successful implementation of the abovementioned project may create the basis for its replication in other parts of the country which would improve the general energy balance in Macedonia through an efficient utilization of the renewable energies for central heating purposes and a possible electricity production.

<b>GHG offset</b>	According to the calculations, the project has capacity to reduce the emissions for app. <b>15.000tCO<sub>2eq</sub></b> per year.
<b>Sustainability</b>	<p>The project will allow the following social and environmental benefits which are not related to the GHG emissions:</p> <ul style="list-style-type: none"> <li>• Support to the sustainable development in the region;</li> <li>• Optimized use of the fire wood and the waste wood;</li> <li>• Improvement of the general energy balance in Macedonia;</li> <li>• Promotion of the renewable energy resources and introduction of clean and efficient technology;</li> <li>• Employments at defined and non-defined period.</li> </ul>
<b>Applied methodology</b>	AMS-I.C. "Thermal energy production with or without electricity"
<b>Estimated investment costs</b>	5.100.000 € is the price for new CHP unit. The price for reconstruction of the distributive net and the maintenance cost are not included.
<b>Current status</b>	Project concept
<b>Local partners</b>	Municipality of Makedonska Kamenica, private company "Zvezda".

**Project title**  
**Ref. Nr. 2**

## **ENERGY EFFICIENCY AND USE OF RENEWABLE ENERGIES IN THE SCHOOLS AND KINDER-GARDENS IN THE MUNICIPALITY OF KARPOS, SKOPJE**

**Project description**

The main goal of the project activity is to apply, through the Clean Development Mechanism, several measures for heating energy savings and production of electricity from renewable. This means that the implementation of the project would allow saving a certain amount of energy which would influence directly the reduction of the negative effects from climate changes. It is also possible to include the replacement of the non efficient street lights with more efficient ones as an additional activity. However, this project activity will not be elaborated in this project proposal and neither the potential for CO<sub>2</sub> savings will be included in the calculations of the total potential of the CO<sub>2</sub> savings of the proposed project activity. The project activity will be implemented in public buildings which are located on the territory of the Municipality of Karpos.

The municipality belongs to the unity of the City of Skopje. It has under its administration 10 primary schools and 10 kinder gardens with app. 8000 pupils. All of the schools are located in urban environment and were constructed in the period from the 50's until the 80's, all except one newly constructed school which was enabled in 2008.

The first foreseen activity is the installation of photovoltaic systems for energy purposes. The surface of the school roofs could be used for the installation of the panels. According to the project calculations, half of the roofs surface will be intended for the installation of panels, however if the further development of this project activity shows a technical possibility to increase the surface of the installed panels, an enlargement of the used surface will be considered.

The utilization of heating pumps for the heating energy production is the second foreseen project activity. The distance between the schools and the kinder gardens is very short (8 schools and 8 kinder gardens are located within 500m of distance). Considering the abovementioned, the calculations have concluded that eight thermal pumps will be enough for the sixteen buildings. However, additional examinations are required in order to define the technology which will be implemented (geothermal or thermal pumps).

The third activity foresees a replacement of the existing doors and windows in order to guarantee a heat savings. Municipality itself is active in this area through different donors so for this project activity, to avoid overlapping, it is necessary to define the request on the beginning

The abovementioned measures will contribute to achieve the goal of GHG emission reduction through:

- a complete switch of the fossil fuels which are currently used to heat the buildings
- a complete replacement of the electricity which currently is being supplied by the national grid and has a high factor of GHG emissions
- reduction of the losses of heat which is used to heat the buildings

The baseline scenario of this project is the amount of CO<sub>2</sub> that will be released in the atmosphere in absence of the project activities.

**Applied methodology**

AMS-I.A. "Electricity generation by the user", AMS-I.C. "Thermal energy production with or

	without electricity”, AMS-II.E. “Energy efficiency and fuel switching measures for buildings”
<b>GHG offset</b>	According to the calculations, the project has a capacity to reduce the GHG emissions for <b>3.600 tCO<sub>2eq</sub></b> in a period of one year.
<b>Sustainability</b>	<p>Besides the activities related to the CO<sub>2</sub> emission reduction, the project also foresees benefits that are not connected to the emission of the abovementioned gases. For example:</p> <ul style="list-style-type: none"> <li>• optimization of the heating systems and the lightning systems which will reduce the operating costs and the maintenance costs;</li> <li>• increase of the employment rate during the implementation of the foreseen activities;</li> <li>• promotion of a system which is in accordance with the sustainable development principles of the Republic of Macedonia</li> </ul>
<b>Current status</b>	Project concept
<b>Expected investment costs</b>	<ul style="list-style-type: none"> <li>- 2.000.000 - 2.500.000 Euros for pumps (to be specified according to the number of pumps and the used technology)</li> <li>- 1.100.000 Euros for the window replacement</li> <li>- 5.000.000 - 9.000.000 Euros for the installation of photovoltaic systems (depends on the surface and the type of applied technology)</li> </ul>
<b>Local partners</b>	Municipality of Karpos

**Project title**  
**Ref. Nr. 3**

**Project**  
**description:**

## **CDM PROJECT IDEA FOR THE TEXTILE INDUSTRY “TETEKs” IN TETOVO**

The textile factory Teteks was built during the 50's and worked intensively until the late 80's when the commercial activities suffered a considerable damage due to the economy in transition. The factory produces several types of natural wool and artificial raw textile fabric. Both of the production technologies require energy consumption.

In order to satisfy the requirements of the factory, heat is being produced in a plant which functions within the factory and has a lignite storehouse, a building for a temporary storage of ash, oil/petrol tanks, boilers and chimneys. The produced heat is used in the production processes by the machines and the equipment (they work continuously and with interruptions) and by the heating units that function only during the winter period and comprise two separate regimes for steam production and distribution. In order to cover the current requirements of the factory, the heat production plant functions from Monday to Friday with app. 25 % of the installed capacity. The steam is produced in two boilers (25/35 t/h and 12/14 t/h, both of them with superheated steam at 450°C, 30 bars) which use local lignite. The boilers that use petrol function periodically (three units: 2x12 t/h and 16 t/h), depending on the requirements. The annual consumption of fossil fuels is 25.000 tons of lignite and 1000 tons of petrol.

The project idea will be implemented like program of activities via following steps:

- Switching from lignite to fire and waste wood
- Restarting of the existing two electricity generation units with nominal capacity of 3 MW and 1.5 MW – turbine will be driven by steam produced by biomass
- Implementation of measures for improvement of the energy efficiency of the factory's distribution network
- As additional activity it could be foreseen delivery of steam to satisfy the requirements of two schools, a university and block of flats. An additional capacity will not be installed to the existing building/heat production plant, however the current low exploitation of the production capacities will be increased.

For the first two steps available biomass is crucial. Project activity consider that the biomass will be supplied by local partners National Park “Mavrovi Anovi”, about 50 km away from the project location, and Public Enterprise “Macedonian Forest” with the branches in Kicevo, Makedonski Brod and Ohrid, which are about 60 km, 90km and 100 km respectively away from the project location. Available biomass based on the forestry management plans and actual cuts is:

1. NP “Mavrovi Anovi” has allowed cuts of 90.000m<sup>3</sup> utilizing 25.000 m<sup>3</sup>
2. PE “Kicevo” has allowed cuts of 113.000 m<sup>3</sup> utilizing 80.000 m<sup>3</sup>
3. PE “Makedonski Brod” has allowed cuts of 84.000 m<sup>3</sup> utilizing 57.000 m<sup>3</sup>
4. PE “Ohrid” has allowed cuts of 76.000 m<sup>3</sup> utilizing 46.000 m<sup>3</sup>

It is important to underline that the shown figures for the NP “Mavrovi Anovi” are figures based on the last forestry plan (expired 2005) where allowed cut were 90.000 m<sup>3</sup> and the

	<p>practice for the last 25 years has shown the potential of utilizing up to 25.000 m<sup>3</sup>. This year the management board of NP "Mavrovi Anovi" has started preparation of strategic management that should be in force for the next 10 years, and in this management plan one of the included activity will be definition of the potential for allowance of cuts in order to support the project activity. The preparation of the management plan is supported by the Italian Ministry for Foreign Affaires.</p> <p>The third step of measures should increase the efficiency of distribution for app. 4% of the steam produced.</p> <p>The fourth step is considered as additional, which means deeper analysis should be made in order to clarify the potential.</p>
<b>GHG offset</b>	<p>According to the preliminary calculations, the GHG emissions could be reduced for app. 52.000 tCO<sub>2eq</sub> per year.</p>
<b>Sustainability</b>	<p>Generally the fuel switch from lignite to biomass will reduce the SO<sub>x</sub>, NO<sub>x</sub> and CO<sub>2</sub> emissions while the energy efficiency measures will contribute, above all to the CO<sub>2</sub> emission reduction from the combustion processes.</p> <p>If considered that this scenario offers a potential local heating system for the nearby consumers like schools, university and block of flats, it is possible to reduce the GHG emissions from the existing individual heating sources.</p> <p>More precisely, the project will contribute to:</p> <ul style="list-style-type: none"> <li>• reduce the unit price of the product</li> <li>• reduce the use of fossil fuels for energy purposes</li> <li>• reduce the SO<sub>x</sub>, NO<sub>x</sub> and CO<sub>2</sub> emissions in the atmosphere</li> <li>• possibility for new employments</li> </ul>
<b>Applied methodology</b>	<p>AMS I.C. Thermal energy production with or without electricity, AMS I.D. Grid connected renewable electricity generation, AMS II.A. Supply side energy efficiency improvements – transmission and distribution</p>
<b>CDM potential investments</b>	<p>Estimated investment cost for installation of 4.5MW for power only production is 10.152.000€. Investment cost for biomass boiler for heat production is around 1.125.000€. Costs of biomass collection, storage, transportation and chipping have not been included in the estimation of investment cost, nor have been included operation and maintenance costs.</p>
<b>Current status</b>	<p>Project idea</p>
<b>Local partners</b>	<p>Textile factory "Teteks" – Tetovo</p>

*Project title*  
*Ref. No. 4*

## **RENEWABLE ENERGY FROM VINEYARDS PRUNING RESIDUES IN NEGOTINO VALLEY**

*Project  
description*

The Macedonian region of Povardarie, in the central part of the country and along the river Vardar, is the largest and most famous grape growing region in Macedonia, where 85% of Macedonian wine is being produced.

One of the biggest wineries in the region is the private-owned winery "Povardarie" a.d., located in the Municipality of Negotino, where there are 4.200ha of vineyards. The company is producing 6.000.000l of wine and 100.000l of brandy annually. The winery has two thermal boilers with total installed capacity of 2.6MW and five electric chillers with total installed capacity of 225kW operating 2.500h per year.

Residual biomass potential from vine pruning on the territory of the Municipality of Negotino has been estimated to be 6t/ha, which are generally cut up and burnt in the field. Taking into account available annual amounts of vineyards pruning residues in the area, it has been estimated that available biomass residues can be used for power generation and in that respect, 2.5MW power generator could be installed at the winery with annual electricity output of 20GWh. Produced electricity would cover the needs of winery and the rest of electricity would be exported to the national grid.

Installation of CHP unit has not been taken into consideration in this project idea due to the lack of comprehensive need for steam production in the winery. However, if such a need would emerge in the future, installation of CHP unit could be taken into reconsideration.

In regard to biomass collection, in order to optimize pruning harvesting activity and decrease biomass losses, it would be best to have pruning performed in the manner that allows residues of two rows fall in only one alternate row and then to have a roundbaler move across alternate rows. Taking into account that natural exsiccation of bales has shown good results, open bales storage was considered when developing this project idea. Fuel preparation process would also include bales chipping to the dimensions compatible with the chosen combustion system.

In the area of the municipality of Negotino, there are no agro-energy systems in place up to date.

Calculations of GHG reductions related to the proposed project activity have been conducted and listed in the section below.

*GHG offset*

It is estimated that the project has a capacity to avoid emission of around **20.000tCO<sub>2eq</sub>** per year.

<b>Sustainability</b>	<p>The following non-GHG related social and environmental benefits have been identified as a result of the project:</p> <ul style="list-style-type: none"> <li>• Support to sustainable development of the region;</li> <li>• Optimization of the use of natural resources;</li> <li>• Improvement of waste management in the area and prevention of parasites development and uncontrolled fires in the vineyards;</li> <li>• Promotion of renewable sources of energy and introduction of clean and efficient technologies;</li> <li>• Diversification of the sources for electricity generation.</li> </ul>
<b>Applied methodology</b>	ACM0006 – Consolidated methodology for electricity generation from biomass residues
<b>Estimated investment cost</b>	<p>Estimated investment cost for installation of 2.5MW for power only production is 5.640.000€. Costs of biomass collection, storage, transportation and chipping have not been included in the estimation of investment cost, nor have been included operation and maintenance costs.</p>
<b>Current status</b>	Project idea
<b>Local partners</b>	<p>The winery "Povardarie" a.d; Municipality of Negotino.</p>