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NAMA Development Guideline of the Republic of Serbia

Capacity Development Project on
Nationally Appropriate Mitigation Actions (NAMAs)
in the Republic of Serbia

Министарство енергетике, развоја и заштите животне средине
Ministry of Energy, Development and Environmental Protection

Јапанска агенција за међународну сарадњу
Japan International Cooperation Agency (JICA)

Preface

"Capacity Development Project on Nationally Appropriate Mitigation Actions (NAMAs) in the Republic of Serbia" represents one of the activities of the Climate Change Division of the Ministry of Energy, Development and Environmental Protection, which, among other activities, confirms the willingness of the Ministry and the country in general to contribute to the realization of the goals of the United Nations Framework Convention on Climate Change and greenhouse gas (GHG) emission reduction at a global level.

The realization of the Project is therefore one of the Ministry's priorities, but the importance of the Project itself and also confirmation and devotion of the Ministry's activities in the field of climate change are reflected in the fact that this Project is one of the first projects in the world of its kind which has been approved for development.

The realization of the Project was initiated by the Ministry of Energy, Development and Environmental Protection, and the Project was implemented by the Ministry in cooperation with Japan International Cooperation Agency (JICA). The aim of the Project is defining actions in energy efficiency sector at a national level which will contribute to the reduction/ limitation of greenhouse gas emissions, as well as the estimation of financial requirements and time frame for their realization.

The process of preparation and development of NAMAs in the Republic of Serbia, and especially the segment of estimation and calculation of possibilities and potential for greenhouse gas emission reductions, as well as the estimation of financial and technological requirements, largely contributed to capacity building at both individual and institutional levels.

We believe that this NAMA Development Guideline of the Republic of Serbia, prepared based on experience acquired during the Project, will be useful for Serbian stakeholders and enhance the realization of NAMA projects in the Republic of Serbia.

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1 Background

1.1 History and Current Situation of NAMA

1.1.1 Definition and Types of NAMA

Nationally Appropriate Mitigation Actions (NAMAs) are voluntary measures towards mitigation of climate change adopted by countries. In international negotiation under United Nations Framework Convention on Climate Change (UNFCCC), the concept of NAMA was first introduced in 2007 at the 13th session of the Conference of the Parties (COP) in Bali, Indonesia.

NAMA is a part of national action on mitigation of climate change by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in an MRV (measureable, reportable, and verifiable) manner[1]. These NAMAs may include a project, plan, program or strategy for GHG emissions reduction at country or sub-national level, and are selected and administrated based on each country's national priorities including long-term national development strategy and plan.

It is important that there is currently no official classification of NAMAs under UNFCCC process. For implementation of these NAMA actions, it is necessary that policies/ measures/ actions in NAMA are implemented in an MRV (Measurable, Reportable, and Verifiable) manner, especially where the NAMA actions are conducted with supports from developed countries including financial support, technology transfer, and capacity building.

1.1.2 International Discussion on NAMA

Since 2007, when NAMA concept was formally mentioned in the Bali Action Plan for the first time in international climate negotiation, NAMA has developed its shape gradually but steadily. Many details are yet to be decided and agreed by the international community, and further development is expected in the upcoming international talks.

The Copenhagen Accord taken note at COP15 in 2009 requested developing countries to submit their NAMAs to the UNFCCC Secretariat. As of October 2012, 44 developing countries submitted information on their NAMA. The scope and contents of these NAMAs are very diverse and significantly vary by Party.

The Cancun Agreements adopted at COP16 in 2010 included agreement on the establishment of the NAMA registry, development of the work plan for promoted support for

[1] Decision 1/ CP.13 Bali Action Plan (p.3, FCCC/ CP/ 2007/ 6/ Add.1)

NAMA implementation, as well as formats and guidelines for MRV for NAMA.

The prototype version of the NAMA registry for internationally-supported NAMA and NAMA for international recognition was introduced by the UNFCCC Secretariat in August 2012. Although according to the plan of UNFCCC Secretariat, a full version of NAMA registry was scheduled to be released at COP18 in 2012, it is yet to be finalized.

NAMA registry was established to record NAMAs seeking international support, to facilitate the matching of finance, technology and capacity-building support with these actions, and to facilitate international recognition of other NAMAs. NAMA registry contains detailed information on NAMAs submitted by developing countries as well as information on support developed countries are willing to provide. The registry prototype consists of the following four parts:

1. NAMA seeking support for preparation,
2. NAMA seeking support for implementation,
3. Other NAMAs for international recognition, and
4. Information on support for NAMAs.

Currently, prototype NAMA registry is available at UNFCCC website (http://unfccc.int/cooperation_support/nama/items/6945.php), and the UNFCCC Secretariat is accepting NAMA information on this platform.

1.2 Benefits of NAMAs for the Republic of Serbia

Capacity building for the development of Nationally Appropriate Mitigation Actions (NAMAs) and their development by Non-Annex I parties to the Convention is one of the key requirements from the negotiation process under the Convention. The importance of defining Nationally Appropriate Mitigation Actions is reflected in the country's willingness to emission limitation and economy development in line with its own capabilities and possibilities and in accordance with sustainable development principles, but also in increasing opportunities for financing at the international level and implementation of specific actions important for the country.

The importance of NAMAs development for the Republic of Serbia is reflected in the increase of opportunities for financing and implementation of GHG emission reduction related activities, but also in continuous monitoring and reporting of emission reductions in concrete activities. Realization of these opportunities undoubtedly requires building national capacities for both implementation and definition of NAMAs. Identifying and implementing NAMAs as well as experiencing such monitoring and reporting activities will provide Serbia to profoundly identify the GHG emission sources and enhance policy making that leads to both

sustainable economic development and climate change mitigation. Furthermore, it is highly helpful for Serbia to experience such monitoring and reporting activities because when Serbia becomes a member state of EU, the country will be required to follow EU's strict directives of monitoring and reporting of GHG emissions.

2. NAMA Development Cycle

2.1 NAMA Development Process in the Republic of Serbia

NAMA development process in the Republic of Serbia through the cooperation Project with Japan International Cooperation Agency (JICA) was initiated by the Ministry with the purpose of searching for possibility in energy efficiency increase in the sectors of energy production transport and buildings, taking into account that these sectors have significant mitigation potential at a national level.

In general, the basic idea is to identify NAMAs which can contribute to reducing/ limiting greenhouse gas emissions at a national level most efficiently and in the shortest period. Also, the main aim is to identify the projects/ actions which will be measurable, reportable and verifiable and finalized, and which will start with certain emission reduction in the period until 2020.

Those are the first requirements for development of future NAMAs. In addition, each of the potentially proposed mitigation actions needs to fulfill evaluation criteria (provided in subchapter 2.2.1) that have been set. It is important to highlight that these criteria have been considered and developed for the first time under this Project since there were no any existing guidelines or references developed by the UNFCCC in relation to the NAMA development or the conditions necessary for it. It is also important to note that these criteria are not yet authorized by the Ministry, and they may be modified in the near future in accordance with future international and national discussions related to climate change.

Examples of the NAMAs which met all the listed criteria and that are included in so called "NAMA short list of mitigation actions" under the Project could be found in Attachment of this guideline as well as on the Serbian NAMA website (http://merz.gov.rs/cir/node/909).

An entity who wishes to propose a mitigation action is requested to prepare a NAMA Short Description (details are described in the following chapter). NAMA evaluation procedure will be similar as Serbia's evaluation and approval procedure of Clean Development Mechanism (CDM) while detailed procedure of NAMA evaluation and approval will be finalized in accordance with future international and national discussions.

2.1.1 NAMA Selection Criteria

The selection criteria are divided into two sets. The first set of criteria is intended for the evaluation of basic NAMA principles, whereas the second set of criteria is intended for the evaluation of sustainability of the action/ project, as well as the criteria for measurement, reporting and verification (MRV). It is important to highlight that only those actions/ projects which met all of the first set of criteria will be further evaluated by the second set of criteria.

The **first set of criteria** includes the criteria which evaluate the characteristics of a project/ action itself, information availability, the possibility of participating in other mechanisms of GHG emission reductions, timeliness, voluntary participation, compliance with national policy, and GHG emission reduction potential.

Table 1: First NAMA Selection Criteria

Category	Criterion	Rationale
Condition	Distinctiveness	A mitigation action is a clearly defined project or program, which provides information on the type of activities.
	Information availability	Sufficient relevant data and information on activity are available for the assessment of mitigation potential.
	No double-counting	A mitigation action has not applied or been registered into other carbon market mechanisms such as CDM in order to avoid double counting of emission reduction.
	Timeline	A mitigation action has not been realized and will ensure emission reduction by 2020.
	Voluntary participation	Operating entity is willing to implement the mitigation action under NAMA scheme, and voluntarily take a role of implementing the action.
General	Compliance	A mitigation action is in line with Serbia's national/ sectoral development plan or strategy.
	GHG reduction potential	A mitigation action will lead to the reduction/ limitation of GHGs emissions in Serbia.

The **second set of criteria** relates to financial and technical feasibility as well as the possibility of measuring, reporting and verification (MRV) of GHG emission reductions.

Since MRV framework for NAMA is yet to be defined by UNFCCC (general principles are provided in the later chapter of this Guideline), the criterion may be modified and updated.

Table 2: Second NAMA Selection Criteria

Category	Criterion	Rationale
Sustainability	Financial feasibility	A mitigation action ensures certain level of financial performance that is considered appropriate for operating entity.
	Technical viability	A mitigation action will use already-proven technology.
MRV	MRV-ability (subject to international negotiation)	A mitigation action will be able to be measured, reported, and verified under expected NAMA scheme. For Measurement: - Emission reduction can be calculated using the internationally approved methodologies such as CDM or IPCC, or methods based on such internationally used methodologies. - Sufficient and transparent data to estimate emission reduction is available. - A NAMA implementing entity is able to monitor all parameters specified in the methodology.

2.1.2 NAMA Short Description

NAMA implementing entity or an entity who wishes to propose a mitigation action is suggested to develop a project description document for NAMA that contains some essential information ("NAMA Short Description") for the Ministry to evaluate the project.

The document, called "NAMA Short Description," consists of the following five parts.

1. General information
2. Financial information
3. Information on support required
4. Expected GHG emission reductions and MRV
5. Other information

(Important note: the template of "NAMA Short Description" may be modified in accordance with any upcoming new decision by the Serbian government or UNFCCC. Please check website of the Ministry for update and the latest template.)

This chapter provides guidance and writing tips as well as the explanation of some of the important concepts related to NAMA development.

GENERAL INFORMATION

Title of NAMA

Provide a title of the proposed NAMA. It is suggested that the title should concisely illustrate the followings:

- *type of technology or measure to be introduced under NAMA,*
- *the size of the mitigation action (e.g. capacity of power plant, number of buildings, floor size, etc.), and*
- *sector*

Description

- **Description of the Mitigation Action**

Describe the contents of the proposed mitigation actions. Focus on the description of action/ measure that are related to GHG emission reduction. Include detailed information of the action as much as possible including numbers/ figures to show the size of the action.

Also describe how the action leads to GHG emission reductions.

- **Technologies/ measures**

Present a summary of technology/ equipment to be introduced by NAMA, including detailed specification of technology/ equipment to be introduced.

Use numbers and values based on the study, literature, official statistics, etc. and always indicate the source of data and information.

Location

Indicate the exact address where available. If not, describe the name of municipality, city, village, geographical coordinates, etc. NAMA will take place. In addition, use a map to indicate the NAMA location.

NAMA Implementing Entity

Include a brief description of the entity/ entities who will participate in the proposed NAMA. Also describe the expected role and task of each entity in the proposed NAMA as well as confirmation on willingness of each of these to take responsibility.

Implementing Schedule

Expected starting date of Action

Include starting date of construction works and operation of plants/ facilities, i.e. technical implementation of the action.

Lifetime

Describe the lifetime of the project, usually the lifetime of the main equipment/ facility.

Current Status

Describe the latest progress of NAMA preparation and implementation, e.g. Feasibility Study completed in October 2012, discussion ongoing with several equipment suppliers, etc.

Coverage

- Sector: *Indicate which sector the proposed NAMA belongs to, e.g. energy supply, residential and commercial buildings, agriculture, waste management, transport and its infrastructure, industry, forestry, etc,*

- GHG Gases: *indicate which greenhouse gas (es) to be reduced by NAMA, e.g. CO_2, CH_4, N_2O.*

FINANCIAL INFORMATION

Finance and Cost

- Expected cost of **preparation**:

  Indicate the expected cost for preparing the NAMA formulation, e.g. cost for feasibility study, technical design, establishment of monitoring plan, etc.

- Expected cost of **implementation**:

  Indicate the expected cost for implementing the NAMA, e.g. cost for the purchase of equipment, cost for operation and maintenance of the plant.

- Expected **incremental cost** of implementation:

  Indicate if there is any additional incremental cost expected during operation of the NAMA

- **Financial sources** identified:

  Indicate any financial sources if they are identified. If not, indicate what type of sources, such as loan and its type, concessional loan, debt swap, grant, equity, guarantee, carbon finance, FDI, etc.

- **Financial analysis**:

  Describe the result of financial analysis of the proposed NAMA by using such indicators as internal rate of return (IRR), net present value (NPV), simple payback period etc. Refer to the Chapter 2.3 of this Guideline for general information on financial analysis methodology.

INFORMATION ON SUPPORT REQUIRED

Description of Support Required

Indicate in the box below, which types of support are needed for successful realization and sustainable implementation of the proposed NAMA:

- *For **preparation** of NAMA, e.g. feasibility study, provision of information or capacity building on available technology, establishment of MRV procedure and system, etc.*
- *For **implementation** of NAMA, e.g. provision of investment cost, equipment/ facility, capacity development of human resources for sustainable operation, etc.*

Also indicate the amount and type of financial support (loan and its type), concessional loan, debt swap, grant, equity, guarantee, carbon finance, FDI, etc.), and describe how the finance will be used. Description of financial options is available in Chapter 2.3 of this Guideline.

It is essential to complete this section because the information indicated here will be viewed by Annex-I country Parties and potential investor for the purpose of deciding finance for the particular NAMA.

Type of Support	**Support required for preparation**	**Support required for implementation**
Financial		
Technical		
Capacity Building		

EXPECTED GHG EMISSION REDUCTIONS AND MRV

Expected GHG Emission Reduction Potential

Referring to the methodology shown in the Chapter 2.2 of this Guideline, estimate the amount of GHG emission reduction from the proposed NAMA.

- **Annual reduction**: tCO_{2e}

Indicate the result of GHG emission reduction estimation in tons of $CO_{2\text{-equivalent}}$. Emission reduction amount of non-CO_2 gases, such as CH_4 and N_2O, must be converted into $CO_{2\text{-equivalent}}$.

- **Total reduction**: tCO_{2e}

Indicate the expected total amount of GHG emission reduction over the lifetime.

Methodologies and Assumptions

- **Methodologies**:

  Indicate which methodology(ies) is used in order to estimate the GHG emission reduction. If the project uses its own methodology, or uses a modified or deviated version of the international methodology, clearly describe which parts are different from the original version and the reason of modification/ deviation.

- **BAU scenario:**

  BAU scenario, or the Business-as-usual scenario, of NAMA can be defined as the scenario or situation that would have occurred in the absence of the proposed NAMA.

  Describe what would be the situation in the future if the proposed NAMA does not take place. BAU scenario must be set for each NAMA but may include such situation as current situation will continue and no advanced technology will be installed or no improvement, due to financial/ technical/ institutional constraints;

  A reasonable and realistic scenario must be set as BAU, since BAU is directly related to the amount of GHG emission reduction from the proposed NAMA. Incorrect BAU setting may lead to significant overestimation or underestimation of GHG emission reduction, which may also affect financial performance of NAMA.

  Some of the methodologies used for GHG emission reduction estimation, notably CDM methodologies, provide a BAU scenario for NAMA.

  Also indicate in this section from which sources GHG would be emitted in the BAU case, e.g. CO_2 emissions from lignite combustion at a thermal power plant A, CO_2 emissions from grid electricity consumption, CH_4 emissions from the existing landfill site, etc.

- **Calculation of emission reduction**

  Describe the calculation steps and equations used, referring to the methodology (ies) applied.
  Indicate the detailed source of all data used for calculation.

  Use the table below to describe the important parameters used in the calculation.

Data / Parameter	
Unit	
Description	
Source of data	
Value applied	
Comment	

Measurement, Reporting, and Verification (MRV)

Monitoring plan

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

  Use the table below to indicate which parameters/ data will be monitored after implementation of the proposed NAMA. This activity corresponds to the "Measurement" (M) part of MRV and it is very important in order to calculate the amount of actual emission reductions from NAMA.

Data / Parameter	
Unit	
Description	
Source of data	
Measurement procedures	
Monitoring frequency	
QA/QC procedures	
Comment	

- **Monitoring plan and structure:**

  Describe the overall plan as well as structure for the Measurement (M) and Reporting (R) steps of MRV for the proposed NAMA.

  Provide an organization chart that includes all personnel/departments responsible for the monitoring and reporting activities. Also clearly indicate who is responsible for monitoring the parameters identified in the above section, who will report the monitored result, and how quality assurance/ quality control is assured.

  It is advised not to establish a new monitoring system for the proposed NAMA, which may cast an additional burden for the NAMA implementing entity, but to use the existing monitoring and reporting system currently in place.

- **Domestic MRV arrangements**

  Domestic MRV system of Serbia is yet to be established. However, it is expected that under the Serbian domestic MRV system, which will be in accordance with the MRV system in EU, a NAMA implementing entity is responsible for the Measurement (M) and Reporting (R) activities, which will go trough Verification (V) from third party.

  General description of the Serbian domestic MRV system should be added in this section once the system is in place.

OTHER INFORMATION

Contribution to Sustainable Development

Indicate how the proposed NAMA will contribute to the sustainable development of Serbia. Also, indicate how the NAMA is in line with Serbia's national policy and strategy.

In analyzing the contribution to sustainable development, NAMA implementing entity can refer to the sustainable criteria for CDM projects in Serbia, which is summarized in the table below.

Criteria	Area
Economic	1. Investment conditions
	2. Sustainable transfer of technology
	3. Economic development of the region
	4. Employment
	5. Sectoral priorities
	6. Costs and production
Social	1. Stakeholders' participation
	2. Improvement of life conditions
	3. Capacity building
Environment and natural resources	1. Energy resources
	2. Air
	3. Water
	4. Land

Stakeholder consultation

Describe how NAMA implementing entity will conduct stakeholder consultation.

CONTACT INFORMATION

Provide information on the contact information of each NAMA implementing entity as well as NAMA coordinating entity.

A NAMA implementing entity is an entity established in Serbia that plays a main role, has main responsibility in implementing a proposed mitigation action, such as operator of the equipment/ facility or overall management of the project. A NAMA implementing entity can be multiple entities. The Ministry of Energy, Development and Environmental Protection does not have any restriction at the moment on this issue.

Whereas a NAMA coordinating entity is a government institution responsible for evaluation and submission of a proposed mitigation action as a Serbian NAMA. Serbian NAMA coordinating entity also has a responsibility to communicate with UNFCCC regarding NAMA submission, update, or withdrawal from NAMA Registry.

NAMA Implementing Entity

Entity Name	
Contact Person	
Title	
Phone	
E-mail	

NAMA Coordinating Entity

Entity Name	
Contact Person	
Title	
Phone	
E-mail	

Attachment: Financial Information

Financial data is crucial information for investors in order for them to decide to invest in the proposed NAMA. If the proposed NAMA has completed financial/ economic analysis and if the NAMA implementing entity is ready to disclose this information to the public, please attach a spreadsheet of financial evaluation here.

2.2 Methodologies for GHG Emission Reduction Estimation

2.2.1 Available Methodologies

There exist various methodologies to calculate the amount of GHG emission reduction from NAMA. Complexity of equations and the number of parameters that have to be collected in order to perform calculation greatly varies depending on the selected methodology. This section presents some of the available and most widely used methodologies for project-based or program-based climate change mitigation actions.

Serbian NAMA implementing entity is advised to select an appropriate methodology(ies) that is applicable to one's NAMA. In selecting a methodology, applicability conditions of a methodology such as limitation of applicable technology/ measure/ sector should be taken into account, as well as the complexity of methodology and data availability for one's NAMA.

Although UNFCCC has yet to publish guidance regarding which methodology should be or can be applied to NAMA, either domestic or internationally supported NAMA, it is recommended to use any of the internationally accepted methodologies listed in the table below. If an applicable methodology cannot be found for a proposed NAMA, a NAMA implementing entity may develop a new methodology.

Although NAMA implementing entity has an option to choose any methodology at the moment, it is important to note that donor countries and institutions that provide support for the implementation of the proposed NAMA may require to use certain methodologies for the proposed NAMA. Some of the existing methodologies under the UNFCCC are listed in the Table 3.

Table 3: Methodologies for GHG Emission Reduction Estimation

Category	Methodology	Description	Sectors covered	Reference
CDM methodology	Clean Development Mechanism (CDM)	- **CDM methodologies** are considered by many as international standard for calculation of amount of GHG emission reduction through mitigation activities. They cover 15 sectors, consist of 188 approved methodologies (As of 11 October, 2012), and are applied to more than 4,600 projects. (As of October, 2012) - The methodologies are considered accurate but some of them are extremely complex for application. - Many of the methodologies are provided with "default" values such as CO_2 emission factor for simplification. One is also provided with various options to choose from, such as international default values, country-specific or project-specific values, and estimated values based on calculation.	- Energy industries (renewable -sources/ non-renewable sources) - Energy distribution - Energy demand - Manufacturing industries - Chemical industries - Construction - Transport - Mining/mineral production - Metal production - Fugitive emissions from fuels (solid, oil and gas) - Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride - Solvent use - Waste handling and disposal - Afforestation and reforestation - Agriculture	http://cdm.unfccc.int/methodologies/index.html
Methodology provided by International Agency	Inter-governmental Panel on Climate Change (IPCC)	- **2006 IPCC Guidelines for National Greenhouse Gas Inventories** are widely used for calculation of amount of GHG emission at national level. The guidelines cover 5 sectors. - The calculation method is originally prepared for calculation of nation-wide GHG emission amount. However, the method can also be applied to calculation of amount of emission in each project in covered sectors. - The guidelines include simplified/ specified	- Energy - Industrial processes and product use - Agriculture, Forestry, and Other - Waste	2006 IPCC Guidelines for National Greenhouse Gas Inventories http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

Category	Methodology	Description	Sectors covered	Reference
		method for calculation of GHG emission amount in each sector; in simplified method, default value in a country is available for calculation, while specified method requires use of national data or data acquired through analysis. - Default values in the guidelines are adopted by various other methodologies as their default value including CDM methodology.		
Methodology provided by International Agency	International Finance Corporation (IFC)	- **IFC GHG Accounting Tools** are composed by i) IFC Carbon Emissions Estimator Tool (CEET), ii) Tools to Estimate Greenhouse Gas Emission Reductions in the Waste Sector, and iii) Forest Industry Carbon Assessment Tool (FICAT). The aim of development of these tools is a better appreciation of implications from the GHG emissions through investments by IFC, as an additional form of business risk analysis. The tools cover 21 sectors. - CEET provides a simple method for: • Estimation of actual project emissions based on information commonly collected during project appraisals, and • Calculation of changes in GHG emissions by comparing project emissions with an alternate project, or reference scenario - Tools to Estimate Greenhouse Gas Emission Reduction in Waste Sector are to help calculate the carbon credits generated by mitigation projects. - FICAT provides a tool for calculation of footprints of the effects of GHG emission in forest-based manufacturing activities along	[CEET] - Fuel consumption, refrigeration/ AC - Waste, Wastewater - Gas Flaring - Other process emissions - Electricity - Cement - Electronics - Metal industry - Geothermal gases - Reservoirs and dams - Forestry - Land use - Livestock - Chemicals - Glass production - Lime production - Oil and mining - Process inputs and materials used [Tools to Estimate Greenhouse Gas Emission Reduction in Waste Sector]	General information http://www1.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/CB_Home/Policies+and+Tools/GHG_Accounting/ Respective tools [CEET] http://www1.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/CB_Home/Policies+and+Tools/GHG_Accounting/ [For Tools to Estimate GHG Emission Reduction in Waste Sector] http://go.worldbank.org/BH4ZM184F0 [FICAT] http://www.ficatmodel.org/landing/index.html

Category	Methodology	Description	Sectors covered	Reference
		the value chain. The tool is based on based on methods provided by IPCC and the WRI/WBCSD GHG Protocol.	- Waste (Waste/ wastewater management) - Landfill gas capture - Manure management [FICAT] Forestry	
Methodology provided by International Agency	World Bank	- World Bank developed "**Greenhouse Gas Assessment Handbook - a practical guidance document for the assessment of project-level greenhouse gas emission**" in 1998 in order to facilitate calculation of GHG emission amount at project preparation stage. - The calculation method applied in this handbook is in accordance with method and data in Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories. The methodology is applicable to calculation of GHG emission amount at project level.	- Energy (including transport) - Industry and infrastructure - Land use (Forestry, soil conservation, and watershed management, etc.)	Greenhouse Gas Assessment Handbook - a practical guidance document for the assessment of project-level greenhouse gas emission http://documents.worldbank.org/curated/en/1998/09/1976183/greenhouse-gas-assessment-handbook-practical-guidance-document-assessment-project-level-greenhouse-gas-emissions
	Organization of Economic Co-operation and Development (OECD) International Energy Agency (IEA)	- OECD-IEA issued "**Practical Baseline Recommendations for Greenhouse Gas Mitigation Projects in the Electric Power Sector**" in 2002. The aim of issuance is to provide a manual for estimation of GHG emission baseline in projects in electric power sector under CDM/JI and other domestic credit schemes. - It provides different baseline approaches in 3 different types (Combined Margin, Build Margin, and Operating Margin) of electricity projects in electric power sector.	- Energy (Electric power sector)	*Practical Baseline Recommendations for Greenhouse Gas Mitigation Projects in the Electric Power Sector* http://www.oecd.org/env/climatechange/documentsonelectricityandclimatechange.htm

Category	Methodology	Description	Sectors covered	Reference
Methodology provided by International Agency	United Nations Environment Programme (UNEP)	- UNEP published **United Nations Greenhouse Gas Calculator** in 2009 with aim to help related UN agencies and organizations prepare their baseline GHG inventories, arising from facilities operations and travel, by type of gas and by source. They only cover activities by these UN agencies and organizations, emitting all 6 GHGs described in the Kyoto Protocol, in 3 sectors.	- Transport (Mobile fuel combustion) - Stationary fuel combustion (*e.g.* electricity consumption in buildings, heating, hot water and cooking) - Fugitive emissions (*e.g.* leakage of GHG from refrigeration and air-conditioning equipment)	United Nations Greenhouse Gas Calculator http://www.unemg.org/MeetingsDocuments/IssueManagementGroups/SustainabilityManagement/UnitedNationsGreenhouse.g.asCalculator/tabid/3975/Default.aspx
	Asian Development Bank (ADB)	- ADB published "***Transport and Carbon Dioxide Emissions: Forecasts, Options Analysis, and Evaluation in 2009***" to provide overview of concept of estimation of GHG emission in energy and urban transportation sector with short-term/ mid-term/ long-term viewpoint. - Also, discussion on the key parameters which needed to be routinely collected by authorities is introduced to help them perform an accurate estimation of GHG emission amount in transportation sector.	- Transport - Energy	Transport and Carbon Dioxide Emissions: Forecasts, Options Analysis, and Evaluation http://www.adb.org/publications/transport-and-carbon-dioxide-emissions-forecasts-options-analysis-and-evaluation
	Global Environment Facility (GEF)	- GEF published "***Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects***" in 2008 to provide a guideline and spreadsheet (named CO2 Calculator) to assess and quantify GHG emission in GEF-sponsored mitigation projects. It covers 2 sectors. This manual partly uses similar steps for evaluating and quantifying effectiveness of GEF-sponsored mitigation projects as standard scheme for CDM does. After setting	- Energy (energy efficiency and renewable energy)	Manual for Calculating GHG Benefits of GEF Projects: Energy Efficiency and Renewable Energy Projects http://www.thegef.org/gef/node/313/

Category	Methodology	Description	Sectors covered	Reference
		baseline, calculation of direct emission reduction is made. - The manual takes into account characteristics of the GEF projects, in comparison with CDM projects including, • Wider range of targeted activities (*e.g.* from demonstration projects to financing mechanisms, capacity building, development and implementation of government policies supporting climate-friendly investments) • Project outputs including energy efficiency and renewable energy investments which lead directly to GHG emission reduction		
Methodology provided by Donor Agencies	Japan International Cooperation Agency (JICA)	- **JICA Climate-FIT** methodologies are prepared to provide methods to estimate quantified emission reduction amount generated through various projects under cooperation framework between JICA and other countries. They cover 6 sectors. - JICA Climate-FIT is prepared to grasp the outcomes of JICA project activities from the viewpoint of climate change mitigation impact.	- Forestry and natural resource conservation (*e.g.* afforestation, forest conservation) - Transport (*e.g.* MRT, BRT) - Energy efficiency in industrial facilities (*e.g.* improved energy efficiency in industrial facilities) - Energy (*e.g.* fuel switch, improved efficiency in power generation facilities) - Renewable energy (*e.g.* wind power, biomass) - Sewage and urban hygiene (*e.g.* waste, wastewater, sewage)	Climate Finance Impact Tool for Mitigation http://www.jica.go.jp/english/our_work/climate_change/mitigation.html

Category	Methodology	Description	Sectors covered	Reference
Methodology provided by Donor Agencies	Japan Bank for International Cooperation (JBIC)	- JBIC established **J-MRV methodologies** for MRV of GHG emission reduction in Global Action for Reconciling Economic Growth and Environmental Preservation (GREEN) Scheme by JBIC. The methodologies cover all types of targeted GHGs of UNFCCC in 2 sectors, consist of 4 methodologies, and are applied to candidate projects for financial support under GREEN scheme. - J-MRV arranges simple and practical and internationally acceptable methodologies for MRV including calculation of emission reduction amount.	- Energy (*e.g.* thermal power generation, electric power generation and/or thermal energy supply from biomass residue, and waste heat recovery and use) - Energy efficiency	J-MRV Guidelines http://www.jbic.go.jp/en/about/environment/j-mrv/
Methodology provided by non-governmental organization	The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD)	- WRI and WBCSD established **Greenhouse Gas Protocol Initiative** (**GHG Protocol**) for quantification and management of GHG emission. GHG Protocol is intended for an international accounting tool for government and business sector. - GHG Protocol provided **Calculation Tools** to guide the entire process of GHG inventory development. The tools cover 2 sectors and 13 sub-sectors in industrial sector. - The tools for each sector are composed by spreadsheets for calculation of direct and indirect GHG emission, and related guidance documents.	[Sector toolsets] - Industry (*e.g.* cement, iron and steel, pulp and paper) - Office-based and service sectors	General information http://www.ghgprotocol.org/calculation-tools Sector toolsets http://www.ghgprotocol.org/calculation-tools/sector-toolsets Third Party Databases http://www.ghgprotocol.org/Third-Party-Databases
Verified Emission Reduction system	Gold Standard	- Gold Standard methodologies cover 3 sectors, consist of 8 methodologies.	- Energy - Energy efficiency - Transport	Gold Standard Methodologies http://www.cdmgoldstandard.org/project-certification/gs-methodologies

Category	Methodology	Description	Sectors covered	Reference
Methodology for domestic voluntary emissions trading	The Climate, Community and Biodiversity Project Design Standards (CCB Standards)	- CCB Standards published **Climate, Community and Biodiversity Project Design Standards** in 2008, with aim to facilitate project developers, investors, and Governments to assess impacts of various projects through various items in project checklist on project components (e.g. project area condition, baseline projections, project design and goals), impacts and benefits to mitigation of climate change, community, and biodiversity. The standards cover forestry sector, and are used as a standard for related projects of land use with multiple benefits.	- Forestry (*e.g.* afforestation and reforestation, sustainable forest management, forest recovery)	Climate, Community and Biodiversity Project Design Standards Second Edition http://www.climate-standards.org/standards/index.html
	California Climate Action Registry (CCAR)	- CCAR published "**General Reporting Protocol**" 3.1 to provide general information on the principles, concepts, calculation methodologies, and procedures required for reporting of emission amount based on consistent emission data. - CCAR also published "**General Verification Protocol**" 3.0 intended for accredited verification bodies under ISO14065 GHG Accreditation Program, with aim to provide a standardized approach of their third party verification of GHG emission baselines and annual emissions reported by CCAR participant entities. The protocol outlines the core components and required steps for the verification bodies' activities for verification of reported emission information. - 415 entities have participated in CCAR, and 863 verified GHG emissions reports were received. (As of October, 2012)	[Industry Specific Protocols] - Local government operations - Power/ Utility - Cement	General Reporting Protocol 3.1 and General Verification Protocol 3.0 http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html Industry Specific Protocols http://www.climateregistry.org/tools/protocols/industry-specific-protocols.html Technical Assistance providers http://www.climateregistry.org/tools/member-resources/verification/technical-assistance-providers.html

Category	Methodology	Description	Sectors covered	Reference
Methodology for domestic voluntary emissions trading	Offset Credit Scheme (J-VER)	- J-VER methodologies are provided for domestic voluntary emission reduction projects in Japan, in accordance with ISO14064-2, 14064-3 and 14065 standards. They are provided only for VER to domestic carbon market for CSR purpose. They cover 3 sectors, consist of 31 methodologies, and are applied to 230 projects. (As of October, 2012) - The methodologies are applied for estimation and accreditation of project-based voluntary GHG emission reduction activities. Their characteristics include simplified monitoring and calculation method for reduced burden and cost in the operator's side with equal standard of quality of generated credits.	- Energy and energy efficiency (27 methodologies) (*e.g.* substitution of grid electricity for solar power generation, introduction of co-generation equipment) - Waste (1 methodology for waste heat recovery and utilization) - Forestry (3 methodologies) (*e.g.* sustainable forest management)	J-VER official website http://www.j-ver.go.jp/e/index.html *The detail of project types and each applied J-VER methodology can be found; http://www.j-ver.go.jp/e/projecttypes.html

Source: JICA Climate-FIT, Climate Finance Impact Tool for Mitigation and Adaptation

Note: All information contained in the above table is as of November 2012. Please check each reference for update.

2.3 Project Evaluation and Financial Analysis

For both public and private projects, there are many plans and proposals of projects with the limited amount of the budgets. Therefore it is inevitable to make priority in the list of the projects for the efficient allocation and use of the limited resources. There are many factors for the investment decision but project evaluation is considered as an important parameter for the investment decision since the result of the evaluation can show whether the project is acceptable and, if it is, whether it is the best alternative. It is the investment decision that decides the priority among the piles of development projects and the sound investment decision is the key to the successful development.

A main objective of this section is to help prospective Serbian NAMA implementing entities to improve investment decisions in three respects: selection, modification and rejection of investment proposals.

2.3.1 Types of Project Analysis

This section describes two methods of project analysis; one with a project's profitability from the viewpoint of the enterprise and that of the country as a whole on the other. The project's commercial profitability is the benefit that the investor may expect and the national profitability is the benefit to the nation as a whole. It provides a feasibility assessment of the financial and economic impact of an investment proposal.

The process of analyzing a project's commercial and national profitability is in itself a highly commendable exercise because it provides decision makers with a variety of parameters both favorable and unfavorable to the project. Consequently it will bring them to consider alternatives and policies conducive to economic development. The process of evaluating a project reveals more to a decision maker about the conditions for development than the mere acknowledgement of the results of an evaluation.

There are different interpretations in using the term of types of analysis. In this section, the term **financial analysis** is used for the evaluation of project's commercial profitability from the viewpoint of enterprise, while the term **economic analysis** is used for the evaluation of project's national profitability from the view of the country as a whole.

2.3.1.1 Financial Analysis and Economic Analysis

Financial Analysis is concerned with assessing the feasibility of a project from the aspect of its commercial profitability. The project's direct benefits and costs are calculated in financial terms at the prevailing market prices. This analysis is applied to appraise the

soundness and viability of a single project as well as to rank projects on the bases of their profitability.

Basically there are two types of analyses in the Financial Analysis, 1) Investment Profitability Analysis and 2) Return on Investment Analysis.

Investment Profitability Analysis measures the profitability of the resources put into a project no matter what the sources of financing. Thus investment profitability analysis is an assessment of the potential earning power of the resources committed to a project without taking into account the financial transactions occurring during the project's life. Therefore, this analysis needs to be conducted as the first step of the financial analysis of the project.

On the other hand, **Return on Investment Analysis** takes into consideration the financial conditions of a project to ensure that the total cost of finances shall permit the smooth implementation and operation of the project. Cash flow data used in investment profitability analysis do not include all costs and receipts affecting a project's cash balance but only those related to the flows of real resources used in a project. Return on Investment Analysis requests the additional cash positions concerned with the financial transactions to be taken into consideration such as:

- Debt services charges, both principal and interest
- Payment of dividends
- Payments on insurance and reinsurance

As the introduction of financial analysis, this clause firstly focuses on the investment profitability analysis. Return on investment analysis will be referred in the later section of Project funding and financial analysis.

1) **Economic Analysis** (National Profitability Analysis)

The objective of commercial profitability analysis is to assess the net financial result of a project, while the national profitability analysis traces the project's contribution to all fundamental development objectives. In other word, while financial analysis emphasizes only on finding the profits of a project in monetary terms, economic analysis focuses on its real contribution to the welfare of the society, such as the effects on employment, distributions, foreign-exchange earnings, international competitiveness, technical know-how and the environment including climate change mitigation. National benefit is the one government needs to seek even in the case of low financial profitability. Later sections describe the analysis options for both financial and economic analysis in detail.

2) **Financial Analysis** (Investment Profitability Analysis)

Financial analysis is the key for entrepreneurs to make decision for investment. It is also the first step in the economic analysis of a project. Financial analysis is concerned with assessing the feasibility of a project from the viewpoint of its expected financial results. The project's direct benefits (revenue and/or saving) and costs are therefore calculated in pecuniary term at the expected market prices.

Result of financial analysis could be used to decide or adjusted tariff level and subsidy amount in the infrastructure projects. Financial analysis is considered important as it provides financial information to investors to make decision such as:

- How much return can be expected?
- How much is the investment amount?
- How many years does it take to recover initial invested capital?
- How much subsidy is required for the project to be viable?
- What level of tariff to be set?

2.3.1.2 Methodologies of Financial Analysis

Different methods may be used as a basis on which to assess the investment profitability of a project. The framework for the commercial profitability analysis is described in the figure below.

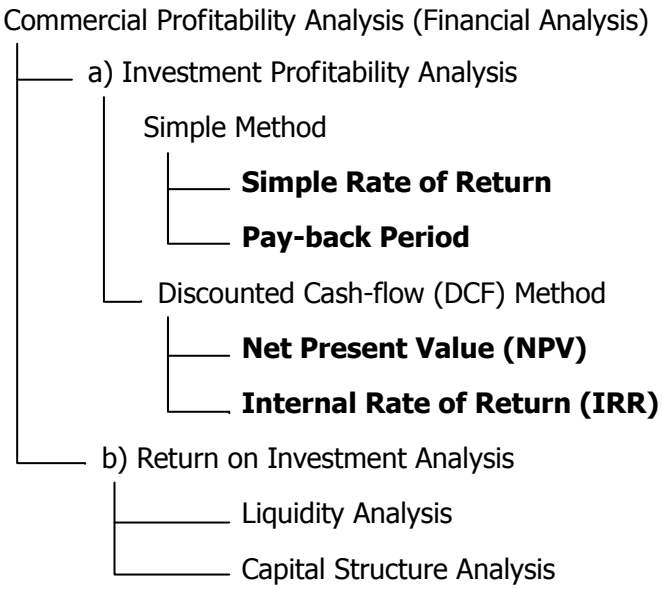


Figure 1: Framework for Commercial Profitability Analysis

Simple Rate of Return and **Pay-back Period** methods are usually referred to as the simple or static methods since they do not take into consideration the whole life span of the project but rely on one model period (most frequently one year).

Net Present Value and **Internal Rate of Return** are called discounted cash flow or dynamic methods since they take into consideration the entire life of a project and the time factor by discounting the future inflows and outflows to their present values.

Hence, the simple methods are somewhat less precise, but in some cases a simple analysis could be sufficient and the only possible alternative while in others it would be preferable to carry out comprehensive analysis using the net present value and the internal rate of return methods.

The choice of method depends on the objectives of the enterprise, the economic environment and the availability of data. However, in case two or more projects are being evaluated and compared, the same method consistent with the objectives of the investor should be used to secure a unified base for adequate comparison, final ranking and rational decision making.

1) Simple Method (or Static Method)

Simple Rate of Return is the ratio of the net profit in a normal year to the initial investment. This rate could be calculated either on total investment or on equity, depending on whether one wants to know the profitability of the total investment (include debt such as loans) or only of the equity capital. Simple rate of return is a useful tool for the quick analysis of the investment profitability of a project. However, this method is based on one year's data and it may be difficult to find one normal year adequately represents the whole life span of a project.

Pay-back Period is the time needed for a project to recover its total investment through its net cash earnings. Therefore it is the number of years during which a project will accumulate sufficient net cash earnings to cover the amount of its total investment.

The result of the pay-back period should be compared with the cut-off pay-back period established by the investors as well as with the pay-back periods of alternative investment projects. The advantage of the pay-back period method is that it is simple and easy to understand. The limitation of this method is that it ignores the project's net profits after the pay-back period. Also it pays much attention to the liquidity of a project while profitability of investment is not measured and the time phasing of cash inflows and outflows within the pay-back period is not assessed.

2) Discounted Cash-flow Method (or Dynamic Method)

Compared to the simple method, discounted cash-flow method is a comprehensive analysis considering the project life of cash flow using the net present value and the internal rate of return methods. It takes into consideration the entire life of a project and the time factor by discounting the future flows and outflows to their present value. Evaluation is based on the value of cash flow estimation against initial investment. Future cash flow should have to be discounted in order to obtain the present value. Future cash flow needs to be discounted because the value of money 100 as of, for example, 14 December 2011 is different from the value of money 100 as of 14 December 2020, because of risk of time and opportunity cost for 10 years.

Although it is more complicated than the simple method, it is the most popular method for CDM projects. CDM projects often use this method in the financial analysis calculation, though the choice of method depends on the objectives, economic environment and the availability of data.

Discount rate is the rate for opportunity cost of capital. In many cases it is not equal to the bank rate, since it has to include risk factors based on uncertainty of business. Some countries decide their own social discount rate to use analysis of the public projects.

Net Present Value (NPV) of a project is defined as the difference between the present value of its future cash inflows and outflows. It means that all annual cash flows should be discounted to the zero point of time (present value) at a predetermined discount rate.

The project's net present value increases with larger cash inflow and number of years but decreases with a higher discount rate and cash outflow. A project is commercially acceptable if its present value is greater than or at least equal to zero. When selecting among alternative projects, the one with the largest net present value is preferred for implementation.

In the **Financial Internal Rate of Return (FIRR)** method, the discount rate is unknown, unlike the net present value method in the application of which the discount rate is given outside the project. By definition, internal rate of return is the rate of discount that reduces the net present value of a project to zero. The internal rate of return determines the return on the total invested costs and therefore signals the maximum rate of interest on loans this project can pay. No other method will supply such important information.

2.3.1.3 Methodologies of Economic Analysis

In the financial analysis, emphasis is on finding the profit in monetary terms and not on its real contribution to the welfare of the society. For measuring a project's contribution to the national economy, economic analysis should be applied. While the former takes into account only the direct monetary effects of a project, the latter takes into consideration both direct and indirect effects. The economic analysis traces the project's contribution to all fundamental development objectives. Both analyses attempt to identify the costs and benefits to assess the profitability, however, the costs and benefits in different valuation. The latter is a much more complex exercise than the former. The section introduces some of the basics of the national profitability analysis.

An overall development strategy of a country usually requires that several objectives to be fulfilled. It is therefore necessary to appraise the social soundness of a project, from the point of view of its effects on the economy as a whole and on the particular aspects of national life in the context of which a project is being considered.

In the economic analysis, benefit is calculated by the difference between "with" the project and "without" the project cases, such as saving of vehicle operating cost (VOC), travel time saving (TTS), CO_2 emission reduction, job creation etc.

Principle idea of the economic analysis is to evaluate the price of resources from the view point of the national economy. For this purpose estimated cost and benefit in market price (financial price) should be adjusted to its economic price. The standard of this adjustment is 1) the resource estimated is truly used for the project, and 2) the estimated price truly expresses the real price. The former resources are tax, interest, subsidy, etc., which are only transferred within the domestic economy. The latter is distorted price by the market. The price includes trading goods that needs to be adjusted to the international market price at actual CIF or FIB prices. In the economic analysis, discounted cash flow is also applied to calculate Net Present Value, **Economic Internal Rate of Return (EIRR)** and **Benefit/Cost ratio (B/C)**. As mentioned earlier, economic analysis is a bit more complicated than financial analysis.

2.3.2 Evaluation of Project

1) Evaluation of the parameter

As mentioned earlier, purpose of the project analysis is to determine whether the project is acceptable or to compare with the other projects. One of the parameters is interest rates of financial market such as deposits, commercial loans and bonds. In addition to the feasibility, or the profitability, total cost of the project is also the key issue since it will affect to the necessary amount of the capital and finance that investors need to arrange.

In recent schemes, considering the limitation of public budget and often not so efficient in the public projects, promotion of private investment and operation into the public projects is becoming more and more important. Dividing a large and unprofitable project into parts and inviting private investments to the parts where it is profitable requires accurate financial analysis. Details will be presented in the later clause: Private Investment and Public Private Partnership.

2) Investment analysis of CDM project

CDM Executive Board of UNFCCC adopted the "Tool for the demonstration and assessment of additionality" that contains three options of methodology for financial analysis; namely, simple cost analysis, investment comparison analysis and benchmark analysis, in which IRR, NPV and Cost benefit ratio are the main indicators. In practical, these indicators and methodologies are in use. Therefore, it is safe to say that discount cash flow methodology is preferred in the international practice. Latest version of the above-mentioned tool is available: http://cdm.unfccc.int/Reference/tools/index.html.

3) Data Required for Cash flow analysis

Since discounted cash flow is used for both financial and economic analysis, it is important that inflow and outflow information to make cash flow to be prepared. Such information includes,

- Investment Cost (Initial & Additional),
- Operation and maintenance Cost,
- Revenue (and/or savings) from the project, and
- project life.

For the economic analysis, it is important that the benefit that could be implemented by the project needs to be determined beforehand.

2.3.3 Project Funding and Financial Analysis

Funding schemes for NAMA vary depending on the type of the action. For profitable large projects such as power generation projects, private investors mainly organize for financing projects to share potential risks. On the other hand, for projects that can expect limited revenue at profitable level find it difficult to attract private investors, public sector needs to finance from the public budget or to seek some assistance forms to attract investors.

1) Domestic source

Other than the government budget, both central and local finance includes guarantee and private investment, financial tools are limited such as equity, loan, issuing of bonds, concession loans.

2) International source

There are wider options in the international market such as;

- Private Loan
- Official Development Assistance (ODA) financial tool
- Specific Financial Tools

Bank Loan, Concession Loan, Equity, are the example of the 1) Private Loan and the schemes of international organizations, Sovereign Loan, Concessional Loan, Guarantee, Grants etc., are the example of 2) ODA financial tools.

- Guarantee (Loan Guarantee Instrument for trans-European transport network projects (LGTT), The Multilateral Investment Guarantee Agency (MIGA), etc,)
- EU Programmes:
- Instrument for Pre-Accession Assistance (IPA) (ec.europa.eu/regional policy/funds/ipa)
- TACSO Project (Technical Assistance for Civil Society Organizations) (www.tacso.org)
- European Agency for Reconstruction （http://ec.europa.eu/enlargement/archives/ear/serbia/serbia.htm）
- Special Climate Change Fund (SCCF) (www.climatefinanceoptions.org)
- Climate Funds (www.climatefundsupdate.org)
- Green Climate Fund (unfcc.int/cooperation_and_support/financial_mechanism/greenclimatefund)

- Green for Growth Fund for Southeast Europe

PPP incentives include subsidy, various technical tools in the financial market such as Debt Equity Swap (DES), which is the exchange of debt to equity to ease the financial burden of the borrower, Carbon Credit (EU, EIB, EBRD, IBRD, Germany, Japan and other OECD countries) are the example of 3) Special financial tools. The scheme of public private partnership (PPP) is not limited to the international market, however, it is important that role and responsibility of each entity involved to be defined precisely in the concession agreement. Financial analysis for PPP scheme also provides necessary information for the support by public such as subsidy, property right. It is important to emphasize that PPP is the scheme to share risks and responsibilities between public and private. Therefore, without taking risk and responsibility by public, private cannot actually implement its finance as defined in the concession agreement.

3) Private Investment and Public Private Partnership (PPP)

When private investors look into the list of potential projects, information about financial analysis seek their interest since recovery of the investment and earning profit from the invested projects are one of their main objectives.

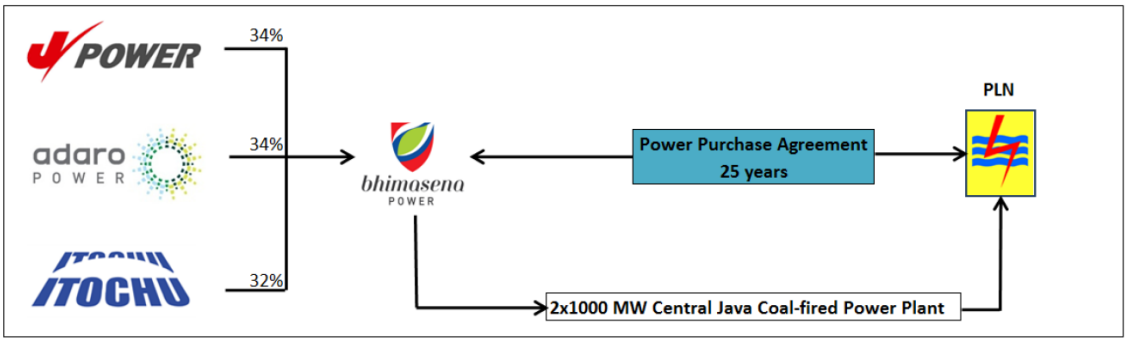
As for the parameters of their judgment/evaluation of the investment, it is normal that they compare with some other opportunity of investment. Especially in terms of the return from the projects they invest. Major parameters for the evaluation are; rate of return, amount of return, years to recover initial investment, etc.

With the limitation of public budget, promotion of private investment into the public project becomes popular. Together with outsourcing, PFI (private finance initiative), privatization, change of the organization scheme from public to independent administrative institution, the scheme called **public-private-partnership (PPP)**, is one of the common schemes taken these days. Main objective of PPP scheme is to provide more opportunities in the public projects to private organizations. Under PPP scheme, role and responsibility of both public and private side vary depending on the project. Public will take some responsibility to exclude obstacles for private investment. By doing so, public can save their budget for the public projects and could expect better administrative services to the public by private efficient operations.

PPP scheme will enable private investment to the unprofitable project by taking risks or providing incentives in the project. Railway project is a good example of PPP scheme. Because of the huge initial investment cost, railway project is considered to be the

unprofitable project as a whole. Typical PPP scheme in the railway project is to divide the project into infrastructure and operation parts. Public will construct the infrastructure and private will take responsibility of its operation where commercially profitable operation can be expected. Therefore, in addition to the financial analysis of the whole project, analysis of each divided part, infrastructure and operation, is required.

As an example of PPP project, J-POWER-ADARO-ITOCHU consortium established a project company, BPI, in July 2011 to build, own and operate a coal-fired power plant, which would be amongst the largest in Asia. The Power Purchase Agreement (PPA) includes the construction of a coal-fired power plant with a total capacity of 2,000 MW in the province of Central Java ("Central Java Power Plant"/"CJPP") and a 25-year supply of electricity to PLN. The total project cost is approximately US$4 billion. It was the first actualized public-private partnership ("PPP") in Indonesia under a guarantee provided by the Indonesia Infrastructure Guarantee Fund (IIGF), which was established by the Government of the Republic of Indonesia to provide guarantees for Government Contracting Agencies' contractual obligations under cooperation agreement between the Government and private sector.



Source: http://www.jpower.co.jp/english/news_release/news/news111007.pdf

Figure 2: Example of PPP scheme

In NAMA, some of the projects that are not so profitable may be able to acquire private investment by introducing PPP scheme. In the scheme of PPP, it is prerequisite to determine the role and responsibility of each participant. Concession agreement is the scheme to determine the detail of the role and responsibility. As the preparation of PPP project, most of the countries have introduced concession laws. **Concession loan** is one scheme of loan in the PPP scheme. For the calculation of this loan, Return on Investment Analysis is required. In Serbia, by the Law on Concession, the period of a concession is limited up to 30 years.

4) Return on Investment Analysis

Return on Investment Analysis has to take into consideration the financial features of a project to ensure that the disposable finances shall permit the smooth implementation and operation of the project. Return on investment analysis requires the additional cash flow with the financial transactions such as repayment of the principal and payment of interest thus the rate of interest be taken into consideration. For the PPP analysis, ROI analysis on each investment divided into parts should be carried out.

In case of railway project mentioned above, investment is divided into two parts. Other than this example, the cash flows of a project can be divided into several other parts. Project X in the figure bellow involves at least six stakeholders; namely, the project entity (such as a joint venture company), the shareholder, the lender, the supplier/contractor, the government and the consumer/user, and cash flows are recognized individually by each one of these stakeholders. The project entity deals with all the cash transactions, while the shareholder invests equity capital and receives dividends, the lender extends a loan and receives principal repayment and interest payment, the supplier/contractor builds production facilities and receives payment, the government receives tax, and consumer/user buys products.

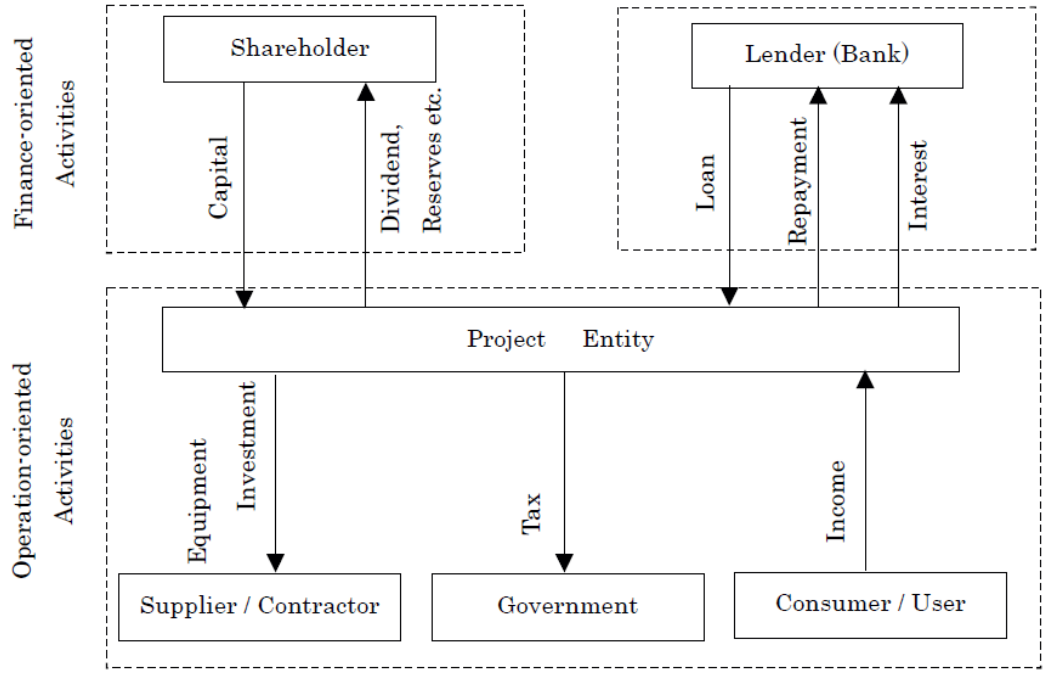


Figure 3: Cash Flows of Project X[2]

[2] Financial Internal Rate of Return (FIRR) Revisited, Japan Bank for International Cooperation (JBIC) Institute, March 2002

Financial analysis on the following entities could be carried out to analyze the return on each investment.

1. Overall Cash Flow Analysis (Involving operation-oriented as well as finance-oriented activities) by Investment Profitability Analysis [FIRR]
2. Return on Investment Analysis by Shareholder [ROE]
3. Return on Investment Analysis by Lender [ROL]
4. Operation-oriented Cash Flow Analysis by Project Entity by Return on Investment Analysis [ROI]

2.3.4 Incentive and Subsidy

As mentioned in the section for the private investment and PPP, when private investors require a certain level of return and if the project's level of the return on investment is lower than that required level, the government (public) might need to consider providing some incentives or subsidy to promote private investment. For the calculation of necessary financial inflow to make the project attractive enough for the private investors, the method of the return on investment needs to be used. Incentive involves preference of tax, provision of development right, etc., which do not directly affect the limitation of public budget.

The Government of Serbia has established an incentive measure that favors renewable energy projects. The incentive is defined in the "Regulation on incentive measures for incentivized electricity producers", which defines the feed-in tariffs to the types of power plant producing electricity from renewable energy sources and the capacity installed.

Table 4: Feed-in tariff in "Regulation on incentive measures for incentivized electricity producers"

Number	Type of power plant	Installed capacity P (MW)	Feed-in tariff (c€/kWh)
1.	**Hydro power plant**		
1.1		Up to 0.2	12.40
1.2		0.2 – 0.5	13.727-6.633*P
1.3		0.5 - 1	10.41
1.4		1 – 10	10.747-0.337*P
1.5		10 - 30	7.38
1.6	Within the existing infrastructure	Up to 30	5.9
2.	**Biomass fired power plants**		
2.1		Up to 1	13.26
2.2		1 - 10	13.82 – 0.56*P
2.3		More than 10	8.22
3.	**Biogas fired power plants**		

Number	Type of power plant	Installed capacity P (MW)	Feed-in tariff (c€/kWh)
3.1		Up to 0.2	15.66
3.2		0.2 - 1	16.498 – 4.188*P
3.3		More than 1	12.31
3.4	**fired** by biogas of animal origin		12.31
4.	**Landfill gas fired power plants and power plants fired by gas from municipal wastewater treatment plants**		6.91
5.	**Wind power plants**		9.20
6.	**Solar power plants**		
6.1		Mounted on a building Up to 0.03	20.66
6.2		Mounted on a building 0.03 – 0.5	20.941 – 9.383*P
6.3		Ground-mounted	16.25
7.	**Geothermal power plants**		
7.1		Up to 1	9.67
7.2		1 – 5	10.358-0.688*P
7.3		More than 5	6.92
8.	**Waste fired power plants**		8.57
9.	**Coal-fired cogeneration plants**	Up to 10	8.04
10.	**Natural gas-fired cogeneration plants**	Up to 10	8.89

Regular annual correction of feed-in tariffs based on inflation in Euro zone shall be performed in February, starting from 2014, in the following manner:

$$C_1 = C_0 * (1 + p_{inf} / 100)$$

Where:

C_1 – New feed-in tariff;

C_0 – Previous feed-in tariff;

p_{inf} – Annual inflation rate in Euro zone published by the relevant institution of the European Union expressed in %.

Correction of feed-in tariff for natural gas fired cogeneration plants shall be performed for each fluctuation of natural gas price at which the supplier that supplies the public supplier sells the natural gas to the public suppliers, in the following manner:

$$C_1 = C_0 *(0.36 + 0.64* G / 35.59)$$

Where:

C_1 – New feed-in tariff;

C_0 – Feed-in tariff, calculated based on the "energy source" tariff of RSD 35.59 per m^3, from the natural gas price at which the supplier supplying the public suppliers sells the natural gas to public suppliers;

G – The new "energy source" tariff from the natural gas price at which the supplier supplying the public suppliers sells the natural gas to the public suppliers, and which does not include the costs of natural gas transportation system use incurred with the Srbijagas Novi Sad Public Company, expressed in RSD per m^3.

The corrected feed-in tariff shall be applied as of the first day of the following month to any future agreement between the incentivized producer and public supplier.

The Draft Law on the Development Bank of Serbia (DBS) has entered parliamentary procedure, as prepared by the former Ministry of Finance in January 2012. According to the draft it is envisaged that DBS will be established with initial capital of EUR 400 million and will approve loans, issue guarantees, invest in securities and conclude insurance and reinsurance agreements, and will finance small to medium enterprises, export development, local and communal infrastructure, energy efficiency, renewable energy sources and environmental protection. Upon the establishment of the DBS, the Agency for Export Insurance and Financing, the Unit for the Management of the Revolving Credit Facilities Fund and Development Fund of Serbia will cease to exist. However, according to the change in the government structures, current status of the draft law is unknown. Development Fund still exists to assist mainly to the private investors (http://www.fondzarazvoj.gov.rs/ Boulevard Nemanjića 14a, 18000 Nis, Serbia Tel: +381 18 41 50 199, +381 18 41 50 200, email: office@fondzarazvoj.rs). There is a development bank in the province of Vojvodina with its head quarters at Stražilovska 2, Novi Sad (Tel: 021/4884433, www.rbv.rs/home.50.html).

Serbia Investment and Export Promotion Agency (SIEPA) is the government organization dedicated to effectively helping foreign investors. SIEPA provides investment related incentives (for further details please see: http://siepa.gov.rs/en/).

State Grants

A new investment package has been prepared for investors into Serbia. State grants are offered for Greenfield and Brownfield projects in all industries, except for primary agriculture, the hospitality industry, retail, and the production of synthetic fibers and coal.

For standard-scale Greenfield and Brownfield projects in the manufacturing, export-related services sector and tourism, non-refundable state funds are offered in the range between €4,000 and €10,000 per new job created within three years.

For large investors, special financial packages are available:

- If a project's value exceeds €200 million, with the minimum of 1,000 new jobs created within an agreed-upon timeframe of no longer than 10 years, the state may cover 17% of the investment.
- Investments of over €100 million that create a minimum of 300 new jobs within an agreed-upon timeframe of no longer than 10 years can be subsidized for up to 17% of the project's value.
- Investments of over €50 million and less than €100 million that create a minimum of 300 new jobs within an agreed-upon timeframe of no longer than 10 years - can be subsidized for up to 20% of the project's value.
- Investments of over €50 million that create at least 150 new jobs within an agreed-upon timeframe of no longer than 10 years - are eligible to receive up to 10% of the total investment value.

Table 5: Serbian state grants for investors

Financial incentives				
Eligible projects	Investments of special importance	Large investment projects		Mid-sized investment projects
Amount of funding (€)	Up to 17% of the total investment amount	Up to 17% of the total investment amount	Up to 20% of the total investment amount	Up to 10% of the total investment amount
Minimum investment amount	€200 million	€100 million or greater	between €50 million and €100 million	€50 million
Minimum number of new, full-time jobs created	1,000	300		150

Financial incentives				
Eligible investment projects	Direct investments			
	Manufacturing sector		Internationally-marketable services	Strategic projects in the field of tourism
	Investments in the 4th group of local administration and devastated regions	Investments in the 1st, 2nd and 3rd groups of local administration	The entire territory of the republic of Serbia.	The entire territory of the republic of Serbia.
Amount of funding (€)	4,000 – 10,000 for each new job created	4,000 – 10,000 for each new job created	4,000 – 10,000 for each new job created	4,000 – 10,000 for each new job created
Minimum investment amount	€500,000	€1,000,000	€500,000	€5 million
Minimum number of new, full-time jobs created	50	50	10	50

Source: http://siepa.gov.rs/en/index-en/invest-in-serbia/investment-incentives/

3. MRV for NAMA

3.1. MRV for NAMA

Measurement, Reporting, and Verification (MRV) is a very important element of NAMA and it has been a key topic in international negotiations on climate change.

MRV is a system and a process in which an impact of mitigation action is;

- **Measured**: either by monitoring, for example, the amount of fuels that have been consumed or saved through NAMA, or calculation using the available or obtained values;
- **Reported**: a result of climate change mitigation impact that has been measured in the form of, for example, ton of carbon dioxide equivalent per year (t-CO_2e/year) reduced by NAMA, is compiled and reported; and,
- **Verified**: the result obtained through Measurement is checked and confirmed whether all the information and data contained in a Report is accurate and correct.

Although the detailed modalities and procedures of MRV for NAMA are yet to be defined by UNFCCC, it is expected that the Measurement and Reporting will be the responsibility of NAMA implementing entity while the Verification will be conducted by a third-party verifier such as a certification entity.

MRV steps are extremely important because these steps allow Serbia to understand, accurately, the GHG emission sources and enhance sustainable policy making. Since the Measurement, or monitoring, step is costly for some types of the project, it is essential for NAMA implementing entity to consider and carefully establish efficient but at the same time effective MRV plan. It is suggested to develop a monitoring plan based on the existing system that is currently in place in order to reduce the burden and cost of monitoring.

3.2 Existing MRV Systems

3.2.1 MRV of Clean Development Mechanism (CDM) under Kyoto Protocol

Although many details of MRV for NAMA are yet to be defined by UNFCCC, it is useful to understand the existing MRV systems on the international level.

It is expected that the MRV system of NAMA will be similar to that of CDM.

Monitoring of CDM refers to collecting and archiving all relevant data necessary for determining the baseline and measuring GHG emissions. A CDM project proponent is required to use the approved (or newly proposed) methodology, which consists of baseline methodology, which stipulates the GHG calculation procedures as well as monitoring methodology, which specifies parameters to be monitored after project implementation and detailed monitoring procedures. A project proponent of the CDM project is also required to show the monitoring plan of the proposed project that describes how the monitoring activity is conducted.

The project proponent then completes and submits the monitoring report in accordance with the provided guideline titled "Guidelines for completing the monitoring report form". CDM MRV system has the standardized format for monitoring report to improve consistency in reporting of the implementation and monitoring of the project activity.

Verification (V) of CDM refers to verification and certification. Verification refers to the periodic independent review and ex-post determination of the monitored reductions of GHG that have occurred as a result of the CDM project activity. Verification is conducted by verification bodies called designated operational entity (DOE) and they conduct verification in accordance with the adopted manual for verifiers called "Clean Development Mechanism Validation and Verification Manual". DOE issues a certification during a specified time period that a project activity achieved the GHG emission reduction as verified. Latest list of Designated Operation Entities who are qualified to conduct verification is available: http://cdm.unfccc.int/DOE/list/index.html.

Project proponents of CDM projects are required to take the above-mentioned MRV steps in accordance with guidelines and manuals adopted by CDM Executive Board. Non-compliance in any of these steps means no issuance of carbon credit (Certified Emission Reductions: CERs) to the project proponent.

3.2.2 MRV of EU-ETS

As another example of well-established MRV system, this section presents the overview of MRV of EU Emission Trading System (EU-ETS).

Overall legal framework of EU-ETS MRV system is stipulated in the Directive 2009/29/EC, and following regulations 601/2012 of 21 June 2012 and 600/2012 of 21 June 2012 by the European Parliament and the Council, titled "establishing a scheme for greenhouse gas emission allowance trading within the Community". Main bodies involved in

the Trading System include the European Commission, Competent Authority (CA) of each member state as an administrative arrangement for the implementation of the rules of the Directive, accredited verification entities, as well as operators which manage targeted installations. Information of overall regulations, guidance and templates on MRV of EU-ETS (Phase III, which will start from 2013) is available in the European Commission website (http://ec.europa.eu/clima/policies/ets/monitoring/documentation_en.htm).

All the MRV processes are checked and inspected by a Competent Authority (CA) of each member state. The style of MRV of EU-ETS is an example of deep engagement of national authority for centralized enforcement of MRV.

Monitoring process ("Measurement" of MRV for NAMA) of EU-ETS contains such activities as preparation of an installation-specific monitoring plan, and monitoring GHG emissions for installation during the year, approval of monitoring plan by Competent Authority, and preparation of monitoring report by operators. The operators complete and submit the monitoring report, which comprises a reporting (R) element of MRV.

These processes are described by legal framework. The directive includes principles and requirements for monitoring and reporting activities by operators. Approaches of monitoring are composed by calculation of emissions by using standard methodology, measurement by continuous emission measurement system (CEMS), and combination of these approaches. EU-ETS does not have a set of registered methodologies as CDM scheme has, but only a combination of data with different quality levels and different monitoring approach from the viewpoint of cost-effectiveness.

Verification (V) of EU-ETS refers to verification of draft monitoring report by verifiers accredited by national accreditation bodies. EU-ETS provided guidance documents on general principles of verification and obligations of verifiers, etc. After verification is finished, operators submit verified monitoring report to Competent Authority. Afterwards, Competent Authority approves their verified monitoring report.

Operators of EU-ETS are required to take the above-mentioned MRV steps. They have to keep close communication with Competent Authority through entire process of MRV. Operators who do not follow these steps cannot obtain their ERU and will be required to payment of the excess emissions penalty.

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
Energy	1	Construction of a 790 MW Ultra Supercritical Lignite Power Plant TPP Nikola Tesla - Unit B3	Construction of a new lignite-fired thermal power plant. The new unit, called Unit B3, will have an installed capacity of 790 MW_e with net efficiency ≈ 43%, which is significantly higher than efficiency of a conventional lignite power plant in Serbia. The project will introduce an ultra-supercritical steam power generation technology.	1,337,728	1,200 million	Construction starts in 2017; operation starts in 2020.	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported
Energy	2	Modernization and Capacity and Efficiency Increase of Unit B2 in Thermal Power Plant Nikola Tesla	Rehabilitation and modernization of a lignite thermal power plant with capacity increase of 47 MW. Adopted technologies include rehabilitation and modernization of the steam turbine, condensing plant and cooling system unit, boiler and auxiliary equipment (e.g., low/high pressure feed water heaters), as well as revitalization and improvement of the firing system and the combustion process by introducing "Low NOx" burners and increasing the efficiency of the boilers.	355,142	22,716,750	Commissioning of the unit planned for 2013	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported
Energy	3	Modernization and Capacity and Efficiency Increase of Unit A3 in Thermal Power Plant Nikola Tesla	Rehabilitation and modernization of a lignite thermal power plant with capacity increase of 30 MW. Adopted technologies are rehabilitation and modernization of the steam turbine, condensing plant and cooling system unit, boiler and auxiliary equipment (e.g., low/high pressure feed water heaters), as well as revitalization and improvement of the firing system and the combustion process by introducing "Low NOx" burners and increasing the efficiency of the boilers.	91,796	30.5 million	Commissioning of the unit planned for 2013	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported
Energy	4	Replacement and Construction of a New Natural Gas Cogeneration Plant CHP Novi Sad	Construction of a new, energy efficient natural gas-fired cogeneration plant that will entirely replace the existing inefficient cogeneration plant, which is also fueled by natural gas and heavy oil. The existing cogeneration plant will be decommissioned when the new plant starts operation. The new cogeneration plant will generate 450 MWe of electricity, which will be supplied to the national grid of Serbia, while the plant will also generate 300 MWth of heat, which will be supplied to district heating plants of Novi Sad municipality through a pumping station.	1,019,380	250 million	Commissioning planned for 2015.	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
Energy	5	Construction of a Super-critical Lignite Power Plant TTP Kostolac B	Construction of a new lignite fired thermal power plant in TPP Kostolac B. The new unit, called block B3, will have an installed capacity of 600 MWe with net efficiency of 40.8%, which is significantly higher than the efficiency of a conventional lignite power plant in Serbia. The project will introduce a super-critical steam power generation technology.	1,390,533	954 million	Construction starts in 2015; operation starts in 2020	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported
Energy	6	Construction of 9 New Small Hydropower Plants (HPPs) in Serbia	The NAMA involves construction of new small scale HPPs (9 units with total installed capacity 30,4 MW and expected generation over 108 GWh/ year). The NAMA will contribute to climate change mitigation as the hydro power plants do not emit any GHG emissions, and reduce GHG that would otherwise be emitted from grid-connected power plants in the absence of the mitigation action.	102,343	54.684 million	Construction starts in 2013 and operation starts from 2014 to 2016	Public Enterprise Electric Power Industry of Serbia (EPS)	Supported
Energy	7	Introduction of Metering System and Billing on the Basis of Measured Consumption in District Heating Systems in Serbia	Almost all residential consumers connected to the district heating network in Serbia are paying their bill based on the floor size, instead of the actual amount of heat consumption. This billing system has prevented consumers from having energy saving mindset. The NAMA involves installation of devices that allow metering of heat consumption by each consumer, which is a necessary prerequisite for billing on the basis of actual heat consumption. Measures to be introduced include heat allocators with radio modem, thermostatic radiator valves as well as rehabilitation of 50% of existing substations in Serbia (approximately 12,500 substations) and installation of heat meters, automatic control, pumps with integrated frequency converters, plate heat exchangers, valves, etc. The NAMA will contribute to climate change mitigation through reducing the consumption of heat at residential sector, which is generated by fossil fuels.	329,117	212 million	Installation complete by 2016	Public Utility Company District Heating Plants of Belgrade, Serbian Association of District Heating Companies	Supported
Energy	8	Introduction 1000 MW of Small Biomass Boilers in	Serbia has abundant biomass resources throughout the country, which is estimated to be more than 100,000 TJ/. This NAMA aims to install 1000 MW of new biomass	414,501	250 million	Installation will start in 2015 and operation	Ministry of Energy, Development	Supported

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
		Serbia	boilers for all residential, commercial, and industrial sectors throughout the country that will be fueled by either wood waste (pellets or 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, and grid electricity.			will start continuously. The installation can be finished in 2019	and Environmental Protection (MEDEP)	
Energy	9	Use of Solar Energy for Domestic Hot Water Production in Heating Plant Cerak in Belgrade	Heating plant Cerak currently uses natural gas to produce and deliver heat for space heating and domestic hot water to residential and non-residential customers in Belgrade municipalities Cukarica and Rakovica. The NAMA involves installation of solar collectors to replace a part of the hot water generation, amounting for around 2,700 MWh which is supplied to 7,000 households. The action will introduce approximately 5,000 m^2 of solar collectors, hot water storage tank, heat exchanger, expansion vessel, pumps, valves, automatic control, and connect a new solar plant with the existing heat plant.	611	1.05 million	Installation starts in 2013 and operation starts in 2015	Public Utility Company District Heating Plants of Belgrade	Supported
Energy	10	Using of Waste Heat from Power Plant for Heating the City of Belgrade, Serbia	The NAMA involves construction of a pipeline from thermal power plant Nikola Tesla A (TENT A). The pipeline will supply Heat Plant New Belgrade with hot water from the power plant. Waste heat from Nikola Tesla TENT A will cover the basic load at the Heat Plant. The total heat capacity of heat source and pipeline will be 570 MW. With operating time of 3500 hours/ year, the pipeline will supply approximately 2,000 GWh of heat to district heating system in Belgrade, thus achieving energy savings of 194 million Nm3 of natural gas and 34,000 tons of heavy oil consumption.	161,875	200 million	Construction planned for 2013 and commissioning of the unit planned for 2016.	Public Enterprise Electric Power Industry of Serbia (EPS), Public Utility Company District Heating Plants of Belgrade, City of Belgrade, Ministry of Energy, Development and Environmental Protection (MEDEP)	Supported
Transport	11	Rehabilitation of Arterial Roads in Serbia	Although approximately 3,500 km of roads have been rehabilitated in the past 10 years, a significant part of Serbian arterial roads has not been maintained sufficiently	2,617	139.328 million	Preparation from 2013 to 2015 and	Ministry of Transport, Public	Supported

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
			due to the lack of funds, and are so deteriorated that caused congestion as well as traffic accidents. The NAMA involves rehabilitation of 19 arterial road sections, whose total length is 297.5 km. Climate change mitigation will be achieved by improving road surface that will prevent excessive slow mobility of vehicles and accompanied fuel saving of gasoline and diesel.			rehabilitation works from 2016 to 2020.	Enterprise "Roads of Serbia"	
Transport	12	Rehabilitation of Regional Roads in Serbia	Although approximately 3,500 km of roads have been rehabilitated in the past 10 years, a significant part of Serbian regional roads has not been maintained sufficiently due to the lack of funds, and are so deteriorated that caused congestion as well as traffic accidents. The NAMA involves rehabilitation of 129 regional road sections, whose total length is 2,768 km. Climate change mitigation will be achieved by improving road surface that will prevent excessive slow mobility of vehicles and by saving consumption of gasoline and diesel.	6,476	500 million	Rehabilitation works will start in 2013 and be completed by 2017.	Ministry of Transport, Public Enterprise "Roads of Serbia"	Supported
Building	13	Expansion of Existing Heating Network in Valjevo	The NAMA is the expansion of the existing district heating network to the city areas of Valjevo with the aim of energy efficiency improvement and air pollution reduction. Total heat capacity to be connected to the district heating system under the project will be 47.6 MW. The mitigation action involves installation of a hot water network in the length of 17.7 km (ϕ 125 mm) and closure of 49 existing inefficient heating stations (boiler rooms) and a large number of individual furnaces. 147 new heating substations will also be constructed in order to supply heat to the total surface area of 356,742 m^2. NAMA will lead to climate change mitigation through reducing fuel consumption at outdated inefficient boilers for heating.	12,141	9.1 million (hot water network EUR 6.4 million and substations EUR 2.7 million).	Construction will start in 2013 and completed by 2016	City of Valjevo, District Heating Company Valjevo	Supported
Building	14	Improvement of Old Residential Buildings	Residential buildings in Serbia that were built between 1950's and 1980's do not have effective thermal insulation, and thus consume tremendous amount of	503,929	723.48 million	Rehabilitation of buildings will start in	Ministry of Construction and Urbanism	Supported

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
		Envelope (exterior doors, windows and thermal insulation) in Serbia	energy for space heating. Objective of the NAMA is the rehabilitation of about 10% of the existing residential buildings throughout Serbia that were built in the said period. Detailed measures to be applied to the buildings include rehabilitation of buildings' envelope (thermal insulation of non-transparent elements: external walls, partitions to unheated spaces, roofs, ceilings, etc.), and replacement of windows with new five-chamber PVC frames, double glazing, low-emissivity glass, filled with argon gas. With the application of all above measures, specific annual energy consumption for heating will decrease from an average value of 160 kWh/m^2y to around 70 kWh/m^2y and GHGs emission reduction will be achieved.			2013 and will be completed in 2020		
Building	15	Construction of New Energy Efficient Buildings Based on Energy Efficiency Regulation in Serbia	Although Serbia has introduced a regulation in the 1970's that requires minimum energy efficiency for new residential and non-residential buildings, and has continuously improved the regulation, the country is taking one further step to make the regulation even much stricter than the previous standard. Under the new regulation, "Regulations on Energy Efficiency in Buildings," all new buildings will be installed with better thermal insulation of non-transparent elements, including external walls, partitions to unheated space, roofs, ceilings, etc., and with better windows quality. This allows specific annual heat energy consumption for new residential buildings to decrease from 100 to 60 kWh/ m^2y, and that for new non-residential buildings from 110 to 70 kWh/ m^2y and GHGs emission reduction will be achieved.	275,282	285.5 million	Construction will start in 2013 and operation will start continuously.	Ministry of Construction and Urbanism	Domestic
Building	16	Energy Efficiency Improvements in Public Buildings: 23 Schools and 26	Most of the old public buildings in Serbia do not have any energy saving measures applied and they are consuming significant amount of energy, which is contributing to GHG emissions in Serbia.	8,326	10.9 million	Construction starts in 2013	Ministry of Energy, Development and	Supported

Attachment 1: NAMA Shortlist of the Republic of Serbia

Sub-Sector	No.	NAMA Title	Description	Mitigation Potential (tCO_{2e}/yr)	Investment Cost (EUR)	Schedule	NAMA Implementing Entity	Domestic/ Supported NAMA
		Hospitals – Serbian Energy Efficiency Project (SEEP)	The NAMA involves application of energy efficiency measures to public buildings such as schools and hospitals. Detailed site portfolio and locations will be identified by line ministries. Tentative number of potential sites for NAMA project is 49 public buildings (23 schools and 26 hospitals). Potential energy efficiency measures include façade insulation, (roof, ceiling, wall insulation), window replacement, HVAC reconstruction, etc.				Environmental Protection (MEDEP)	

GENERAL INFORMATION

Title of NAMA

- Construction of a 790MW Ultra Supercritical Lignite Power Plant TPP Nikola Tesla – Unit B3

Description

- **Description of the Mitigation Action**

The NAMA represents construction of the new 790 MW unit on TPP Nikola Tesla B location.
It is foreseen as condensing type, ultra supercritical steam parameters, with a river water once-through cooling system, mainly designed to operate in the electric power system of Serbia and at the base load level of the load diagram.
The NAMA will contribute to climate change mitigation as the highly efficient plant emits less GHG than existing TPPs. By its operation, it reduces GHGs that would be otherwise emitted by less efficient grid-connected TPPs in the absence of the mitigation action. The plant is expected to become the first ultra supercritical power plant in Serbia and will result in technology transfer of state-of-the-art clean coal technology.

- **Technologies / measures**

The design must incorporate a high efficiency (coal usage) unit of modern construction with ultra supercritical steam parameters and cycle. Total power of the unit should be approximately 730 MW at the net connection. The unit will use lignite from the Open Pit Mine Kolubara as primary fuel. The lignite will be delivered to the plant location as homogenized coal of stated mean calorific value of 6,900 kJ/kg.
The unit will be connected to the electric power system at the 400 kV voltage level via transmission lines and the switchgear Mladost located 9 km from the TPP Nikola Tesla B.
Minimum expected annual operating time is 7,600 h/year.

TPP Nikola Tesla B3 technical data

Data in this table are of indicative nature. Preliminary technical analysis currently ongoing and the detailed technical data will be available by March 2013.

Parameter	Value	Unit
Boiler type		
Once-though, Benson type, with superheated steam parameters		
Turbine type		
Condensing, with steam extractions		
Unit power, total	~ 790	MW
Unit power, net	~ 730	MW
Rotor speed	3,000	r/min
Generator Voltage	24	kV
Number of reheating	1	
Number of turbine extractions	8	

Parameter	Value	Unit
Net Unit efficiency	≈ 43	%
Net specific heat consumption of the Unit	> 9,000	kJ/kWh
Boiler efficiency	~ 88	%
Live steam flow rate	> 2,000	t/h
Basic fuel – Coal		
Lignite, Low heating value	~ 6,900	kJ/kg
Cooling system		
Condensing pressure at nominal operating conditions	~ 0.043	Bar
Cooling water temperature t_{in}/t_{out}	14 / 23	^{o}C
Boiler Load		
Minimal boiler load with coal firing only	40	%
Minimal boiler load with liquid fuel firing only	35	%
Operating range at once-through operating conditions	40 – 100	%
Operating range at sliding operating conditions	40 – 100	%
Load change gradient		
in 40-80 % range and variation >25 %	6	%/min
in 80 - 100 % range and variation ≤ 20 %	4	%/min
in 90 -100 % range and variation >5 %	2	%/min
Emissions of harmful combustion products		
NO_x (at 6% O2)	≤ 200	mg/Nm^3
SO_2 (at 6% O2)	≤ 200	mg/Nm^3
CO_2	≤ 262	g/Nm^3
Particles	≤ 30	mg/Nm^3

Location

- TPP Nikola Tesla B is located on the right hand bank of the Sava River, 59 km upstream of Belgrade. The new power plant is located near the village Vorbis, between the villages of Skela and Usce, 12 km upstream of TPP Nikola Tesla A. Geographical location is given at the picture below.

NAMA Implementing Entity

- Public Enterprise Electric Power Industry of Serbia (EPS)
- EPS is a 100% state-owned company whose main business include electric power generation, electric power distribution and distribution system management, electric power trade, coal production, processing and transport, steam and hot water production in combined heating processes, water power utilization and services in river and lake traffic, wholesale trade in fuel and similar products. EPS operations also include research and development, design, construction and maintenance of energy and mining plants, design, construction and operation of telecommunication facilities and engineering.
- www.eps.rs

Implementing Schedule

Time span	Activity	
2013 – 2016	Preparatory period	Feasibility Study with Preliminary Design of TENT B3 – including Revision by the State Revision Committee, securing project funding, Main Designs for TENT B3 construction – including Technical Review, obtaining the necessary approvals from the relevant institutions, preparation of tender documents, bidding and contracting procedures and other necessary activities
2017 – 2020	Implementation	Construction, commissioning, trial operation and guarantee tests.

Expected starting date of Action

- Construction starts in 2017 and operation starts in 2020

Lifetime

- 30 years

Current Status

- Operations stability study and selection of the most favorable parameter values and TPP Kolubara B and TENT B3 turbo aggregates and block-transformer characteristics
- Study on Environmental Impact Assessment of TENT B3
- Preliminary technical and financial analysis of application of ultra supercritical technology in 2012 – 2013.

Coverage

- **Sector:** Energy – Fuel combustion – Energy industries - Energy efficiency improvement
- **GHG Gases:** CO_2

FINANCIAL INFORMATION

Finance and Cost

- Expected cost of **preparation**:

  EUR 40 million for investment and technical documentation
  (more accurate expected cost will be available by March 2013)

- Expected cost of **implementation**:

  EUR1,200 million
  (more accurate expected cost will be available by March 2013)

- Expected **incremental cost** of implementation:
  (more accurate expected cost will be available by March 2013)

- **Financial sources** identified:

  EPS would provide up to 30% of the investment.

- **Financial analysis**:

  Preliminary financial analysis is currently under development. Result of the analysis will be available by March 2013 upon request.

INFORMATION ON SUPPORT REQUIRED

Description of Support Required

Type of Support	**Support required for preparation**	**Support required for implementation**
Financial	30 million EUR for technical design	Approximately 850 million EUR as a share of the Strategic Partner in the project
Technical	x	Technology transfer of USC technology for electricity generation
Capacity Building	x	O&M of the new TPP

(more accurate information will be available by March 2013)

EXPECTED GHG EMISSION REDUCTIONS AND MRV

Expected Mitigation Potential

- **Annual reduction**: 1,337,728 tCO_{2e}
- **Total reduction**: 40,131,830 tCO_{2e} (30 years)

Methodologies and Assumptions

- **Methodologies**: Ex-ante and ex-post calculation of GHG emission reduction is conducted based on the approved CDM methodology, ACM0013 – "Consolidated baseline and monitoring methodology for new grid connected fossil fuel fired power plants using a less GHG intensive technology." A deviation from the said methodology was applied in the calculation since several information was not available in order to determine the baseline power plants as specified in the CDM methodology, i.e. similar power plants that meet specified conditions in the geographical area in all neighboring non-Annex I countries or all non-Annex I countries in the continent.

  Instead of considering those power plants in other countries, the NAMA takes into consideration the current condition and reasonable future projections of the power generation and electricity market in Serbia.

- **BAU scenario:** Continued operation of the existing sub-critical lignite-fired power plants is the most likely baseline scenario, as it has the lowest levelized costs of electricity generation.

- **Calculation of emission reduction**

  <u>Baseline emissions</u>

  Baseline emissions are calculated by multiplying the electricity generated in the project plant using lignite fossil fuel ($EG_{PJ,y}$) with a baseline CO_2 emission factor ($EF_{BL,CO2}$), as follows:

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

and

$EF_{BL,CO2} = 3.6 * EF_{FF,co2} / \eta_{BL}$

Where:

$EG_{PJ,y}$	=	Total net quantity of electricity generated in the project plant in year *y* (MWh/yr)
$EF_{BL,CO2}$	=	Baseline emission factor (t CO_2/MWh)
$EF_{FF,co2}$	=	CO_2 emission factor of the fossil fuel type (lignite) used in the project and the baseline (t CO_2/GJ)
η_{BL}	=	Energy efficiency of the power generation technology that has been identified as the most likely baseline scenario
3.6	=	Unit conversion factor from GJ to MWh

Data / Parameter	$EG_{PJ,y}$
Unit	MWh
Description	Net electricity generated by the project power plant in year *y*
Source of data	Calculated based on installed capacity of the plant (790 MW) and anticipated working hours of the plant (7,600 h) Expected amount of electricity consumed for power plant operation is not included.
Value applied	6,004,000 MWh

Data / Parameter	$EF_{FF,CO2,y}$
Unit	tCO_2/GJ
Description	CO_2 emission factor of the fossil fuel type used in the project plant in year *y* – lignite from Kolubara pit mine
Source of data	Initial National Communication of the Republic of Serbia, Annex 1 "Net calorific value and emission factor of the raw lignite from pit-mine exploitation in the republic of Serbia"
Value applied	0.10962 tCO_2/GJ

Data / Parameter	η_{BL}
Unit	%
Description	Energy efficiency value of the power generation technology that can be considered as the most likely baseline scenario
Source of data	Efficiency is calculated based on the following reasonable projections and assumptions: 1. Four units of the existing power plant (Kolubara TPP, units A1 to A4), which are connected to the Serbian national grid, will be closed once the proposed ultra supercritical power plant is constructed, whose total installed capacity is 160MW.

	2. A new thermal power plant that uses conventional sub-critical technology will be installed and connected to the grid, which should be same or larger than 630 MW, a difference between the proposed power plant size (790MW) and the four units that will be closed (160MW). Efficiency of the above item 1. is 25%, based on the calculation by EPS. Efficiency of the above item 2. is 37%, based on the average efficiency of the conventional sub-critical technology available in the market today. η_{BL} is calculated as: (160*0.25 + 630*0.37) / 790 = 0.3457
Value applied	34.6%

Baseline emissions are calculated as:

BE_y = 3.6 * 0.10962 / 34.6 * 6,004,000
= 6,847,892 (t-CO_2)

Project emissions

Project emissions are the CO_2 emission from combustion of lignite at the new power plant. The CO_2 emissions from electricity generation in the project plant (PE_y) can be calculated as follows:

$PE_y = EG_{PJ,y} * EF_{PJ,CO2}$

and

$EF_{PJ,CO2} = 3.6 * EF_{FF,co2} / \eta_{PJ}$

Where:

$EF_{PJ,CO2}$ = Project emission factor (t CO_2/MWh)
η_{PJ} = Energy efficiency of the project power plant

Data / Parameter	η_{PJ}
Unit	%
Description	Project power plant energy efficiency value
Source of data	Manufacturer's catalogue
Value applied	43.0%

Project emissions are calculated as:

PE_y = 3.6 * 0.10962 / 43.0 * 6,004,000
= 5,510,164 (t-CO_2)

Emissions reductions

Emission reductions are a difference between baseline emissions and project emissions.

$ER_y = BE_y - PE_y$
$= 6,847,892\ tCO_2 - 5,510,164\ \ tCO_2$
$= 1,337,728\ \ tCO_2$

Measurement, Reporting, and Verification (MRV)

Monitoring plan

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

Data / Parameter	EG y
Unit	MWh
Description	Electricity generated by the project power plant in year *y*
Source of data	Operation centre at generation system
Measurement procedures	Measured continuously by electricity meter equipped at the power plant and recorded daily.
Monitoring frequency	Monthly compiled and aggregated data is recorded on computer.
QA/QC procedures	The electricity meters will be periodically calibrated according to the relevant national industrial standards and regulations. Meter readings will be compared to electricity sales receipts.

Data / Parameter	$FC_{lignite,y}$
Unit	Ton/ year
Description	Annual lignite fuel consumption at the project power plant in year *y*
Source of data	Operation centre at generation system
Measurement procedures	Measured continuously by weighing bridge at the power plant and recorded daily.
Monitoring frequency	Monthly compiled and aggregated data is recorded on computer.
QA/QC procedures	The weighing bridge and its meters will be periodically calibrated according to the relevant national industrial standards and regulations. The consistency of metered fuel consumption quantities will be cross-checked by an annual energy balance that is based on purchased quantities and stock changes.

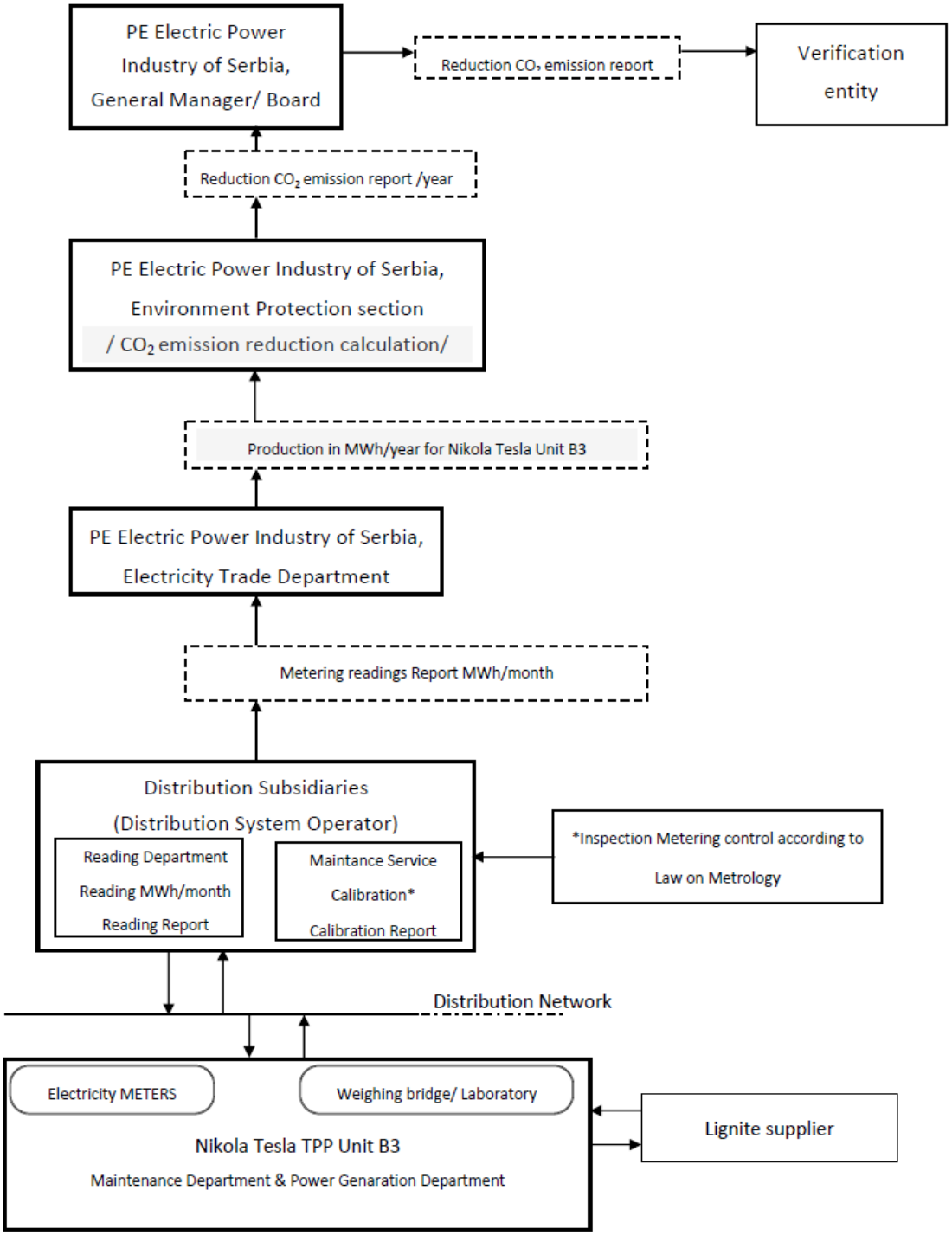
Data / Parameter	$NCV_{lignite,y}$
Unit	GJ/ton
Description	Weighted average net calorific value of lignite fuel in year *y*
Source of data	Values provided by the fuel supplier in invoices/ monitored at the laboratory located in the project power plant

Measurement procedures	Laboratories in the power plant will measure the value for each fuel delivery.
Monitoring frequency	NCV value will be obtained for each fuel delivery, from which weighted average annual values will be calculated.
QA/QC procedures	Laboratories will have ISO accreditation and data will be checked according to international standard.

- **Monitoring plan and structure:**

Monitoring of the data and parameters above will be conducted based on the EPS monitoring structure shown below.

Monitoring activities will be conducted by EPS, the NAMA implementing entity, based on its ISO 9001:2008 certified quality management system.



NAMA Monitoring Structure

Calibration * - Verification and benchmarking meters are calibrated by accredited Metrology laboratories, which are accredited by the Accreditation Body of Serbia (ATS).

The Distribution System Operator must take care that all meters in his ownership be verified and calibrated

in time and in the manner prescribed by the Law on Metrology, according to meters class.

All the meters for the calculation of generation/ consumed electricity are ownership of Distribution system operators, including meters in the Nikola Tesla TPP. Monthly reading generation/ consumption of electricity is done by Distribution system operator on a monthly basis.

Reporting course:

- After metering readings of electricity generation in TPP, all Distribution system operators - Distribution Subsidiariess submit monthly reports to EPS Electricity Trade Department for the calculation and payment of electricity delivered.
- EPS Electricity Trade Department, based on monthly reports at the request of the common functions of EPS Environmental Protection section submit the data for delivered and calculated electricity production on a annually base from TPP.
- Common functions of EPS Environmental Protection section include CO2 emissions reduction calculation based on data obtained from Electricity Trade Department on an annual basis and deliver to General Manager of EPS and Board of Directors.
- EPS submits CO_2 Emission Reduction Monitoring Report to Verification authorities.

Accuracy control:

- Verification and calibration standards of meters shall be subject to such terms and in the manner specified by regulatory law, by an accredited laboratory, on which a Distribution system operator shall maintain proper records.
- In case of conflict or doubt that there is a conflict in the read values assumed for calculation of delivered electric energy, all participants in the generation, reading and calculation of electric energy the TPP may request that the Commission establish the accuracy of the readings or calculated data, in accordance with long-term contracts.

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 trough Verification (V) from third party.
- It is expected that the MRV of the proposed NAMA will be conducted in the following manner:
  1. EPS will conduct the Measurement activity based on the above-mentioned monitoring plan in order to calculate the emission reductions achieved by the NAMA.
  2. EPS will prepare a Report that contains information on 1) the detailed result of the monitoring activities conducted based on the monitoring plan, 2) the result of emission reduction calculation based on the above mentioned methodology, and 3) any support received under NAMA scheme from Annex-I countries or international organization regarding financial support, technical support, or support on capacity building.

OTHER INFORMATION

Contribution to Sustainable Development

Implementation of the NAMA is meeting majority of the Sustainable Development Indicators in accordance with three criterion indicated in appendix of the Serbian DNA Rules of procedure.

- According to the economic criterion, it satisfies following fields:
  1. Investing conditions - Construction of the new TPP will be carried out through strategic partnership of EPS and power utility that will be selected on the international tender. EPS would participate with up to 30% of the capital, while the strategic partner would provide the rest of investments amounting 900 millions EUR.
  2. Sustainable technology transfer - Final technological solution is not been defined yet, but it is anticipated that TPP Nikola Tesla B3 will be unit of the modern construction with supercritical steam parameters, which represent the best available technology at this point.
  3. Economic development of the region - Construction of the TPP Nikola Tesla B3 will bring construction of new infrastructure; it also contributes to the power system stability and supply security, which consequently have effect on the stability of the prices for electric energy.
  4. Employment - Construction of the TPP Nikola Tesla will provide work for many domestic companies. After commissioning and connection to the network, new work places will be available at the power plant and following facilities, as well as the chance for engagement of the companies from the sector of services and maintenance on long-term basis.
  5. Priorities of the sector - Power generation at the TPP Nikola Tesla B3 will contribute to the power system stability and supply security, which represent one of the priorities in the energy sector.
  6. Consumption and generation - Power generation at the new power plant will reduce need for electricity import, and its modern concept will reduce waste production per unit of generated energy as well as waste management in ecology acceptable manner.
- According to the social criterion, it satisfies following fields:
  1. Participation of the interested parties - Project TPP Nikola Tesla B3 will be implemented with strategic partner on mutual benefit. Strategic partner will provide technology and financing, while EPS will provide fuel supply, existing infrastructure, and part of the funds. Implementation of this project includes participation of every governmental structure from the state to the local level, which supporting project due to its many advantages.
  2. Life conditions improvement - Project implementation of such scope, lead up to the employment increase, as well as income increase, on the local and regional level.
  3. Capacity increase - According to the work needs and modern equipment maintenance, strategic partner will provide training for the employees, as well as expertise and tools for local companies engaged on this implementation of the project during its operational life.
- According to the environment and natural resources criterions, it satisfies following fields:
  1. Energy resources – Generation of TPP Nikola Tesla B3 will, due to the higher energy efficiency of the plant, reduce coal consumption for power generation, and significantly reduce need for electricity import.
  2. Air - Due to the application of the modern technology and higher energy efficiency of the plant, project will result in reduced emission levels of CO_2, SO_x and NO_x, comparing to the existing thermo power plants in Serbia.
  3. Water - Contribution to the sustainable water use would be the application of measures for water treatment of all water quantities used in the technological process of electricity generation.
  4. Soil - New thermo power plant will be constructed on the location of TPP Nikola Tesla B, where already exist land for this purpose, as well as joint systems, so it would not be necessary to change the purpose of the land. In addition, ash disposal will be at the area anticipated for this purpose with application of the reclamation measures.

5. Biodiversity – Whether the ash disposal will be at the area reserved for that purpose or at the area of the open pit mines of EPS - biological reclamation measures will contribute to the preservation of plants and increase of wooded areas.
6. Natural recourses - Modern concept of the unit TPP Nikola Tesla B3 will significantly contribute to the sustainable use of mineral recourses, because energy efficiency of primary energy transformation (≈ 43%) will be significantly higher than at existing thermal power plants in Serbia. Exploitation life of domestic lignite deposits is extended that way.

Stakeholder consultation

- EPS will conduct a public stakeholder consultation regarding the NAMA. At the consultation, objective and outcome, expected impacts on local environment, employment opportunities, etc. will be presented to stakeholders, and their comments will be collected and compiled.
- EPS will take necessary due actions to the comments received during the public consultation and report the results.
- Public consultation will be held either through website or through meetings near the project site.

CONTACT INFORMATION

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