

GENERAL INFORMATION

Title of NAMA

- ▶ Introduction 1000 MW of small biomass boilers in Serbia

Description

▶ Description of the Mitigation Action

The NAMA aims to install new biomass boilers totaling 1,000 MW that can provide around 3,150TJ of heat energy for residential, commercial and industrial sectors throughout the country that will be fueled by either wood waste (wood chips) or agricultural waste. Climate change mitigation will be achieved through replacing the existing small inefficient boilers that are fuelled mainly by carbon-intensive coal, oil, natural gas and grid electricity.

A domestic crediting mechanism will be developed as the tool to trigger private/public users to invest in new high-efficient biomass boilers. The increase of biomass usage is strategic goal of the Government and it would be promoted through donations and with loans with some incentives.

▶ Technologies/measures

Boilers will be used for space heating, domestic hot water and technical purposes.

There are two projects that are expected to start during 2013 for creating biomass market in Serbia. One is "Reducing Barriers to Accelerate the Development of Biomass Markets in Serbia" (UNDP, as implementing agency of Global Environmental Fund – GEF) and the other is "Development of a Sustainable Bioenergy Market in Serbia" (KfW and GIZ). Both projects will be realized with cooperation of competent Ministries of Republic Serbia. Under these projects, biomass potential will be analyzed and barriers for implementation of biomass projects in Serbia will be analyzed in detail. At second stages of these projects there will be an established public-private company that would supply prepared biomass for use in boilers. In accordance with available raw biomass, there should be standardized prepared biomass available on market.

The first stages of the projects consider making few pre-feasibility studies for creating sustainable biomass market in some areas. According to the results of the pre-feasibility studies and existing experience, it will be decided the optimal actions for installation 1000 MW of small biomass boilers in Serbia.

The potential for the biomass can be categorized as wood biomass and crop residues. The structure of those potentials is shown in the table:

Table 1 Biomass potential in Serbia

Biomass source	Potential (ktoe)
<i>Wood biomass</i>	<i>1,527</i>
Fuel wood	1,150
Forest residue	163
Wood processing residue	179
<i>Agricultural biomass</i>	<i>1,670</i>
Crop residue	1,023
Residues from fruit growing, viniculture and fruit processing	605

(Source: Biomass Action Plan for the Republic of Serbia 2010-2012)

Since some parts of this woody biomass potential are already being consumed (1059 ktoe), estimated available biomass potential is more than 1500 ktoe. Estimated amount of consumption by 1000 MW boilers is less than 100 ktoe, so the potential is sufficient enough to be an input for planned capacities.

It is expected that the existing boilers can be switched to biomass boilers or new biomass fired boilers can be installed in total capacity of 1000 MW. Expected range of boiler capacity is 100 kW – 1000 kW with average capacity of 250 kW. According to these expectations, total number of new biomass boilers should be around 4,000. According to statistical analysis of boilers in use, it is expected that number of replaced boilers should be in the next proportions:

Table 2 Type of boilers to be replaced by biomass boilers

Type of boilers that will be replaced	Number of boilers	Boilers in use, %
electrical	800	20
oil	1200	30
gas	600	15
coal	1400	35
Total:	4000	100

Construction activities differ from boiler to boiler. Depending on availability of biomass and local needs, appropriate type of boiler will be used. Biomass boilers are bigger and need more space than fossil fuel boilers, as well as requiring more storage space, and therefore the technical feasibility of each individual installation needs to be examined.

Location

- ▶ Boilers will be installed throughout Serbia. Serbia consists of 150 municipalities and every municipality will be asked to determine few project locations if there are biomass available. There will be possibility and for private initiatives so every potential investor will be able to apply for credit for locations where the project is sustainable.

NAMA Implementing Entity

Final structure of the project has not yet been defined and it will be determined by the feasibility study. However, it is expected that following actors may be involved.

▶ **Ministry of Energy, Development and Environmental Protection - MEDEP**

Ministry of Energy, Development and Environmental Protection deals with the state administration affairs with regard to: energy; energy balances of the Republic of Serbia; oil and gas industry; safe pipe transport of gaseous and liquid hydrocarbons; nuclear power plants the purpose of which is the production of electric i.e. thermal energy, the production, use and disposal of radioactive substances in these facilities; environmental protection; taking measures to provide the conditions for public enterprises to operate in the fields for which the Ministry was set up; supervision in the fields within the scope of the Ministry as well as other affairs stipulated by law.

MEDEP will coordinate between all Entities. The unit for support of biomass project will be established. Ministry will supervise SPC.

▶ **Municipality**

Local governments will assist in finding potential sites for the replacement of boilers.

▶ **Special purpose company - SPC**

SPC will be responsible for the collection of data on biomass consumed by boilers and creating reports for reporting and verification. SPC could be partly financed through budget, but final decision will be made during negotiations with potential financier.

▶ **Boiler owners**

Boiler owners will conduct monitoring activities determined in NAMA by keeping track of biomass consumption and to periodically send reports to SPC.

Implementing Schedule

Expected starting date of Action

- ▶ Installation will start in 2015 and operation will start continuously. It is expected the installation be finished in 2019.

Lifetime

- ▶ 25 years

Current Status

- ▶ The contracts with GIZ and KfW for the project "Development of a Sustainable Bioenergy Market in Serbia" will be signed by the end of 2012.
- ▶ Preparation of documents for project and requests for funding a project "Reducing Barriers to Accelerate the Development of Biomass Markets in Serbia" is in final stage. The decision on acceptance of the project by the GEF is expected by the end of September 2013.

Coverage

- ▶ Sector: renewable energy
- ▶ GHG Gases: CO₂

FINANCIAL INFORMATION

Finance and Cost

- ▶ Expected cost of **preparation**:
EUR 0.5 million
- ▶ Expected cost of **implementation**:
EUR 250 million
- ▶ Expected **incremental cost** of implementation:
N/A
- ▶ **Financial sources** identified:
Ministry of Energy, Development and Environmental Protection is searching financial support from Annex-I countries and international organizations through NAMA scheme. Development Bank of Serbia will be intermediate and it could provide some sort of incentive.
- ▶ **Financial analysis**:

Financial analysis is done without calculating value of CO₂ and with discount rate 8%.
Simple payback period: 6.9 years
IRR: 12.9 %
NRV: 88 million EUR

INFORMATION ON SUPPORT REQUIRED

Description of Support Required

Type of Support	Support required for preparation	Support required for implementation
Financial	x	250 million EUR for loans which will be distributed as loans with some incentives to the boiler owners.
Technical	500,000 EUR – support for feasibility study in order to identify the project sites and technical specifications	x
Capacity Building	x	x

EXPECTED GHG EMISSION REDUCTIONS AND MRV

Expected Mitigation Potential

- ▶ **Annual reduction:** 414,501 tCO_{2e}
- ▶ **Total reduction:** 10,362,525 tCO_{2e} (25 years)

Methodologies and Assumptions

- ▶ **Methodologies:** Approved CDM methodology, AMS-I.I. "Biogas/biomass thermal application for households/small users"
- ▶ **BAU scenario:** Small biomass boilers are not installed and instead technologies based on electricity, oil, natural gas, coal continue producing thermal energy
- ▶ **Calculation of emission reduction**

Calculation of emission reductions is done based on assumption that structure of replaced boilers will be proportional to the current share of particular boiler types in use. The share of boiler types currently in use is shown in section "Description" part of this document.

In accordance with selected methodology emission reductions are calculated using the formula:

$$ER_y = \sum_k N_{k,0} * n_{k,y} * BS_{k,y} * EF * \eta_{PJ/BL} * NCV_{biomass} - LE_y$$

Where:

$N_{k,0}$	Number of thermal applications k commissioned
$n_{k,y}$	Proportion of $N_{k,0}$ that remain operating in year y (fraction)
$BS_{k,y}$	The net quantity of renewable biomass or biogas consumed by the thermal application k in year y (mass or volume units, dry basis)
EF	CO ₂ emission factor (tCO ₂ /GJ) $EF = \sum_j x_j * EF_{FF,j}$ Where: x_j is a fraction representing fuel type j used by the baseline thermal applications displaced by biomass/biogas
$\eta_{PJ/BL}$	Ratio of efficiencies of project equipment and baseline equipment (e.g. cook stove using coal) measured once prior to validation applying the same test procedure (e.g. lab test), as per a national or an international standard. Official data or scientific literature can be used for cross-check purposes
$NCV_{biomass}$	Net calorific value of the biomass (GJ/unit mass or volume, dry basis).

Data / Parameter	$N_{k,0}$
Description	Number of thermal application k commissioned
Value applied	1

Data / Parameter	$n_{k,y}$
Description	Proportion of $N_{k,0}$ that remain operating in year y (fraction)
Value applied	1

Data / Parameter	$BS_{k,y}$
Unit	t
Description	The net quantity of renewable biomass by the thermal application k in year y (mass or volume units, dry basis)
Source of data	Estimated value for heat production of 3150TJ
Value applied	Value for each baseline fuel type k is estimated as follows: $BS_{electricity,y} = 233,333 \text{ tons} * 20\% = 46,667\text{t}$ $BS_{oil,y} = 233,333 \text{ tons} * 30\% = 70,000\text{t}$ $BS_{gas,y} = 233,333 \text{ tons} * 15\% = 35,000\text{t}$ $BS_{coal,y} = 233,333 \text{ tons} * 35\% = 81,667\text{t}$
Comment	The plan is to change boilers that are now producing 3150 TJ equivalent of energy with biomass boilers that has the efficiency of 0.9. Expected amount of biomass fuels used for the project is calculated as follows: $3150 \text{ TJ} / NCV_{biomass} / 0.9 = 233,333 \text{ t}$

Data / Parameter	EF
Unit	tCO ₂ /GJ
Description	CO ₂ emission
Source of data	Calculated according formula $EF = \sum x_j EF_{FF,j}$
Value applied	0.11595 tCO ₂ /GJ
Comment	Weighted average of baseline fuel emission factors; Electricity 0.2625 t-CO ₂ /GJ Oil 0.0774 Gas 0.0561 Coal 0.0909

Data /	$\eta_{PI/BL}$
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Parameter	
Unit	1/1
Description	Ratio of efficiencies of project equipment and baseline equipment
Source of data	Calculation based on general statistics
Value applied	$\eta_{PJ/BL}$ (electricity) = 0.9/ 1.0 = 0.9 $\eta_{PJ/BL}$ (oil) = 0.9/ 0.85 = 1.06 $\eta_{PJ/BL}$ (gas) = 0.9/ 0.9 = 1.0 $\eta_{PJ/BL}$ (coal) = 0.9/ 0.75 = 1.2

Data / Parameter	$NCV_{biomass}$
Unit	GJ/t
Description	Net calorific value of the biomass (dry basis)
Source of data	Literature: - Austrian standard ONORM EN 14961-2 for pellet defines NCV = 16,5 MJ/kg - Austrian standard ONORM M 7133 for wood chips with 25% moisture defines NCV =14,4 MJ/kg - Martinov M., Đurkov Đ., in article "Čvrsta biomasa za grejanje - ocena ekonomičnosti" , in paper "Savremena poljoprivredna tehnika" vol. 36, No 4, pp 382-386, 2100. shows that NCV for wood residues with moisture 15% is 15MJ/kg
Value applied	15 GJ/t
Comment	At this moment it is not possible to estimate share of biomass types on the market, so value for the net calorific value is taken from the literature.

Data / Parameter	LE_y
Unit	tCO ₂
Description	Leakage during the year y
Value applied	0
Comment	The proposed action does not emit any leakage emissions since the biomass boilers introduced by the project activity will not be transferred to another location.

$$ER_y = \sum_k N_{k,0} * n_{k,y} * BS_{k,y} * EF * \eta_{PJ/BL} * NCV_{biomass} - LE_y$$

$$= 0.11595 \text{ t-CO}_2/\text{GJ} * 15 \text{ GJ/t} * (46,667\text{t} * 0.9 + 70,000\text{t} * 1.05 + 35,000\text{t} * 1.0 + 81,667\text{t} * 1.2) - 0$$

Calculated emission reduction is:

$$ER_y = 414,501 \cdot tCO_2$$

Measurement, Reporting, and Verification (MRV)

Monitoring plan

► **Data and parameters to be monitored:**

Following parameters will be monitored in order to calculate emission reduction from the NAMA.

Data / Parameter	$N_{k,0}$
Description	Number of thermal application k commissioned
Source of data	MEDEP – NAMA implementing entity
Measurement procedures	At the time of installation all project activity system shall be inspected and undergo acceptance testing for proper compliance with specification. The installation date of each system shall be recorded
Monitoring frequency	Once, at the time of installation

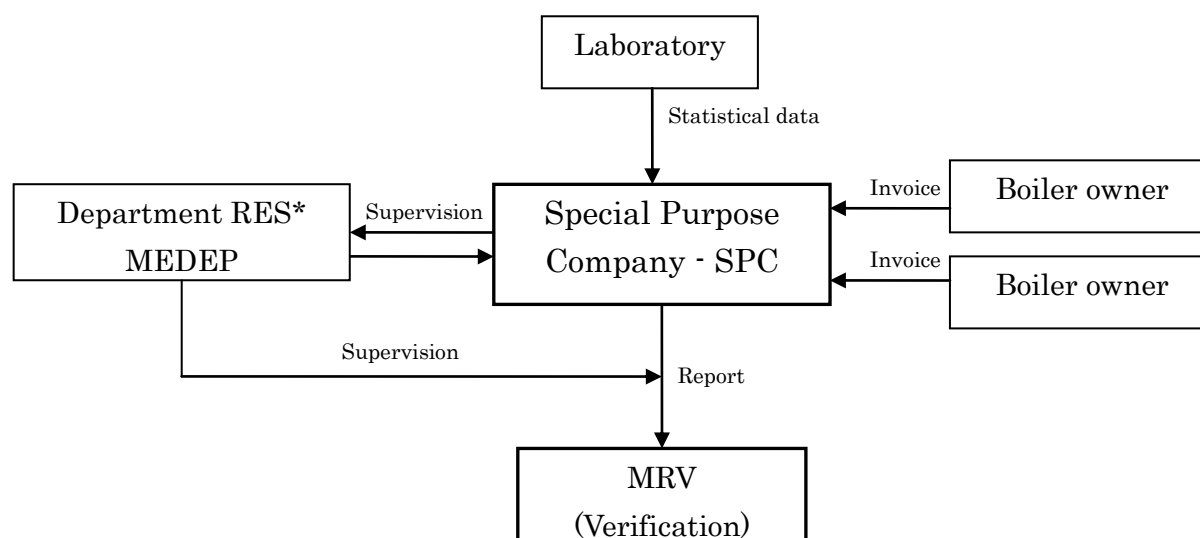
Data / Parameter	$n_{k,y}$
Description	Proportion of $N_{k,0}$ that remain operating in year y (fraction)
Source of data	MEDEP – NAMA implementing entity
Measurement procedures	A statistically valid sample of the residences where the systems are installed, with consideration, in the sampling design, of occupancy and demographic differences can be used to determine the percentage of systems operating, as per the relevant requirements for sampling in the "General guidelines for sampling and surveys for small-scale CDM project activities.
Monitoring frequency	2 years

Data / Parameter	$BS_{k,y}$
Unit	t
Description	The net quantity of renewable biomass by the thermal application k in year y (mass or volume units, dry basis)
Source of data	MEDEP – NAMA implementing entity
Measurement procedures	Data shall be collected for mass, moisture content, NCV of briquettes that are supplied to users with an appropriate sampling frequency. Cross-check with annual energy/mass balance that is based on purchased/sold quantities and stock
Monitoring frequency	Monthly
Comment	Project entity could collect information on used quantity of renewable biomass based on collected invoices for biomass.

Data / Parameter	$NCV_{biomass}$
Unit	GJ/t
Description	Net calorific value of the biomass (dry basis)
Source of data	Laboratory
Measurement procedures	Measurement in laboratories according to relevant national/international standards. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC
Monitoring frequency	Annually

► **Monitoring plan and structure:**

Monitoring structure will be decided once the final structure of the project is defined. The working concept of monitoring of the data and parameters above will be conducted based on monitoring structure shown below:



* RES: Department for Renewable Energy Sources

Responsibility of each key monitoring department is summarized below:

Implementing entity	Function and responsibility
MEDEP, Department for Renewable Energy Sources	<ul style="list-style-type: none"> - Supervise the whole process - Control work of SPC - Control report before MRV
Special Purpose Company - SPC	<ul style="list-style-type: none"> - Check installations of boilers - Capture monitoring data from installation process identifying each boiler by unique reference number and GPS tag. - Ensures that Project locations provide data - Ensures that all forms are filled correctly - Compile and analyze all the data and cross-check the reports - Elaborate an estimate of emission reduction in Monitoring Report
Boiler owner	<ul style="list-style-type: none"> - Regularly fill forms with data for: stack quantities, purchased/ sold quantities - Send invoices for purchased/ sold biomass to SPC
Laboratory	<ul style="list-style-type: none"> - Sampling and determining $NCV_{biomass}$ for all biomass types on the market. - Check the consistency of the measurements - Regularly submit data to SPC

Monitoring data collected during the installation and operation of the boilers will be stored in an electronic data management system, or monitoring database. Monitoring of working boilers will be done on the statistical sample. From this data, emissions reductions of this NAMA will be determined.

► **Domestic MRV arrangements**

Domestic MRV arrangement of Serbia is currently under development

It is expected that under the Serbian domestic MRV system, a NAMA implementing entity is responsible for the Measurement (M) and Reporting (R) activities, which will go through Verification (V) from third party.

OTHER INFORMATION

Contribution to Sustainable Development

- ▶ **Environmental**
 - This mitigation action will reduce Serbia's greenhouse gas emissions over its lifetime
 - Improvement of local environmental condition - wood waste and agricultural waste would be used for heat generation
 - Agricultural waste that may cause environmental problems, such as odor and waste management problems for local residents and land owners, will be properly treated
- ▶ **Social**
 - Quality of life - New boilers have abilities for automation, so less time will be spent operating with boilers
- ▶ **Economic**
 - This action will help develop rural economy - biomass market
 - Creation of local employment opportunities
 - Cost incurred in the purchase of fuel will be reduced through increased thermal efficiency
 - Energy security - reducing dependence on imported fossil fuels.

Stakeholder consultation

- ▶ The public will be informed about this project through various activity:
 - Public institutions will be questionnaire directly or through local governments
 - Investors will be informed through Chamber of Commerce and Industries of Serbia and its sections
 - The whole activity will be accompanied through media with organizing forums and public discussions

CONTACT INFORMATION

NAMA Implementing Entity

Entity Name	Ministry of Energy, Development and Environmental Protection
Contact Person	Predrag Milanovic
Title	Advisor in the Department for Renewable Energy
Phone	+381-11-3346-755
E-mail	predrag.milanovic@merz.gov.rs

NAMA Coordinating Entity

Entity Name	Ministry of Energy, Development, and Environmental Protection Climate Change Division
Contact Person	State Secretary: Mr. Vladan Zdravkovic Head of Climate Change Division: Ms. Danijela Bozanic
Phone	+381-11-3131-355
E-mail	danijela.bozanic@merz.gov.rs