JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Sreden Iskar Cascade HPP Portfolio Project, September 2006 ("The Project"), Rev.2, dated 15 October 2007.

Please note that this version is identical to the previous version (Rev.1, September 2006), except for changes made in the operational date for project Phase I and II (HPP 1-5), which has implications for the calculation of the project's emission reductions in Section A.4.3.1., C.1., C.3., E.4. E.5. and E.6.

Moreover, Section A.5 has been updated (project approval by the Parties involved), Section B.2. in relation to the total investment cost and the contact information contained in Annex I.

A.2. Description of the project:

This Project Design Document ("PDD") is provided for the purpose of the registration of a project portfolio for grid-connected electricity generation from renewable hydraulic energy sources in Bulgaria as Join Implementation ("JI") project, under Art. 6 of the Kyoto Protocol ("KP").

The project envisages the establishment of nine Hydro Power Plants ("HPPs") on the river Iskar, about 40 km north of Sofia, with the overall objective to generate Emission Reduction Units ("ERUs"), reducing 370,969 tonnes of CO_2 equivalent in the period 2008 till 2012 (inclusive).

In year 2000, the Municipality of Svoge carried out a feasibility study of the proposed HPPs. It attracted the interest of several energy companies that proposed to jointly develop the project with the city and in late 2003 the Municipality of Svoge and Petrolvilla signed a Letter of Intent.

Based on the Memorandum of Understanding on co-operation between the Kingdom of the Netherlands and the Republic of Bulgaria in reducing emission of Greenhouse Gases ("GHGs") under article 6 of the KP the proposed JI portfolio project aims at reducing GHGs by replacing electricity generated from fossil fuel with electricity generated from renewable hydraulic energy sources.

The project will contribute to the sustainable environmental-socio-economic development of the region. The use of renewable sources, which today represent about 2% of the national energy production and about 8% of electrical energy supply, will permit to improve the exploitation of local resources avoiding import from abroad and, above all, it will permit to produce clean electricity by hydropower plant reducing emissions of NO_X, SO_2, VOC and solid particles that would be otherwise emitted during electricity generation from fossil fuels. The implementation of HPPs portfolio project will generate renewable electricity and displace conventional thermal electricity production.

The construction of HPPs on the river Iskar, in the municipalities of Svoge and Mezdra has been favoured by the Ministry of Economy and Energy (formerly the Ministry of Energy and Energy Resources).

Besides these environmental benefits, the proposed portfolio projects have additional revenues to those derived from tariffs, like returns from Carbon Credits and from Green Certificates[1],

---

[1] NEK is obliged to buy all electricity from renewable sources at preferential price: 80% of the average retail price of previous year. This system changes legally from mid 2006, but in practise it will change from 2010 or later, when the system of green certificates will be implemented. From 2010-2012 onwards the revenue for renewable energy generators will consist of two main components: a base tariff and green certificates. The base tariffs will be based on the average market price for electricity paid by NEK. Expected revenues from the green certificates component are not yet clear since the value will be based on supply and demand and the Government is still finalising the system.

which will support debt services and return on equity. Revenues from JI activities will permit to construct according to the newest state of the art technologies.

In absence of the KP instruments these technologies have hardly been implemented in Bulgaria because of the high risk due to the little experience with such project types and the resulting difficulties of financing. As the value of Green Certificates is uncertain, extra benefit from carbon credits helps to mitigate the price risk on the green certificates.

Furthermore the project contributes to meet EU requirements for the Bulgaria regarding:

- Electricity generation from renewable energy sources;
- Reduction of NO_X, SO_2 and VOC in the country.

Finally the project has a significant social impact creating several jobs for qualified and non-qualified local workers.

A.3. Project participants:

Party Involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Bulgaria (Host Party)	Vez Svoghe OOD Strt. St. Karadja, 7 1000 Sofia, Bulgaria	No
Netherlands	EBRD (for the account of the Netherlands) One Exchange Square London EC2A 2JN, United	No

Table A.1: Project participants

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

Republic of Bulgaria.

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

The subprojects are located on the river Iskar, near Sofia, Bulgaria.

A.4.1.3. City/Town/Community etc.:

The figure below indicates the area of the Iskar river basin where the portfolio project will be implemented.

Figure A.1: The Iskar river basin

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project:

The River Iskar is the longest river within the territory of the Republic of Bulgaria, which flows entirely within the country's territory and discharges into the Danube. The river's total length is 363.8 km.

In the middle section, the section from the city of Novi Iskar (elevation 503 mt.) to the city of Cherven Briag (elevation 90 mt.), Middle Iskar has a length of 146 km with 413 mt. displacement and 2,8% average incline. The average annual water volume at Novi Iskar is 716 million m^3.

The river has therefore a great potential for energy generation.

The Project envisages the establishment of nine HPPs on the river Iskar, about 40 km north of Sofia. The plan involves purchasing most of the land from public and private owners, and design, construction and operation of the plants. An EIA has been approved by the Ministry of Environment[2].

The project will be implemented in three phases: (i) implementation of the first two HPPs; (ii) implementation of three more HPPs; and (iii) implementation of last four HPPs. The location of the nine HPPs, the start construction dates and the dates on which the individual HPPs will become operational are reported in the table below.

Location	Start Construction date	Operational Date
Lakatnik	July 2006	January 2008
Svrazhen	July 2006	January 2008
Opletnia	July 2009	April 2010
Levishte	July 2009	April 2010
Gavrovnitsa	July 2009	April 2010
Prokopanik	May 2010	July 2011
Tzerovo	May 2010	July 2011
Bov-Sud	May 2010	July 2011
Bov-Nord	May 2010	July 2011

Table A.2: Scheduling of the Portfolio activities

The following map shows the location of the HPPs along the Iskar banks.

[2] Deliberation for approval of EIA is available, in Bulgarian and Italian, to the Validator on request.

Figure A.2: HPPs locations

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

The HPPs stations in the section middle Iskar are run-on-the-river free flowing hydroelectric power plants.

The power stations will operate under a constant flow secured by automatic relief systems and equipment. The processed water is released immediately after the weir.

The facilities are situated in the river-bed of the River Iskar and in the first spill terrace of the river in a section with a length of about 33 km. It is envisioned that the stations will be connected to a unified management and control system. The equipment includes Kaplan turbines with dual regulation.

Details of technical features of each HPP are reported in the following tables.

TECHNICAL DATA BASED ON THE PERMITS FOR WATER USE *DATI TECNICI DI CONCESSIONE*								
Subphase *Sottofase*	HPP Name *Denominazione Centrale*	Gross head Salto lordo	Average available flow rate *Portata media derivabile*	Available flow rate @ 95% *Portata Derivabile @ 95%*	Q_max_t (maximum flow rate across the turbine) *Q_max_t (portata massima turbinabile)*	Concession rating *Potenza di concessione*	Max. available water volume *Massimo volume turbinabile*	Environmental Limit Flow Rate *Portata di rispetto ecologica*
		m	m^3/s	m^3/s	m^3/s	kW	Mm^3/a	m^3/s
1	Lakatnik	9.80	32.22	19.14	36.000	2,900	734.74	3.22
1	Svrazhen	11.00	32.40	19.14	36.000	3,900	737.56	3.24
2	Opletnia	8.00	32.43	19.16	36.000	2,600	738.02	3.24
2	Levishte	7.75	32.57	19.24	36.000	2,600	740.22	3.26
2	Gabrovnitsa	8.00	32.67	19.30	36.000	2,500	741.77	3.26
3	Prokopanik	11.75	25.72	15.20	30.000	3,250	588.76	2.57
3	Tzerovo	8.50	29.85	17.64	34.000	2,500	683.10	2.99
3	Bov-sud	8.50	30.51	18.03	34.000	2,700	693.64	3.05
3	Bov-nord	8.25	30.76	18.18	34.000	2,700	697.55	3.08
	Total or average *Totale o Media*	9.06	30.95	18.34	**34.667**	25,650	706.15	3.10

Table A.3: Technical parameters for each plant

The project will use state of art, western manufacturing technologies for electricity generation and transmission. However the realisation of these type of projects in Bulgaria only take place on a limited scale, mainly due to financial barriers and therefore the project will promote, facilitate and finance the transfer of technology to Bulgaria and to build their capacity.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Baseline scenario

The baseline scenario for the HPPs Portfolio is the continuing operation of existing and future power plants in the Bulgarian power grid without the nine HPPs foreseen in this project to cover the current and future electricity demand of Bulgaria.

Project scenario

In the project scenario the current and future electricity demand of Bulgaria is provided by the existing and future power plants including the electricity generation of the nine HPPs.

Due to the negligible operating costs of hydro power plants it would make no sense in economic terms to reduce the energy output in off-peak periods. Therefore, hydro power plants are considered as low-cost and must-run power generation.

The electricity produced by the HPPs will displace electricity production of existing national power plants.

Emission reductions

Based on the baseline and project scenarios explained above the electricity generated by the project activities replaces that currently generated by power plants. The emission reductions associated with the implementation of this JI Project are calculated as the quantity of electricity displaced from the grid times the emission factor (calculated with the CM method as referred in paragraph B.1), which is higher than the emissions of the project (hydro-power is a zero-emission source).

A.4.3.1. Estimated amount of emission reductions over the crediting period:

The project is expected to reduce 370,969 tonnes of CO_2 reduction in the period 2008 till 2012 (inclusive).

In the following table an overview of the emissions reduction over the crediting period is provided.

Length of crediting period	Years 5 (from 2008 till 2012)
Year	**Estimate of annual emission reductions in tonnes of CO_2 equivalent**
2008	41,735
2009	37,321
2010	66,729
2011	102,566
2012	122,618

	Years
Length of crediting period	5 (from 2008 till 2012)
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	370,969
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	74,194

Table A.4: Overview of emissions reduction over the crediting period

A.5. Project approval by the Parties involved:

Both the Netherlands Government and Bulgaria have issued a Letter of Approval for the project activity.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

In accordance with decision 10/CMP.1, approved CDM methodologies can be used for developing PDDs for JI projects.

The approved consolidated baseline methodology ("CBM") ACM0002 "*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" version 06, sectoral scope 01, 19th May, 2006, has been used as reference for this project.

The chosen methodology is applicable to the present project as the following conditions are respected:

- The proposed project activities apply to electricity capacity addition from run-of-river power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased;
- The proposed project activities don't involve switching from fossil fuels to renewable energy at the sites of the project activities;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

As reported in the CBM ACM0002 for project activities that don't modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

"*Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin calculation […]*".

The baseline is the kWh produced by the generating units, times an emission factor (measured in kg CO_2eq/kWh) calculated in a transparent and conservative manner as the average of the "operating margin" and the "build margin", where:

- The "operating margin" is the weighted average emissions (in kg CO_2eq/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.
- The "build margin" is the weighted average emissions (in kg CO_2eq/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants."

OECD[3] recommends to use the weighted mean between the operating margin and build margin for determination of the Baseline based on the assumption that a Joint Implementation Project will very likely have an impact on the operation of an existing and new plant in the short term (marginal operating costs) as well as delay the implementation of a new plant in the longer term (marginal build costs). It will be possible to use a power sector model for forecasting of the build margin as well as of the operating margin.

The document "*Baseline Study of Joint Implementation projects in the Bulgarian energy sector*"[4] performed by the NEK and published on May 5th, 2005 has been used for estimation of baseline emissions (more details are reported in Annex 2). This study was developed using the ACM0002 Methodology and was performed at the request from the Ministry of Environment and Water of Bulgaria. It aims reduction of transaction costs of the JI projects that influence the

---

[3] Organization for Economic Co-operation and Development

[4] http://www.moew.government.bg/index_e.html

electricity production and electricity demand in the country. The results are reported for the historical period 2000 – 2004 and for the future period 2005 – 2012.

The historical data are taken from the records of the National Dispatching Centre of the Power Grid and from the annual reports of the electricity producers.

The data for the future period are based on the official Least Cost Development Plan of the Bulgaria Power Sector, published in April 2004[5]. The NEK uses the computer code IRP Manager (Integrated resource planning Manager) that was developed in the United States of America for the purposes of the optimal planning of the power sector and the analysis of the demand side management. The sophisticated software tool allows to model long term period with hourly load diagrams. This allows to get forecast for the annual loading curve by every hour (8760 hours a year) for every of the plants as well as fuel spent.

The methodology used for Baseline Determination was developed on the basis of merit order dispatch analysis. This type of approach is considered the most precise to analyse which unit will be replaced by a new capacity. Merit order dispatch analysis for the power sector indicates, in economic terms, what technologies or which particular generating units can be possibly replaced by a new generation in the network. That can provide a realistic picture of replacement, more specifically in the open electricity markets.

The relation between operation margin and build margin is assumed everywhere as 50/50% for baseline carbon emission factor determination.

There is a current trend in baseline determination to eliminate the output of all nuclear and hydro-power plants because the low operating costs mean that their output will not be affected by new plants in the network.

This methodology considers two different scenarios for calculation of final dispatch data operating margin emission factor as function of annual electricity demand:

	UoM	2007	2008	2009	2010	2011	2012
Scenario Stagnation – Minimum Demand	$tC0_2/MWh$	1.100	1.078	0.956	0.917	0.902	0.899
Scenario Prosperity - Maximum Demand	$tC0_2/MWh$	1.156	1.059	0.947	0.908	0.884	0.833

Table B.1: Dispatch data adjusted operating margin emission factor

In order to be conservative the maximum demand scenario, which is resulting in lower carbon emission factors, has been considered.

This methodology is officially approved by Ministry of Environment and Water and emission factors are updated and published annually. Annual updating is included in the monitoring plan.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

The following explanation refers to the latest version[6] of the UNFCCC document: "*Tools for the demonstration and assessment of additionality*" that provides for a step-wise approach to demonstrate and assess additionality. As highlighted in the following figure, extracted from the above mentioned document, a step-wise approach is adopted, including:

- Step 1: Identification of alternatives to the project activity;
- Step 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive; or

[5] "Bulgarian Power Sector least-cost development plan 2004-2020", National Electric Kompany – EAD, Sofia April 2004
[6] 28[th] November 2005.

- Step 3: Barrier analysis;
- Step 4: Common practice analysis; and
- Step 5: Impact of registration of the proposed project activity as a JI project activity.

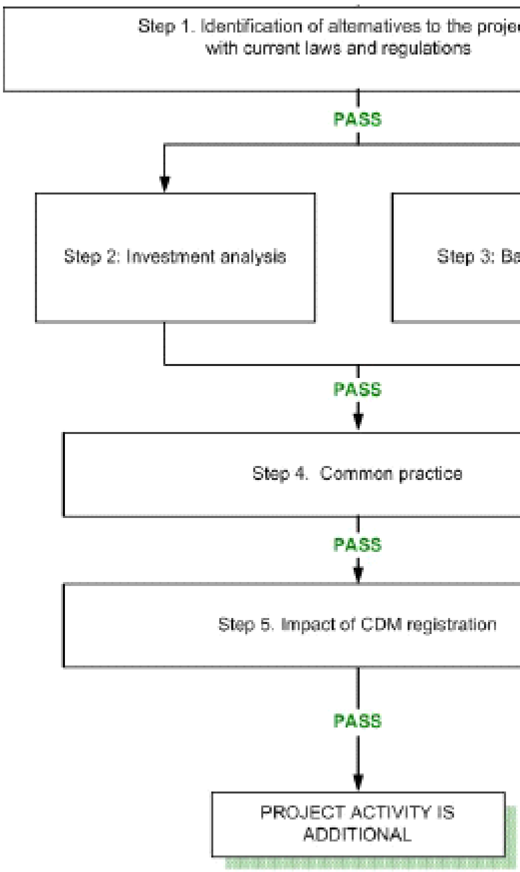

Figure B.1: Additionality scheme

Step 1: Identification of alternatives to the project activity consistent with current laws and regulation

The energy consumption per capita in Bulgaria is approximately two times less in comparison with average EU-15 countries[7], because of two main reasons: (i) the severe economic slowdown in the 90s and (ii) the low amount of oil reserves and natural gas deposits.

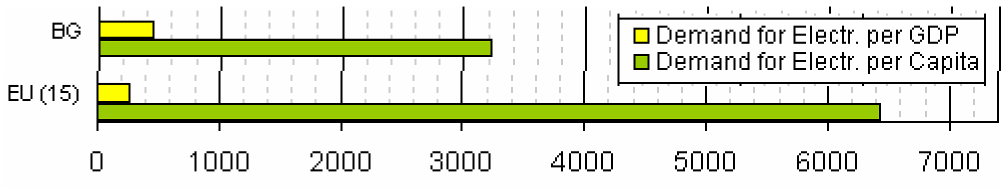

Figure B.2: Demand of electricity per capita (kWh/habitant) for Bulgaria, as compared to the EU-15

[7] Source: Enerdata - Demand of Electricity per GDP (MWh/M$95) and per Capita (kWh/hab) for Bulgaria, as compared to other countries in Central and Eastern Europe, Austria and the European Union 15, 2003

Bulgaria's main energy resource is low quality, brown lignite and sub-bituminous coal; the country has no oil and only modest gas reserves while energy import accounts for more than 70% of the primary energy resources[8]. However, domestic consumption still exceeds production, requiring large amount of coal imports from the international market.

In 2003 Bulgaria had a total of 12,331 MW installed power generation capacities consisting of[9]:

- Thermal power plants 6,613 MW (53.6%);
- Nuclear power plants 2,880 MW (23.4%);
- Hydropower plants 1,974 MW (16.0%);
- Pumped storage power plants 864 MW (7%).

The available capacity of the existing power generation sources, however, is considerably lower than their installed capacity mainly because of economical and technical reasons and amounts at about 9,515 MW.

The economic growth is rising again and therefore it is expected that energy demand will keep increasing for the next years.

Bulgaria needs significant investments in the energy sector, in order to carry out the necessary rehabilitations and extensions of existing capacities, to construct replacing and new capacities, so as to compensate the investment passivity during the last 12 years.

The following figure illustrates the development foreseen till 2020 of the generating capacities compared with the capacity of existing plants.

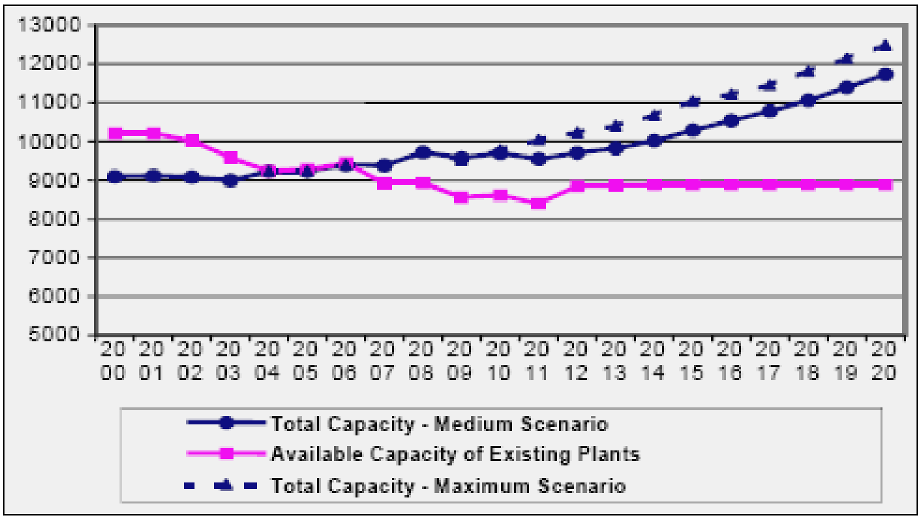

Figure B.3: Development of the Electricity Generating Capacities in the power Systems, MW

The area between the curves of available capacity of existing power plants and the total estimated capacity required in the future corresponds to the need for new generating capacities.

In the context of market development, the current planned supply-based investment policy needs to be transformed into a demand-based investment policy. Due to uncertain long-term demand forecasts and dynamically changing electricity market, the risky and expensive investments has to be put off till a later time and at the same time the firm position of Bulgaria in the region has to be maintained (among other things) by means of efficient use of existing generating capacities and extending the economically viable service life of major electricity and

[8] U.S. Department of Energy Office of fossil Energy, An energy Overview of the Republic of Bulgaria, 2005.

[9] Bulgarian Power Sector least-cost development plan 2004-2020", National Electric Kompany – EAD, Sofia April 2004

heat generating plants through privatisation with the participation of strategic investors and at relatively low investment costs[10].

The Bulgarian Energy Strategy calls for more than US$400 million investment in the coal sector to increase production.

For all the above mentioned reasons, it is realistic to consider that electricity delivered to the grid by the project would be otherwise generated by the operation of grid-connected thermal power-plants and by the construction of new coal-fired power plants.

Hydro power is a renewable zero emission energy source. Due to the negligible operating costs in comparison to construction costs of hydro power plants it would make no sense in economic terms to reduce the energy output in off-peak periods. Hydro power plants are considered as low-cost and must-run power generation sources.

Step 2: Investment analysis to determine that the proposed project activity is not the most economically or financially attractive

This step was not applied to show additionality of the project activity as step 3 was deemed more applicable to the type of project.

Step 3: Barrier analysis

The total investment cost for the nine HPPs is estimated at EUR 72.3 million. Table below shows an overview of the Project investment programme.

Stage	Cost of stage (EUR MM)	Number of Plants	Construction period	Installed capacity
1	16.8	2	2006-08	6.80 MW
2	23.8	3	2009-10	7.70 MW
3	31.7	4	2010-11	11.15 MW
Total	72.3	9		25.65 MW

Table B.2: Project investment programme

For such a relatively large investment, Companies need access to long term financing, which would allow availability of capital. However Bulgaria is an economy in transition and project developers have limited access to financial investments in the energy sector.

Especially for SHPP projects, requiring significant investment and having longer payback periods, it is unlikely to obtain access to capital from local investors. Local Banks were not able to issue loans covering the full amount of investment required for this project, which amount to EUR 72.3 million. Moreover the state-of-the-art technology from mostly western suppliers makes these investments even more expensive.

For a company like Vez Svoghe, access to local long term financing was not available. Only NEK (the Bulgarian Energy Company), which is much bigger than Vez Svoghe, has been able to obtain capital for large investments in hydropower generation. The table below shows a selection of large loans in Bulgaria. All of them were financed by the EBRD or other international financing Institutions, since local Banks were not able to sustain these investments. Similarly Vez Svoghe was not able to gather alternative available funds from local banks for financing the whole amount of capital required for the implementation of the project.

Signing date	Borrower Full Name	Business	Amt (€ mm)	Mty (yrs)	Arranger

[10] Bulgarian Ministry of Energy and Energy Resource: “Bulgaria Energy Strategy”

Signing date	Borrower Full Name	Business	Amt (€ mm)	Mty (yrs)	Arranger
Aug 2005	GloBul (mobile operator)	Telecoms	75	3	BACREDIT
Apr 2005	Bulgarian Telecom (to replace EBRD loan) at the holding company level	Telecoms	400	5 3	BACREDT, CITIGR, EFGERG, INGBANK
Jul 2004	Boliari	Agri-business	12	7	EBRD
Jun 2004	Bulgarian Telecom	Telecoms	73 123	7 5	EBRD
May 2004	MobilTel EAD	Telecoms	450 200	5 1	ABNAM, ING CITIGR, RBS, RZB, BAWAG, BULPOST
Apr 2004	OpetAygaz JSC (sponsors' guarantee)	Oil & Gas	32	8	EBRD
Oct 2003	Maritza East III Power Co	Power & Energy	347.8	12 - 15	EBRD
Jul 2002	Cosmo Bulgaria Mobile EAD	Telecoms	70	0.5	AUSTRIA, UNIBUL
Apr 2002	Munic. of Sofia – Public Transport	Public Tranport	20 15	10 8	EBRD
Dec 2001	Sofia Water System	Water	31	15	EBRD
Aug 2001	Balkanpharma	Pharmaceutical.	22.5	4.5	EBRD

Table B.3: Selection of large loans in Bulgaria

Additional subsidies are needed to provide the requested share of security. The selling of Emission Reduction Units enables project developers to provide securities to the bank and improves the feasibility of the project.

By the end of 2003 in Bulgaria has commenced a liberalisation process of the energy sector that is expected to be finished in July 2007; in February 2005, Bulgaria announced that its energy sector was 66 percent privatized in accordance with EU directives.

At present the public providers and public suppliers are required to purchase, at regulated prices, the entire electricity output of generators utilizing renewable resources or high-efficiency co-generators.

This mandatory acquisition mechanism on preferential prices will be applied until the system for the issue and trade of Green Certificates will come into force (it was supposed to be by July 1st, 2006 but it will be postponed to 2010 or later). It will determine the minimum mandatory quotas as a percentage from the total annual electricity production. After implementation of this scheme the electricity producers have two products: the electricity fed to the national grid and the green certificates, which may be sold to power producers but, until the quotas are set, the uncertain of their market price leads to a high uncertainty and a considerable financial risk for investors.

Prediction of the market price is unsafe, so any cash flow resulting from the sale of green certificates is uncertain. For development of new renewable energy projects, this is an important barrier, as already happened in Countries that applied a similar mechanism (e.g. Italy).

In addition to that a further barrier to the implementation of the portfolio project is represented by lack of experience with small hydro power plants and in particular with these river bed low head stations for flowing water. This "run of the river" scheme does not include any water storage, and uses the water flowing in the river creating the head by means of low height weirs.

While from an environmental point of view such schemes are good as they will not have impact on the water flow and will not have any negative impact on groundwater, from an economical point of view they are costly and are often only viable if the weir is required for water management or irrigation. Project developers have little experience in implementing such projects in the Bulgarian national power grid.

Therefore, small scale hydro power projects are considered risky by the government and the banks, despite of the good potential as energy source. The marginal share of small hydro power energy sources in the national power grid reflects the high risk for these project types.

From the following figure, showing the power generation structure in Bulgaria, it can be noted that only 8% of total electricity demand is supplied from hydro power plants: thermal power plants are prevailing in the Bulgarian energy supply system due to the higher experience in this sector.

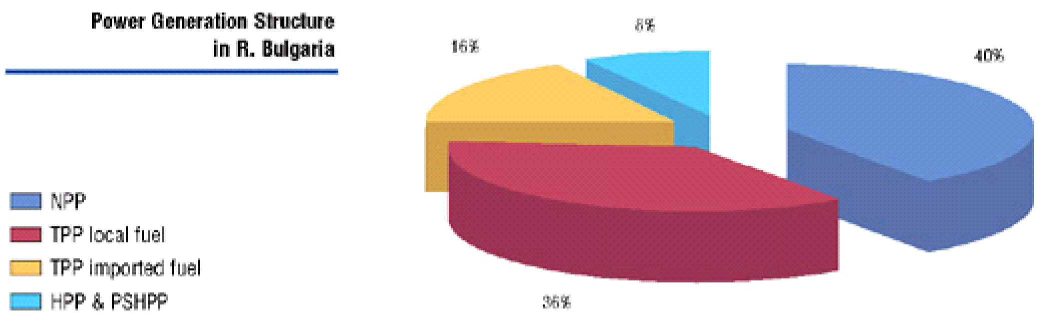

Figure B.4: Power generation structure in Bulgaria

Step 4: Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Bulgaria complies with the requirements of the UNFCCC, ratified by the Bulgarian Parliament in March 1995. Besides, the Parliament of the country ratified the Kyoto Protocol to the Convention on 17th July 2002.

In Bulgaria, joint implementation of projects is viewed as an economically acceptable way of reducing the emissions of anthropogenic GHG and receiving, at the same time, financial, economic, technical assistance and expertise.

In order to start work by the so-called "flexible mechanism" under the Kyoto Protocol – Joint implementation Projects have been signed with the Kingdom of Netherlands, the Republic of Austria, the Kingdom of Denmark and EBRD.

Two Austrian companies signed agreements with Bulgaria in April 2006 to modernise the country's hydropower plants, in a project that will be partly financed under the Kyoto Protocol.

VA Tech Hydro GMBH, which is already helping to build a hydropower plant in the southern Rhodope Mountains, agreed to revamp and refurbish three plants in the same region with a total capacity of 270 MW.

Another company, Porr Technobau und Umwelt AG, agreed to build a new block to the existing Studen Kladenetz plant in the south by the end of 2008.

Part of the €65 million project will be funded under the Kyoto Protocol. By participating in this scheme, Austria will be able to buy carbon reduction credits from Bulgaria, thus allowing it to meet its targets under the Kyoto Protocol.

Other similar projects for which a Joint Implementation scheme was developed are the run-of-the river SHPPs at Tumrush and Lesitchevo financed by EBRD under the Bulgaria Energy Efficiency and Renewable Energy Credit Line Support Facility[11], and the 6.3 MW SHPP portfolio, consisting of three hydropower plants at Loziata, Byala Mesta and Cherna Mesta, whose aggregated emission rights have been assigned to Brestion Plc[12].

Sub-step 4b. Discuss any similar options that are occurring:

[11] For more information refer to www.berecl.com
[12] For more information related to this project refer to http://www.netinform.net/KE/files/pdf/PDD_GSP.pdf

Currently, there is about 12,700 MW installed capacity in Bulgaria including thermal, nuclear, and hydroelectric resources. Despite the current excess of capacity, Bulgaria is actively seeking outside investment to expand, because 40% of the current generation is to be retired by 2010.

The HPPs which are currently in operation process about 33% of the estimated hydro energy technical potential. Hydropower installed capacity constitutes 23% of the total installed capacity in the country and about 8% of the electricity generation[13].

The main statistics regarding SHPP number, installed capacity, electricity generation in Bulgaria are shown in the table below and figure B.5. The number of SHP plant and installed capacity has grown steadily over the reference period and the same pace is to be kept in the future.

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	Forecast 2010	Forecast 2015
Total number of SHP	61	63	67	67	69	72	77	79	83	84	128	249
Capacity MW	139.0	143.1	144.7	144.7	145.7	147.5	149.0	150.1	156.3	166.3	251	310
Generation GWh	304.9	307.9	309.9	310.0	311.8	313.5	316.4	318.1	354.6	347.7	564	697

Table B.4: Small Hydro power (<10MW) evolution and forecast in Bulgaria[14]

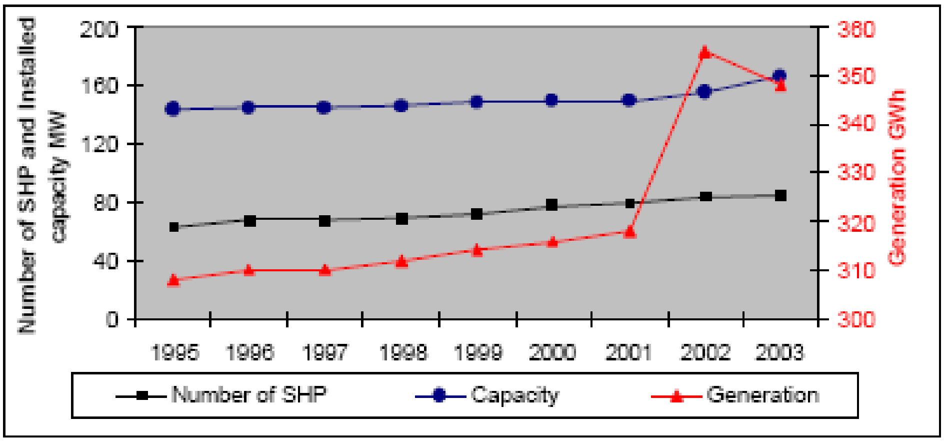

Figure B.5: Trends in the SHP plants number, installed capacity (MW) and electricity generation (GWh) in Bulgaria

More than half of all SHP plants in Bulgaria can be regarded as old ones; exceeding 40-60 years (see Table below). Most SHP plants, according to their generating capacity, are privately owned.

Age	0-19 years old	20-39 years old	40-59 years old	>60 years old	Total
Number of SHP	22	7	29	25	83

[13] Source: NEK – "Small Hydropower Plants – Investments for the future", August 2004

[14] Tables and figures are taken from: "*Small hydropower situation in the new EU member states and candidate countries*" prepared by the Marketing Working Group of the Thematic Network of Small Hydropower (TNSHP), September 2004

Table B.5: Age structure of SHP plants at 2002.

Small hydro contributes 0.81% to the electricity mix in Bulgaria and represents about 3.6% of total electricity generation.

The study published by NEK "Small Hydropower Plants – Investments for the future" reports that about 700 spots have been identified where there are technical potential for the construction of small run-on-the river HPPs, and there are over 100 attractive spots for the construction of HPPs below existing irrigation or water supply reservoirs.

However detailed technical and economic analyses have been completed for only few small HPPs, and a very limited number of plants have been realized in past years, most of them under a Joint Implementation scheme.

The above mentioned study also reports that "the return of investments in hydro power projects takes quite a time. Due to that reason it is necessary to make in advance an appropriate long-term planning of the required power generating capacities, as well as a correct evaluation of the energy potential of the water resources so that a higher return of investments can be achieved. Many of the hydro power projects require a detailed study to prove that the project is technically feasible and economically justified and attractive".

The main reason why most of the identified small HPPs were not implemented is that they are still seeking financing and the sector is not attracting private investment due to the large initial investments costs and the relatively long period of return.

The marginal share of small hydro power energy sources in the national power grid reflects the high risk for these project types.

Step 5: Impact of registration of the proposed project activity as a JI project activity

The financial benefits from the revenue obtained by selling the CO_2 emission reductions has been one of the key issues that encouraged shareholders to invest in the proposed project activity.

The Company started a negotiation with the EBRD to access long-term loans (the loan agreement has not been signed yet). Nevertheless, most of the large and long term investments in Bulgaria are done in other sectors (mainly telecoms), or for large lignite power plants. Investments in renewable energy are risky. Main risk is a secure a fixed income stream for debt service. This is mainly due to the uncertainty on the prices for green certificates. This system has not been implemented yet, but is expected that it will in the coming few years (was scheduled to be implemented in July 2006, but has been postponed). Prices for green certificates will be based on supply and demand. It is however not clear what the supply and demand will be. Large coal fired power plants might consider to co-fire with biomass (which is done in other countries where green certificates systems have been implemented, like Italy and the Netherlands). Co-firing would reduce the demand for green certificates from the large power producers. It is therefore difficult to secure steady income, needed to obtain financing.

The loan agreement that will be signed between the Project Company and the EBRD defines that EBRD will provide a loan to cover part of the investment cost under the condition that at least 300,000 ERUs generated under the project will be sold through the Bank to the Netherlands Emissions Reductions Co-operation Fund, established in 2003 with the Dutch Government.

The nine projects of the portfolio are financed by the EBRD and the carbon revenues are part of the project to get subsidies and loans for the project portfolio. EBRD holds an option to purchase exceeding ERUs generated by the project, which could otherwise be sold on the open market.

Moreover, the revenues coming from ERUs will reduce the financial risks for investors by supporting debt service and return on equity and will help this project to become economically viable.

The EBRD commitment to support the Project Company during the whole cycle of JI project is also representing a clear statement of the priority given by the Bank to this project for its potential to generate carbon revenues.

For these reasons it is unquestionable that carbon revenues contributed to the project developers' decisions to proceed and develop this project.

Registering the project as a JI project will attract foreign investors that bring capacity to operate successfully on the Bulgarian electricity power market. This will enable Bulgaria to make its energy production system more sustainable by duplicating this kind of projects.

B.3. Description of how the definition of the project boundary is applied to the project:

The spatial extend of the project boundary includes the project sites and all power plants connected physically to the electricity system that the JI project power plant is connected to.

Since National standard baseline (approved by the Bulgarian Government and prepared by NEK) has been used, the boundary for the proposed projects is defined as the national grid in Bulgaria and the grid emission factor is based on the national grid data.

The project boundary for the baseline will include all direct emissions being the emissions related to the electricity produced by the facilities and power plants to be replaced. This involves emissions from displaced fossil fuel use at power plants.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

The date of the baseline setting is 08/08/2006

The entity setting the baseline is:

MWH S.p.A.

Centro Direzionale Milano 2 - Palazzo Canova

20090 Segrate (MI) - Italy

Mr. Eugenio Ferro

Tel: +39 02 21084 375

Fax: +39 02 2692 4275

MWH is not a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Location	Start Construction date	Commissioning date
Lakatnik	July 2006	January 2008
Svrazhen	July 2006	January 2008
Opletnia	July 2009	April 2010
Levishte	July 2009	April 2010
Gavrovnitsa	July 2009	April 2010
Prokopanik	May 2010	July 2011
Tzerovo	May 2010	July 2011
Bov-Sud	May 2010	July 2011
Bov-Nord	May 2010	July 2011

Table C.1: Project activities starting date

C.2. Expected operational lifetime of the project:

The operational life time for each project is estimated at thirty years.

C.3. Length of the crediting period:

The Portfolio Project seeks ERUs, under Art. 6 of the Kyoto Protocol, from 01-01-2008 till 31-12-2012; for a total of 5 years.

Location	ERUs	Crediting Period Starting Date	Crediting Period End Date
Lakatnik	ERUs	01/01/2008	31/12/2012
Svrazhen	ERUs	01/01/2008	31/12/2012
Opletnia	ERUs	01/04/2010	31/12/2012
Levishte	ERUs	01/04/2010	31/12/2012
Gavrovnitsa	ERUs	01/04/2010	31/12/2012
Prokopanik	ERUs	01/07/2011	31/12/2012
Tzerovo	ERUs	01/07/2011	31/12/2012
Bov-Sud	ERUs	01/07/2011	31/12/2012
Bov-Nord	ERUs	01/07/2011	31/12/2012

Table C.2: Crediting period for the Project

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

This methodology refers to the approved consolidated monitoring methodology ACM0002 "*Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources*" version 06, sectoral scope 01, 19th May, 2006.

The selected methodology is appropriate for the proposed project because it is used in conjunction with the approved consolidate baseline methodology. The applicability criteria are the same as for the Baseline Methodology; they are outlined in the chapter B.1.1 and are therefore not repeated here.

The data and other information required are publicly available and can be assessed and reviewed. This monitoring methodology is expected to improve the accuracy of the baseline emission rate by its yearly calculation based on updated data.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

According to baseline methodology ("CBM") ACM0002 "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources" version 06, sectoral scope 01, 19th May, 2006, being a hydropower project, no emissions from the Project scenario are identified. Therefore there are no entries in the following table.

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

The Project is a Hydropower project; it does not give rise to direct GHG emissions. Therefore no formulae for calculation of direct emissions are provided here.

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.EG_y	Electricity supplied to the grid by the Project	Meters at each HPP	MWh	m	Hourly measurement and monthly recording	100%	Electronic	Electricity supplied to the grid by the Project
2.EF_y	CO_2 emission factor of the grid	Published by NEK	tCO_2/MWh	c	yearly	100%	Electronic	Determined using the “Combined Margin Method” procedure published by NEK

The spreadsheet to be used for reporting monitoring data is attached as Annex 3.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

The formulae used to estimate baseline emissions follow the document “*Study on standard multi project baseline for joint implementation projects in the Bulgaria power sector*” performed by the NEK and published on May 5th, 2005 that was developed referring to the formulae and algorithms used in the ACM0002 Baseline Methodology.

1) The Operating Margin (OM) is calculated ex-ante, using the Dispatch Data Analysis OM Method of the approved Methodology;
2) The Build Margin (BM) is calculated ex-ante, using the Algorithm described in the approved methodology;
3) The Combined Margin (CM) is made equal to the average of the OM and the BM, as indicated in the approved methodology;
4) The emission reductions are calculated by multiplying the electricity supplied to the grid by the project times the CO_2 emission factor of grid:

$$BEy = \sum_{i=1}^{9} EGyi \times EFyi ;$$

Where "y" represents the year the calculation is referred to and "i" represents the sequence of the nine HPPs. Both electricity supplied to the grid by the project and the carbon emission factor will be calculated and monitored ex-post on annual basis.

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

Since Option 1 in D.1.1 above was applied, this section is not applicable.

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable.

D.1.3. Treatment of leakage in the monitoring plan:

Main emissions potentially giving rise to leakage in the context of this Project are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation but, in the case of the proposed project and for every project that apply the ACM0002 Methodology, there is no need to consider these emission sources.

For this kind of projects, these emissions are thought to be comparable to the life cycle emissions that would result from the eventual construction and operation of alternative capacity. The life-cycle emission of alternative power generation plants, in particular of fossil fuel power plants, are typically higher than from hydro-power plants when including emission due to the mining, refining and transportation of fossil fuel.

On the other hand the Project does not claim emission reduction from these activities. Therefore no significant net leakage from the above activities was identified.

Thus, no sources of leakages were identified, and therefore no data will be collected, archived and summarized in the following table.

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

Not applicable

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Since the Project is a hydropower project and it does not give rise to direct GHG emissions, the emission reductions are equals to the baseline emissions.

$$ERy = \sum_{i=1}^{9}(BEy - PEy - Ly) = \sum_{i=1}^{9} BEy\ ;$$

Being PE_y=0 and L_y=0 as discussed above

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

As reported in the draft version of the document "*Energy utilization of the river Iskar's water via the construction of nine mini water power stations (MWPS) along the river bed on the territory of Svoghe and Mezdra municipalities, Bulgaria*" the environmental monitoring programme for the Project will be designed to address the conditions set out in the Bulgarian Ministry of Environment and Water, Environmental Impact Decision № 1 - 1/2005. Monitoring will be focused on three locations along the Iskar Gorge:

- the Iskar River at Prokopanik and Gabrovnitsa;
- the Iskretska River near Svoge.

The data will be collected quarterly throughout the development of the Project, and will focus on water and sediment quality as well as recording data on fish life and groundwater. This monitoring will be used to assess the impacts on the river, both from the surrounding communities and from the development of the project. The results of the monitoring programme will be used to effect continuous improvement as the MPWS scheme is implemented.

The mentioned document is going to be finalized by Vez Svoghe and EBRD and it will be made available to the public by EBRD.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1.EG_y;	*Low*	*QA/QC procedures shall be adopted for monitoring the energy production as accurately as possible. Meters will be subject to regular maintenance and testing to ensure accuracy. Sales record to the grid and other records are to be used to ensure the consistency.*
2. EFy;	*Low*	*QA/QC procedures shall be adopted to ensure regular annual revision of carbon emission factor calculated using the "Combined Margin method" and published by NEK*

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

In the context of JI projects, the monitoring plan ("MP") describes the systematic surveillance of a project's performance by measuring and recording performance-related indicators relevant to the project or activity.

The nine HPPs will be connected to a unified management and control system. This will permit to monitor every kWh produced and delivered to the grid. The metering equipment will be carried out according to the regulation of the utility. Record of project electricity generation and of emission factor will be archived for a period of at least ten years.

This Monitoring Plan (MP) defines a standard against which the implementation of the project performs in terms of its GHG reductions, in conformance with all relevant JI project monitoring criteria.

The MP is fully consistent with the scenario identified in the baseline study. The MP provides the basis for the projection of the GHG emissions reductions (ERUs) the project expects to generate over its lifetime.

The MP also provides a practical framework for the collection and management of project performance data which will be used for retrospective verification of actual ERUs generated.

Verification is the periodic auditing by a third party of monitoring results, the assessment of achieved ERUs and of the project's continued conformance with all relevant project criteria. This MP does not contain specific guidelines on emission reduction auditing and verification, but it provides sufficient detail on the project structure, the proposed data monitoring methodologies and relevant operational issues, to allow an independent verifier to develop suitable auditing and verification procedures for portfolio project.

The MP will constitute integral part of Vez Svoghe Quality Management and will be embedded in the overall Standard Operating Procedures.

The MP must be used by the operator when planning and implementing the project activity and during the project's operation. Adherence to the instructions in the MP is necessary for the project operators to measure and track the project impacts and prepare for the verification process that must be undertaken to confirm the achieved ERUs. The MP is thus the basis for the production and delivery of ERUs to the buyer, and for any related revenue stream that the operator expects to receive.

The MP assists the operator in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to successfully develop and maintain the proper information required for the verification and certification of the achieved ERUs and other project outcomes. The MP ensures environmental integrity and accuracy of crediting ERUs by only allowing actual ERUs to be accounted for after they have been achieved. The MP must therefore be used throughout the life of the project by being:

- Adopted as a key input into the detailed planning of the project; and
- Included into the operational manuals of the implemented projects.

The MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by the verifier during the process of initial or periodic verification.

The baseline grid emission factors will be monitored using the document "*Baseline Study of Joint Implementation projects in the Bulgarian energy sector*"[15] performed annually by the NEK. The emission factors will be calculated ex-post from actual power generation and fuel consumption data.

The technical staff of the HPPs and the responsible person of the local distribution company will both check the net electricity produced. All operational data will be recorded while the delivery and sales documentation copies will be stored for documentation.

As no leakages are taken into consideration in this project no operational and management structure will be implemented to monitor such effects.

All operational staff will have annual training scheme that include training on monitoring issue.

MP will be constituted by a workbook (in excel format), fully consistent with the baseline scenario identified. The workbook provides the basis for easily calculate the projection of the GHG emissions reduction that the project expects to generate over its lifetime taking the data to be monitored as input and automatically calculates the GHG emission reductions for each crediting year.

Responsible for monitoring are the operational staff. Responsible for checking the monitored data, supervision the monitoring and checking the calculation of emission reductions is: Mr. Plamen Dilkov - Project Manager

Here below are described the activities to be completed and are assigned the responsibilities for each activity under this MP.

---

[15] http://www.moew.government.bg/index_e.html

Activities	HPPs Operator and Management	Responsible
Monitoring system	Review MP and suggest adjustments if necessary Develop and establish management and operations system Establish and maintain monitoring system and implement MP Prepare for initial verification and project commissioning	Project Mgr.
Data Collection	Establish and maintain data measurement and collection systems for all MP indicators Check data quality and collection procedures regularly	Project Mgr.
Data computation	Enter date in MP workbooks Use MP workbooks to calculate emission reductions	Project Mgr.
Data storage systems	Implement record maintenance system Store and maintain records (paper trail) Implement sign off system for completed worksheets Forward monthly and annual worksheet outputs	Project Mgr.
Performance monitoring and reporting	Analyse data and compare project performance with project targets Analyse system problems and recommend improvements (performance management) Prepare and forward periodic reports	Project Mgr.
MP Training and Capacity Building	Develop and establish MP training, skills review and feedback system Ensure operational staff trained and enabled to meet needs of MP Consider providing training support to national authorities and other JI projects	Project Mgr.
Quality assurance, audit and verification	Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification Prepare for, facilitate and co-ordinate audits and verification process	Quality Mgr.

Table D.1: MP management and operating system

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

MWH S.p.A.
Centro Direzionale Milano 2 - Palazzo Canova
20090 Segrate (MI) - Italy
Mr. Eugenio Ferro, Tel: +39 02 21084 375 - Fax: +39 02 2692 4275
The entity establishing the monitoring plan is not a project participant

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Since the Project is a hydropower project; it does not give rise to direct GHG emissions. Therefore no formulae for calculation of direct emissions are provided here.

$$PEy = 0;$$

E.2. Estimated leakage:

As reported in the chapter D.2.3 no sources of leakages were identified.

$$Ly = 0;$$

E.3. The sum of E.1. and E.2.:

Based on paragraph E.1 and E.2 there are no emissions associates with the Project.

$$PEy + Ly = 0;$$

E.4. Estimated baseline emissions:

Baseline emissions are calculated by the following formula:

$$BEy = \sum_{i=1}^{9} (EGyi \times EFyi);$$

Where:
BE_y= Annual baseline emissions during the crediting period [tCO_2/y];
EG_y= Project annual Electricity dispatched to the grid by each HPP [MWh/y];
EF_y= Emission factor [tCO_2/MWh].
i [1…9]= each of the nine HPP.

The annual generation is given by the project's annual electricity dispatched to the grid times the CO_2 emission rate of the estimated baseline.

The electricity dispatched to the grid by each HPP will be yearly monitored while the emission factor is calculated as reported in chapter B.3 and Annex 3.

The nine HPPs are expected to generate about 415.5 GWh in the period 2008-2012.

The expected emissions are: 370,969 tCO_2 in the period 2008-2012.

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Since project emissions and leakages are zero, the emission reductions are those calculated in the paragraph E.4.

$$ERy = BEy - PEy - Ly = BEy;$$

The following table summarise the emission reductions for each HPP during the crediting period.

Therefore the expected emissions reductions are: 370,969 tCO_2 in the period 2008-2012.

E.6. Table providing values obtained when applying formulae above:

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2008	0	0	41,735	41,735
2009	0	0	37,321	37,321
2010	0	0	66,729	66,729
2011	0	0	102,566	102,566
2012	0	0	122,618	122,618
Total (tonnes of CO_2 equivalent)	0	0	370,969	370,969

Table E.1: Emission scenario during the crediting period (2008-2012)

The following figures show respectively the annual emission reductions from each HPP over the crediting period, and the breakdown of emission reductions for each HPP.

CO2 Emission Reduction Calculation

Hydro power plant	MWh	operational date:	UoM	Year 2007	2008	2009	2010	2011	2012	Total
Lakatnik	18,520	July 2008	tCO_2	0	19,613	17,538	16,816	16,372	15,427	85,766
Svrajhen	20,890	July 2008	tCO_2	0	22,123	19,783	18,968	18,467	17,401	96,742
Opletnia	15,240	Oct 2010	tCO_2	0	0	0	10,378	13,472	12,695	36,546
Levishte	14,840	Oct 2010	tCO_2	0	0	0	10,106	13,119	12,362	35,586
Gavrovnitza	15,360	Oct 2010	tCO_2	0	0	0	10,460	13,578	12,795	36,833
Bov-Nord	14,810	July 2011	tCO_2	0	0	0	0	6,546	12,337	18,883
Prokopanik	17,570	July 2011	tCO_2	0	0	0	0	7,766	14,636	22,402
Tzerovo	14,820	July 2011	tCO_2	0	0	0	0	6,550	12,345	18,896
Bov-Sud	15,150	July 2011	tCO_2	0	0	0	0	6,696	12,620	19,316
Total emission reduction			tCO_2	0	41,735	37,321	66,729	102,566	122,618	370,969

Figure E.1: Overview of emissions reduction for each HPP over the years

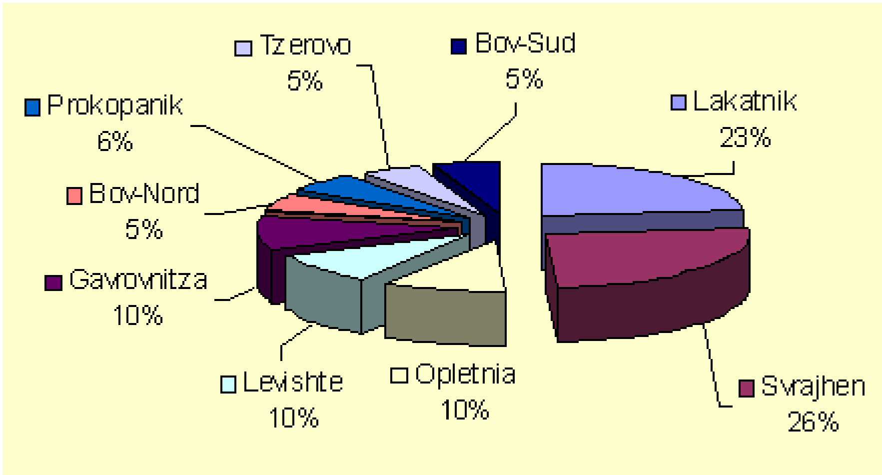

Figure E.2: Breakdown emission reductions for each HPP

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including trans-boundary impacts, in accordance with procedures as determined by the host Party:

The Environmental Impact Assessment for the portfolio project of the 9 HPPs was prepared in September 2004.

Main conclusion related to the impact of the construction and operation of the power plants on the local environment were identified as:

- The Iskar river is heavily polluted and this prevents the use of the river for a number of recreational activities, such as swimming, fishing, etc;
- The project is divided in phases so that the impact of the Sreden Iskar cascade can be studied better, and to provide the possibility for further improvement of the management of the power plants and weirs in order to minimize the negative effects on the environment on the basis of the experience from the previous phase of the project and the operation of the completed power plants;
- The construction of the 9 HPPs will not change the major characteristics of the climate in the region during the operation of the facilities and will not have any negative impact on the population;
- The construction and the operation of the HPPs will not have impact on the water flow and will not have any negative impact on groundwater;

- The construction of the HPPs will not have any negative impact on geological environment. For some of the sites, additional measures must be taken to prevent landslides and landfalls. In order to avoid them in the future it will be necessary[16]:
    - During the pending engineering, geological and hydro geological surveys, to carefully analyze the tectonic rifts in the area of the concrete wall's foundation.
    - During the construction blasting must be avoided during performance of excavations in order to avoid landslides and landfalls. If necessary, and if proven in the technical-working project, explosives can be used in the base of the dam lake only after completion of special analysis and project.
    - That Coastline inspection will be performed. The waste generated during construction is relatively small in size and only of few types. If the provisions of the Waste Management Act are observed, these will not pose any threat to the environment.

- During construction the noise limit will be exceeded by 10 dBA in few points close to 2-3 buildings near plants of Lakatnik and Prokopanik. During the operation the noise level is well below the limit values for day and night operation. The scope of the impact is limited to small residential areas with one or two residential building;

- The project will not have negative effects on the CORINE habitats;

- The project will not have negative effect over the Iskar river and will not deteriorate the quality of the water and their biological diversity. In order to limit the impact on the water fawn it is planned the construction of fish bypass channels and fish protection devices at the entrance of the turbines;

- The construction of the HPPs on a sector of 17 km down the river will create conditions for active recreation and sports, which will improve the health of the population.

In addition the project offers the social benefits to the local Community. The HPPs implementation brings new investment and employment to an economically depressed part of the country. The economic problems faced by Bulgaria in the transition period have impacted this region with unemployment rates in 2004 reported at 21%. This project will contribute to increase local employment by:

- Engaging of local designer teams, research laboratories; and specialists;
- Creating up to 60 jobs during each station's construction for qualified and non-qualified construction workers. During the construction period for completing each HPP construction, this shall lead to the possibility of improving the quality of life of the workers and of their families;
- Hiring 5 qualified specialists on a permanent basis for each HPP during the exploitation depending on the level of automation and the required security personnel;

[16] Deliberation for approval of EIA is available, in Bulgarian and Italian, to the Validator on request.

Production of green electric energy with positive environmental advantages compared to other energy sources. The project will result in a reduction in the generation of GHGs SOx, NOx and dust emission.

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

There has been no environmental impact considered as significant by the host party.

The Environmental Impact Assessment was approved in 2005 by the Ministry of Environment and Water of Bulgaria[17].

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments, as appropriate:

The fact that the Municipality of Svoge owns 10% of Vez Svoghe OOD (the Project Company) is itself a guarantee of full involvement and care of project's Stakeholders.

On December 14th and 15th 2004, two meetings were held at the Municipalities of Svoge and Mezdra to present the project to local Stakeholder.

During the meetings results of environmental impact assessment were presented and Stakeholders were invited to comment on.

The project was well considered by local Communities and received positive comments[18].

[17] Both the Environmental Impact Assessment Report and the Resolution of the Ministry are available to the Validator on request.

[18] Minutes of the meetings are available, in Bulgarian, to the Validator on request.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Vez Svoghe OOD
Street/P.O.Box:	Strt. St. Karadja, 7
Building:	
City:	Sofia
State/Region:	
Postal code:	1000
Country:	Bulgaria
Phone:	+3592 9 888 570
Fax:	
E-mail:	Bulgaria@petrolvilla.it
URL:	www.petrolvilla.it
Represented by:	
Title:	Project Manager
Salutation:	Mr.
Last name:	Dilkov
Middle name:	
First name:	Plamen
Department:	Technical Director
Phone (direct):	+3592 9 888 570
Fax (direct):	
Mobile:	
Personal e-mail:	plamen.dilkov@finenergy.it

Organisation:	European Bank for Reconstruction and Development
Street/P.O.Box:	One Exchange Square
Building:	
City:	London
State/Region:	
Postal code:	EC2A 2JN
Country:	United Kingdom
Phone:	+44 20 7338 6000
Fax:	+44 20 7338 6100
E-mail:	
URL:	www.ebrd.com
Represented by:	
Title:	Carbon Finance Analyst
Salutation:	Mr.
Last name:	De Jong
Middle name:	
First name:	Friso
Department:	Netherlands-EBRD Carbon Fund
Phone (direct):	+44 20 7338 7808
Fax (direct):	+44 20 7338 6942
Mobile:	
Personal e-mail:	DejongF@ebrd.com

Annex 2

BASELINE INFORMATION

NATSIONALNA ELEKTRICHESKA KOMPANIA
BASELINE STUDY OF JOINT IMPLEMENTATION PROJECTS IN THE BULGARIAN ENERGY SECTOR
SOFIA
05.05.2005

1. Introduction

Bulgaria complies with the requirements of the UN Framework Convention on Climate Changes (UNFCCC) ratified by the Bulgarian Parliament in March 1995. Besides, the Parliament of the country ratified the Kyoto Protocol to the Convention on 17th July 2002. The Protocol was based on the ideas and principles set forth in it and develop them further adding new obligations, larger in scope and detail than those in the Convention.

According to Art. 6 of the Kyoto Protocol, in order to perform its obligations for emission reduction and limitation, each of the countries listed in Annex 1 may transfer to another country on the list, or receive from it, emission reduction limits obtained as a result of projects for reduction of anthropogeneous emissions of greenhouse gases by sources. In practice, such projects are mostly implemented in countries with economies in the process of transition where there are more opportunities for emission reduction, and at a lower cost. The amounts of Emission Reduction Units achieved as results of the project may be bought by a developed country for the purpose of keeping its obligation under the Protocol.

In Bulgaria, joint implementation of projects is viewed as an economically acceptable way of reducing the emissions of anthropogeneous greenhouse gases and receiving, at the same time, financial, economic, technical assistance and expertise.

In order to start work by the so-called "flexible mechanism" under the Kyoto Protocol – Joint implementation (JP) Projects – a bilateral agreement has to be signed between the Government of Bulgaria and another developed country or an international fund for protection of the environment.

So far, bilateral Memoranda of Understanding and Bilateral Cooperation for implementation of JP Projects have been signed with the Kingdom of Netherlands, the Republic of Austria, the Kingdom of Denmark and EBRD in the latter's capacity of trustee of a Prototype Carbon Fund.

2. Purpose of the Study

The purpose of the present assignment is to carry out a study in order to define the Baseline scenarios of the Bulgarian Electricity Power System and calculate the annual Basic Carbon Emission Factor (BCEF) of the Baseline in the process of operation of the electric power sector.

3. Introduction to the Baseline Study

The most important part of the preparation for a greenhouse gas reduction project is the Baseline Study. It should define, in a transparent and comprehensive manner, what rate of CO_{2eq} reduction and related financing can be expected. Besides, the Baseline defines and provides the methodology of assessing which of several possible developments is the most probable in the absence of the project and what emissions would be generated by that scenario.

The Marrakesh Accords (the decisions of COP7 in Marrakesh in November 2001) constitute the central guidance as far as documents required by COP for climate protection projects are concerned.

According to the Marrakesh Accords, the Baseline shall meet the following more significant requirements:

1. To be transparent in terms of assumptions, method, project boundary, parameters, data sources, key factors and Additionality;

2. To account of important national and industrial policy measures and circumstances such as sector-related reforms, availability of indigenous fuels, plans for expansion of the electric power sector, and economic situation in the sector;
3. To be formed in such a manner that it would be impossible to generate ERUs and CERs for reduction of activities beyond the project boundary on the basis of Force Majeure events;
4. To be project-based or standard oriented;
5. To take data uncertainty into account. The assumptions shall be selected conservatively.

It means that the assumptions as to calculations in the event of hesitation (data range, data uncertainty, etc.) shall be selected in such a manner that the resulting total Baseline emissions would be low rather than high. As a result of that, the calculated emission reduction is underestimated rather than overestimated and is, therefore, more stable with respect to data status variations or with respect to criticism from outside. That increases the probability for the Baseline to be accepted by the validator and by the stakeholders.

6. Besides, the Baseline selection shall be substantiated.
7. There is a restriction upon the choice of a Baseline composition method for projects under CDM, but not for [3]JI projects. The following three Baseline approaches are possible only:

a) “historical or existing emissions”

That generally well sustained wording probably leaves room for all substantial Baseline methods because, in principle, every method can be supported by the argument that, directly or indirectly, it rests on historical or existing emissions.

b) “emission of a technology that, due to obstacles before investments, is an economically attractive alternative”

Practically, the purpose of that wording could be to extend the investment analysis method – an economically attractive alternative.

c) “the mean percentage of emissions from comparable project activities during the last five years implemented in similar social, economic, environmental and technological conditions, the project activities of which belong to the best 20% in their category”.

That last requirement may be interpreted to mean that JI/CDM projects should not lead to implementation of outdated technologies or used equipment, but to technological and social progress, that is, to sustainable development in the countries where they are implemented.

Beside these official requirements of the Marrakesh Accords, theoretically there are no other substantial directions restricting the Baseline development. This is to emphasize that, in the development of a Baseline, the question “What would happen to the system and its emissions if no financial resources came from Carbon Credit sales” has priority over adherence to preset criteria.

Although, in principle, individual routes may be chosen to the implementation of that task, the previous experience offers several already proven methodological approaches that should be favoured. Other routes should be chosen only where there are special reasons for that and where they are, respectively, adduced intelligibly by the author of the Baseline. Method selection depends on the type of project, the data status, the preferences of Carbon Credit buyers, resp. the parties to the Contract, the Baseline author's experience, etc.

4. Methodological Approaches to Baseline Determination

The Baseline Determination Methodologies fall into two broad categories – project-specific approaches and multi-project approaches.

1) Project-Specific Baseline

a) Reference Group

From the point of view of a project specific Baseline, it is often emphasized that the type of project, its size and availability of data are the main factors that determine the choice of Baseline methodology.

The Reference Group approach requires finding of a similar country, region or project with conditions comparable to the particular project for the purpose of studying a development that does not include the Joint Implementation Project. The definition of a reference group in a similar situation in the electric power industry, would be difficult due to different circumstances with respect to fuels used, technologies implemented, economic aspects, electricity market liberalization status and policy, etc.

b) Investment Analyses

In these analyses, all probable and realistic possibilities are determined taking into account the technical, economic, political, social and environmental aspects graded by economic benefit, for example through determination of the Internal Rate of Return. The highest-return alternative is defined as Baseline Alternative. Due to the fact that economic aspects are the determining factors for that aspect, such approach requires a solution model guided mainly by economic considerations and the clear comparability of different options.

The potential for use of investment analysis in the electric power sector is quite limited because, in principle, the new projects compete with a variety of generation units in the electric power sector. It is very seldom that a new project competes directly with an existing unit. For that reason the investment approach is not considered very useful in the electric power sector.

b) Scenario analysis

Risk-based analyses deal with the possible development scenarios in the absence of a project taking into consideration various influencing factors such as technologies, policies and market restrictions. Possibilities leading to high risk are dismissed and the most probable scenario is selected as baseline. The main challenge in this approach is selecting the main influencing factors and to determine the best and most reliable data sources for the study.

2) Standard-oriented, or Multi-project Baseline

There are a number of different approaches to Multi-project Baselines. They can vary from average-emission specific emissions for a sector to technological standards of broad modeling within the frameworks of the particular sector such as, for example, merit order dispatch analysis in the electric power sector. In spite of the variety of approaches, the main point is to provide a set of standard data that shall be used as a baseline for a number of different projects. That can be also bases for comparison with respect to the baselines specific to a project and could be expressed in specific emissions per unit of electricity output (i.e., Basic Carbon Emission Factor /BCEF/ determined in tons of CO_2/GWh).

The multi-project approach is launched because, through the use of such methods, the transaction costs of Joint-Implementation Projects will be significantly reduced. In other words, the baseline development costs in Joint-Implementation Projects will be much lower than those developed in countries that already have a Multi-project Baseline and, therefore, the project developers' and investors' costs will be significantly reduced. Therefore the present study will also launch a number of projects that will be implemented by means of these mechanisms, as it will launch implementation of smaller but environmentally friendly and stable energy projects as well. Besides, there will be better predictability to the project developer in terms of number of emission reduction units that will be achieved through a project.

More particularly, in the power plant case, the multi-project approach to a Baseline seems to be a reliable and efficient solution.

5. Multi-Project Baseline for the Electric Power Sector

Considering the electric power sector, Multi-project Baselines find wide application in Joint-Implementation Projects and in Clean Development Mechanism Projects. The reason is that, in most cases, implementation of a project with capacity exceeding 20MWe, there is a marginal impact on the whole electric power sector. Therefore, project-specific Baselines are not suitable and multi-project approaches are preferred.

In the next section, an analysis of different Baseline methodologies based on multi-project approaches is made, and their compatibility with the subject of discussion is examined. Institutional conditions, available data and specificity of the Bulgarian electric power sector should also be taken into account when the most appropriate Baseline methodology is finally selected.

1) Mean specific emissions will all plants participating

At present, this is the most simplified methodology for Baseline determination. It assumes that the project will displace part of the integral electricity generation mix. The problem with that method is that it encompasses all plants with low operating costs that usually operate as baseload plants, inclusive of hydro- and nuclear power plants. There is, however, almost no chance for a new investment to replace the output of these plants; it is much more probable for an investment to replace plants with higher operating costs such as plants fired with fossil fuel. Therefore, that methodology may be rejected by the investor countries because the share of nuclear generation added to that of hydro-power (about 50%) is large within the power system of Bulgaria.

2) Mean specific emissions less Nuclear, Pumped-Storage and Hydro-Power Plants

In principle, there will be technologies that will continue to work irrespective of the adoption of a Joint-Implementation Project. The best example of that are the Chaira Pumped-Storage Hydro-Power Plant and the four large existing hydro-power cascades with hydro-power plants built downstream of the weirs that have extremely flexible load-following capacity and can operate in peak-load periods. That is not due to the high operating costs but rather to the opportunity offered by them to choose the time of electricity generation in the event of unexpected need for generation capacity in the system.

There is also a current trend in Baseline determination to eliminate the output of all nuclear and hydro-power plants because the low operating costs mean that their output will not be affected by new plants in the network. If NPP and HPP are eliminated from the Baseline, such assumption shall be supported by clear written records and justified.

Therefore, this approach attempts to consider matters related only to consideration of mean values in the system; however, precision here still remains questionable. The benefit of that approach is that it will yield the variety of all loads that will be replaced by the project; however, it will not yield the mean weighted value against the current (operating) costs.

3) Mean emissions for each Load Category

That involves load curve grouping into different load categories such as seasonal, peak, shoulder, and base loads. After determining the load profile of a project, a direct comparison to the same load category in the Baseline forecasts can be made.

4) Consideration of Solely Marginal Plants (Merit order dispatch Analysis)

The Least-Cost Method assumes that plants operating at the margin (at highest costs and, most probably, with highest emissions) will be the first to be replaced. The method should indicate the generation from each plant for every hour (or group of hours) within one year. The assumption is that commissioning of the new capacity will displace plants that currently operate at the end limit of the load curve. That analysis will require evaluation of the last unit(s) that should be connected, for every hour or group of hours in a year and, in that manner, the specific emissions per hour. That type of approach proves to be the most precise with respect to determining which unit actually stops generating electricity. The negative aspect is the quality and quantity of data needed for that method.

5) Operating Margin/Build Margin Methodology of IEA and OECD

OECD recommends to use the weighted mean between the operating margin and build margin for determination of the Baseline. That is based on the assumption that a Joint Implementation Project will very likely have an impact on the operation of an existing and new plant in the short term (marginal operating costs) as well as delay the implementation of a new plant in the longer term (marginal build costs). It will be possible to use a power sector model for forecasting of the build margin as well as of the operating margin.

6. Baseline Determination and Computation of the Carbon Emission Factor (CEF) Common to the Bulgarian Power Sector

6.1. Mean specific emissions (all plants included)

The study enables determination of the mean specific emissions and the corresponding CEF for every plant and system-total. That analysis encompasses all power plants, inclusive of nuclear power plants and hydro-power plants that release no emissions but contribute power generation to the system. This approach is too imprecise to analyze CEF and, respectively, reduction of CO_2 emissions in a Joint-Implementation Project, because the operation of nuclear power plants and, to less extent, the operation of the four large hydro-power cascades of the power system are not influenced by the implementation of such projects.

6.2. Mean Specific Emissions (less NPP and HPP)

The study calculates and determines the mean specific emissions and the corresponding CEF for every plant and system-total, only excluding NPP and HPP from the calculation of Baseline emissions because they have low operating costs and, for that reason, there is not probability of their replacement. An option with starting up of the hydro-power cascades with HPP participating in the regulation of the system according to the above-mentioned calculations was developed for the event that a JP project hypothetically replaces peak-load hydro-power capacities of the system (HPP or gas-fired combined-cycle power plant over 20 MW).

That methodology can have quite extensive application in projects but still it remains a less refined methodology and is recommended only in cases of smaller-volume emission reductions in the sector. For example, when integration of JI projects with less than 200 MW installed capacity into the system is considered.

6.3. Mean Specific Emissions for Each Load Category

This approach is not considered in detail because it requires CEF determination for the overall power system. The approach does not add much to the two previous methodologies and it can be said again that it is a less refined approach and it does not reach far in determining what will actually be replaced by the new capacity.

6.4. Integrated Resource Planning (Least-Cost Planning Analysis)

Merit order dispatch analysis for the power sector indicates, in economic terms, what technologies or which particular generating units can be possibly replaced by a new generation in the network. That can provide a realistic picture of replacement, more specifically in the open electricity markets.

This method requires detailed information on the generating capacities and evaluation of the marginal units that shall be started up from a cold reserve state for every hour of the year. The power plants with guaranteed supply contracts shall be taken into consideration.

6.5. Operation Margin/Build Margin Methodology

This approach is a combination of marginal operating costs and marginal construction costs. It can be applied in countries where the power system capacities are expanding. The problem with this methodology is that it is difficult to determine the weighted mean between the Operation Margin and the Build Margin.

7. Selection of Baseline Study Methodology

Following the argumentation here above, the methodology used for Baseline Determination was developed on the basis of merit order dispatch analysis. This type of approach is considered the most precise for analysis which unit will be replaced by a new capacity.

The merit order dispatch approach analyses the electric power sector on the basis of electricity demand forecasts – minimum and maximum; fuel prices, new capacities and envisaged rehabilitation projects; and cost estimates. For these analyses NEK uses the IRP Manager computer model (Integrated Resource Planning Model).

The US software company Electric Power Software in Minneapolis has developed the software called IRP Manager for US institute EPRI. Since 1995 the model is implemented in the Bulgarian National Electricity Company for the least cost expansion planning of the power sector development.

The IRP-Manager model provides comprehensive management of demand, supply, financial and rate data needed for long-term integrated resource planning of the power sector. It coordinates an expansive “Tool Box” of capabilities including: chronological simulation of demand and resources, automated resource strategy development, decision analysis and complete forecasts of impacts from all perspectives.

The forecast power balances obtained by merit order dispatching are used to develop the Baseline study. The basis study itself was developed using the ACM0002 Methodology, "Consolidated Baseline Methodology for Grid-Connected Electricity Generation from Renewable Sources" of UNFCCC CDM – Executive Board.

In order that the study can be as complete as possible and applied to the widest possible range of JP projects in the Bulgarian power sector, all methods offered in the power plant operation margin determination methodology are applied. The relation between operation margin and build margin is assumed everywhere as 50/50 % for BCEF determination.

	Forecast								
	Minimum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	45 051	43 115	44 156	47 490	48 212	51 139	52 291
2.	Total system heat generation	$MW_{th}h$	17 875 519	18 057 503	18 320 175	18 746 936	19 028 565	19 744 974	19 358 651
3.	Total CO2 emissions of power generation	kt/a	28 035,37	31 810,38	31 245,76	33 538,31	33 547,47	33 863,20	31 248,73
4.	Total CO2 emissions of energy transformation	kt/a	34 447,38	38 304,71	37 832,72	40 154,36	40 358,39	40 560,20	37 758,36
	Baseline Emission Factor - BEF								
	Fossil Fuels								
1.	Dispatch Data_OM_EF	tonne/MWh	1,215	1,158	1,144	1,022	0,984	0,963	0,953
2.	Dispatch Data Adjusted_OM_EF	tonne/MWh	1,154	1,100	1,078	0,956	0,917	0,902	0,899
3.	Average Dispatch Data_OM_EF	tonne/MWh	1,243	1,190	1,146	1,026	0,986	0,974	0,983
	HPP included								
1.	Dispatch Data_OM_EF	tonne/MWh	1,176	1,175	1,110	0,995	0,959	0,940	0,918
2.	Dispatch Data Adjusted_OM_EF	tonne/MWh	1,111	1,102	1,017	0,894	0,858	0,849	0,838
3.	Average Dispatch Data_OM_EF	tonne/MWh	1,138	1,153	1,057	0,947	0,909	0,898	0,889
	Fossil Fuels								
1.	Dispatch Data_OM_EF	kg/GJ	111,997	106,693	106,484	100,340	97,288	95,088	96,152
2.	Dispatch Data Adjusted_OM_EF	kg/GJ	111,976	106,621	106,402	100,566	97,871	95,946	96,570
3.	Average Dispatch Data_OM_EF	kg/GJ	111,622	106,175	106,640	100,646	98,217	96,578	97,026
	Forecast								
	Maximum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	46 739	43 572	46 588	48 351	49 455	51 368	53 194
2.	Total system heat generation	$MW_{th}h$	20 360 486	19 909 333	20 240 498	21 206 857	22 170 354	23 026 991	23 407 576
3.	Total CO2 emissions of power generation	kt/a	27 152,04	31 508,75	32 821,32	33 044,62	33 387,00	32 807,31	30 531,04
4.	Total CO2 emissions of energy transformation	kt/a	34 405,23	38 713,17	40 181,87	40 770,13	41 342,14	40 706,37	38 615,88
	Baseline Emission Factor - BEF								
	Fossil Fuels								
1.	Dispatch Data_OM_EF	tCO2/MWh	1,204	1,215	1,124	1,014	0,973	0,947	0,884
2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1,143	1,156	1,059	0,947	0,908	0,884	0,833
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1,233	1,252	1,127	1,018	0,977	0,953	0,917
	HPP included								
1.	Dispatch Data_OM_EF	tCO2/MWh	1,158	1,168	1,101	0,990	0,947	0,928	0,865
2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1,091	1,095	1,006	0,888	0,850	0,834	0,791
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1,118	1,144	1,052	0,940	0,899	0,879	0,840
	Fossil Fuels								
1.	Dispatch Data_OM_EF	kg/GJ	109,651	111,991	105,315	100,011	95,929	94,604	93,043
2.	Dispatch Data Adjusted_OM_EF	kg/GJ	109,571	111,876	105,263	100,226	96,498	95,130	93,524
3.	Average Dispatch Data_OM_EF	kg/GJ	109,126	111,908	105,550	100,273	96,821	95,676	94,056

Annex 3

MONITORING PLAN

Sreden Iskar Cascade HPP Portfolio Project

SHEET ONE - Instructions

This workbook consists of twelve worksheets as described in the table below.

Key for cell colours:	
(white)	Title Cell
(green)	Unit Cell
(brown)	Input Cell
(blue)	Calculation Cell

The operator should input data into the **brown** cells only.

	Title	Description
Sheet One	Instructions	Introduction and instructions for MP worksheet use
Sheet Two	EF_NEK	Emission Factors
Sheet Three	Lakatnik HPP	MP for Lakatnik HPP
Sheet Four	Svrajhen HPP	MP for Svrajhen HPP
Sheet Five	Opletnia HPP	MP for Opletnia HPP
Sheet Six	Levishte HPP	MP for Levishte HPP
Sheet Seven	Gavrovnitza HPP	MP for Gavrovnitza HPP
Sheet Eight	Bov-North HPP	MP for Bov-North HPP
Sheet Nine	Prokopanik HPP	MP for Prokopanik HPP
Sheet Ten	Tzerovo HPP	MP for Tzerovo HPP
Sheet Eleven	Bov-South HPP	MP for Bov-South HPP
Sheet Twelve	Consolidata	Calculation of total project emission reductions

Emission Factors	UoM	Year 2007	2008	2009	2010	2011	2012	Note
Electricity produced by hydro power plants	tCO_2/MWh	0.0	0.0	0.0	0.0	0.0	0.0	Each annual value will be calculated as the sum of the monthly data monitored according to table D.1.1.3 of PDD-Rev.1
Electricity produced by the grid	tCO_2/MWh							Determined by using the "combined margin method"

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Lakatnik

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Annual electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Lakatnik

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Lakatnik

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Svrajhen

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year						Note
		2007	2008	2009	2010	2011	2012	
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Svrajhen

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Svrajhen

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year						Note
		2007	2008	2009	2010	2011	2012	
Baseline scenario emission	tCO_2	0	0	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Opletnia

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Opletnia

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Opletnia

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	0	0	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Levishte

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year						Note
		2007	2008	2009	2010	2011	2012	
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Levishte

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	tCO_2	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Levishte

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year						Note
		2007	2008	2009	2010	2011	2012	
Baseline scenario emission	tCO_2	0	0	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Gavrovnitza

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Gavrovnitza

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Gavrovnitza

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-North

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-North

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		2007	2008	2009	2010	2011	2012	Note
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-North

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Prokopanik

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year						Note
		2007	2008	2009	2010	2011	2012	
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Prokopanik

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Prokopanik

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year						Note
		2007	2008	2009	2010	2011	2012	
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Tzerovo

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Tzerovo

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		2007	2008	2009	2010	2011	2012	Note
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Tzerovo

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-South

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year						Note
		2007	2008	2009	2010	2011	2012	
Electricity saved from the grid	MWh	0	0	0	0	0	0	
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-South

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity production from the HPP	MWh							measured
CO_2 emissions from electricity production	$tC0_2$	0	0	0	0	0	0	

Company: Vez Svoghe LTD: "Project Company" **Reference:** HPP Bov-South

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year						Note
		2007	2008	2009	2010	2011	2012	
Baseline scenario emission	$tC0_2$	0	0	0	0	0	0	
Project scenario emission	$tC0_2$	0	0	0	0	0	0	
Total project emission reduction	$tC0_2$	0	0	0	0	0	0	Total crediting period 2008-2012= 0

Monitorin Plan

Company: **Vez Svoghe LTD: "Project Company"**

Efficiency Measure: **Establishment of nine Hydro power plant**

Reference: Consolidata

OUTPUT DATA

Total estimated CO_2 emission reduction	0	Ton CO2

CO2 Emission Reduction Calculation

Hydro power plant	UoM	Year 2007	2008	2009	2010	2011	2012	Total	Note
Lakatnik	tCO_2	0	0	0	0	0	0	0	
Svrajhen	tCO_2	0	0	0	0	0	0	0	
Opletnia	tCO_2	0	0	0	0	0	0	0	
Levishte	tCO_2	0	0	0	0	0	0	0	
Gavrovnitza	tCO_2	0	0	0	0	0	0	0	
Bov-North	tCO_2	0	0	0	0	0	0	0	
Prokopanik	tCO_2	0	0	0	0	0	0	0	
Tzerovo	tCO_2	0	0	0	0	0	0	0	
Bov-South	tCO_2	0	0	0	0	0	0	0	
Total emission reduction	tCO_2	0	0	0	0	0	0	0	

Company: **Vez Svoghe LTD: "Project Company"** **Reference:** Consolidata

Efficiency Measure: Total ERUs from Project Activity

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	0	0	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	0	0	0	0	0	Total crediting period 2008-2012= 0