MONITORING REPORT

Sreden Iskar Cascade HPPs Portfolio Project
Rev.2 Dated March, 31st, 2009

CONTENTS

Annexes

Background and Objectives of Monitoring Report

According to paragraph 36 of the JI guidelines project participants "shall submit to an accredited independent entity a report in accordance with the monitoring plan on reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks that have already occurred. The report shall be made publicly available."

The objective of the present monitoring report is to provide the complete, consistent, clear, and accurate calculation of the emissions reductions, within the boundaries of the Sreden Iskar Cascade Hydro Power Plants, for the period 1st January 2008 – 31st December 2008.

SECTION A. General Project activity information

A.1. Title of the project:

Sreden Iskar Cascade HPP Portfolio Project, September 2006 ("The Project"), Rev.1, dated 8 November 2006.

A.2. JI registration number:

The project reference number is 0063.

A.3. Short description of the project activity:

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 370,970 tonnes of CO_2 equivalent in the period 2008 till 2012 (inclusive).

In year 2000, the Municipality of Svoghe 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 Svoghe 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. Here below the project parties including the Carbon Credit purchaser, and the Project owner.

Party Involved	Legal entity project participant (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
Bulgaria (Host Party)	Vez Svoghe OOD Boulevard Cristopher Columbus, 41 1592 Sofia, Bulgaria	No
Netherlands	EBRD (for the account of the Netherlands) One Exchange Square London EC2A 2JN, United Kingdom	No

Table 1: Party involved

Project Design Document (PDD) including baseline and monitoring plan has been prepared by engineering consulting company MWH S.p.A.. The Letters of Approvals (LoA) have been issued by the Ministry of the Environment of the Republic of Bulgaria on 22.12.2006 and by the designated focal point of the State of the Netherlands on 28.11.2007.

“Sreden Iskar Cascade Hydro Power Plants” project has been approved by an accredited independent entity (AEI) and has been granted final determination on 03.12.2007. PDD and Determination Report are available on the UNFCCC website under project reference number 0063.

A.4. Monitoring period:

- Monitoring period starting date: 1/01/2008;
- Monitoring period closing date: 31/12/2008[1].

A.5. Methodology applied to the project activity (incl. version number)

A.5.1. Baseline methodology:

The ACM0002 “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources” version 07, sectoral scope 01, 30th November, 2007 has been used to identify the baseline scenario of the proposed JI project. This methodology also refers to the “Tool for calculation of emission factor for electricity systems”.

A.5.2. Monitoring methodology:

The ACM0002 “Consolidated monitoring methodology for grid-connected electricity generation from renewable sources” version 07, sectoral scope 01, 30th November, 2007 has been used to monitor the proposed JI project.

A.6. Status of implementation including time table for major project parts:

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. In 2008, only Lakatnik Hydro Power Plant started to be in operation. Due to delays with work, the Svrazhen Hydro Power Plant commissioning has been delayed compared to the time schedule foreseen in the PDD (see table below).

Location	Start Construction date according to PDD	Commissioning Date according to PDD	Commissioning Date
Lakatnik	July 2006	June 2008	July 2008
Svrazhen	July 2006	June 2008	Not in operation yet
Opletnia	July 2009	September 2010	-
Levishte	July 2009	September 2010	-
Gavrovnitsa	July 2009	September 2010	-
Prokopanik	May 2010	June 2011	-
Tzerovo	May 2010	June 2011	-
Bov-Sud	May 2010	June 2011	-
Bov-Nord	May 2010	June 2011	-

[1] Both days were included. Monitoring period includes time from 00:00 01/01/08 up to 24:00 31/12/08.

Table 2: Scheduling of the Portfolio activities

A.7. Intended deviations or revisions to the registered PDD:

Due to delays with work, the Svrazhen Hydro Power Plant commissioning has been delayed compared to the time schedule foreseen in the PDD.

A.8. Intended deviations or revisions to the registered monitoring plan (Decision 17/CP.7, Annex H, paragraph 57 to be considered):

According to the Monitoring Plan checked and approved by DNV after the initial verification (3rd and 4th July 2008), *"the electricity distributor send the read-off measurements to the engineer in charge of monitoring process who will verify the accuracy of the recorded energy data against the data recorded by SCADA System. Both values will be entered by the engineer in a special log book for that purpose on monthly basis (Annex II)"*. However, it must be observed that the electricity distributor doesn't send the read-off measurements to Vez Svoghe. The procedure is the following: a person responsible for Vez Svoghe and a person responsible for CES read together the commercial electricity meter installed at Lakatnik hydro power plant, and they countersign the reading which will be the electricity generation included in the invoice issued by Vez Svoghe to the Electricity provider.

Furthermore, as the SCADA system didn't provide reliable data during the past months, they were not included in Annex II (see § 2.4.2). However, it must be stated that the monthly invoices for electricity sold to the Grid Operator instead of the SCADA system recording will be used for annual CO_2 emission reduction calculation. As a matter of fact, the commercial measuring meter is not connected to the SCADA system, but it is independent.

A.9. Changes since last verification:

This is the first monitoring verification. On 3rd and 4th July 2008, DNV, an accredited independent entity, performed the initial verification in order to verify that the project is implemented as planned and to confirm that the monitoring system is in place and fully functional. On 30th September 2008, DNV sent to MWH S.p.A. and Petrolvilla-Vez Svoghe a list of Forward Action Requests which have been completely accomplished.

A.10. Person(s) responsible for the preparation and submission of the monitoring report

The person (s) responsible for the preparation and submission of the monitoring report are:

- Vassil Shumanov, Vez Svoghe
- Dario Dilucia La Perna, Consultant MWH

SECTION B. SECTION B. Key monitoring activities according to the monitoring plan for the monitoring period stated in A.4.

B.1. Monitoring equipment types

The measuring devices are implemented in accordance with the official "Electricity Metering Rules" and comply with the technical and metrological requirements, defined by the "Regulation for Metering Devices". The devices have to undergo regular inspection and supervision under the "Metering Law" and the "Regulation for Metering Devices".

The commercial electric energy meter, owned by the Electricity Distributor (CES), records active energy delivered to the grid (Actaris mod. SL7000, code 3X57.7/100-3x240/415V 1(10)A)). The Vez Svoghe Company is not allowed to have access at the commercial electric energy meter. The commercial measuring meter is not connected to the SCADA system, and consequently is not monitored remotely. The measuring devices are implemented in accordance with the official “Electricity Metering Rules” and comply with the technical and metrological requirements, defined by the “Regulation for Metering Devices”. The devices have to undergo regular inspection and supervision under the “Metering Law” and the “Regulation for Metering Devices”. The public provider will pay close attention to the correct operation of the measurement devices and the correct measuring values

Further to the commercial electric energy meter, a static electric energy meter is installed in each Hydro Power Plant. It records the electricity generation only for verification purpose. The values recorded by the static electric energy meter are then transferred to the SCADA system (Monitoring System) in order to report the trend of the electricity generation. The electricity generation on SCADA system is different from the electricity generation booked by the Electricity Distributor (CES) because it includes auxiliary equipment of the plant whose electricity consumption is not paid by the Electricity Distributor.

B.2. Data collection (accumulated data for the whole monitoring period):

As the amount of electricity supply to the grid from the JI project is defined as the key activity to monitor for verification process, the main data collected during the monitoring period are the electricity invoices issued on monthly basis to the Electricity Distributor. The electronic copy of the invoices is stored into “*GHG emission reduction\Invoices*” folder. Production data history is also stored at Main Grid, the owner of measuring devices, in form of electricity sale invoices issued by Vez Svoghe. The information flow is described in “Monitoring Plan” document at § 2.4.2.

Further to the copy of electricity invoices, the “monitoring annual report” is generated and collected during the monitoring period.

It has to be noted that the invoice for July electricity production includes also the electricity produced during the 72 hours of start-up performed in May and the electricity generated between May and the official start of activities occurred in July.

B.3. Data processing and archiving:

A new folder called “GHG emission reduction” has been created into the SCADA server including all documents related to the Monitoring Process. In particular, the following documents are stored:

- Monitoring plan-pdf format;
- Annex I-excel format;
- Annex II-excel format;
- Annex IV-scanned copy;
- Invoices-pdf format;
- Audit Report-pdf format;
- Monitoring annual report-pdf format;
- Non-conformities registry-pdf format;

The folder is protected by password which is known only by the Chief operation & maintenance, and the engineer in charge of monitoring process. The "Monitoring process" folder is structured as follows:

- Sub-folder called "Monitoring plan" which includes the procedures, Annex I, and Annex II;
- Sub-folder called "Invoices" which gathers all the invoices sent to CES;
- Sub-folder called "Annual Report" which includes the "Monitoring annual report_20xx", and;
- Sub-folder called "quality control and assurance procedures" which includes the training certificate of the auditor, "audit reports", and non-conformities registry.

Name	Size	Type	Date Modified
Monitoring plan		File Folder	7/4/2008 10:50 AM
Invoices		File Folder	7/4/2008 10:50 AM
Quality control and assurance procedures		File Folder	7/4/2008 10:50 AM
Annual Report		File Folder	7/4/2008 10:50 AM

Figure 1: Structure of the "GHG emission reduction" folder

All records are maintained in paper and electronic form until 2014 (during the crediting period plus two years) for JI project purposes.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan

The “Monitoring Plan” is the most relevant document including all the procedures. It is stored in the SCADA server in the following folder: //GHG emission reduction/Monitoring Plan.

C.1.1. Roles and responsibilities:

The personnel involved in the Monitoring process and their responsibilities are the following:

- Shift operator of Sreden Iskar Cascade Hydro Power Plants: he is responsible to control the correct operation of the SCADA System and ensure the proper operation of the measurement instruments;
- Auditor: he is responsible to perform internal audit (he can’t be the same person who is charge of monitoring process);
- Engineer in charge of monitoring process: he is responsible to assess and validate the reliability and accuracy of the data recorded. Furthermore, he is responsible to calculate the total annual Emission Reductions (see Annex I), update the monthly document (see Annex II), and generate the “Monitoring Annual Report” on status of the yearly Monitoring plan progress. He has also to liaise with the Chief operation & maintenance about any non - conformities.
- Chief operation & maintenance: responsible of the monitoring plan.

C.1.2. Trainings:

The internal auditor(s) have been trained by MWH in order to elaborate and plan the annual internal audit plan, execute the audits according to the approved plans, elaborate, submit and distribute pertinent reports, and supervise the implementation and fitting of amendment and preventive actions, if any.

C.2. Internal audits and control measures

The procedure of internal auditing and control measures is included in the “Monitoring Plan”. This procedure has the purpose to describe the established system for the programming and execution of internal audits of the Monitoring Plan of Sreden Iskar Cascade Hydro Power Plants. The Internal Auditor must comply with the following requirements:

- He has to be trained by an Independent Company with proven expertise in developing PDD projects;
- He must be certified by an Independent Company as auditor (see Annex IV);
- He must have participated to at least one audit as observer;
- He can’t be the same person involved in the monitoring process.

According to the Monitoring Plan, at least two internal audits per year have to be performed. As the first plant start generating electricity, no internal audits have been performed yet. The audit plan for 2009 has not been defined yet. It is going to be set up within the end of March.

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SECTION D. Calculation of GHG emission reductions

D.3.1. 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.

$$PEy = 0;$$

D.3.2. Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$BE_y = (EG_y – EG_{baseline}) \times EF_{grid, CM, y}$

Where

BE_y = Baseline emissions in year y (tCO_2/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh).

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y .

Being the Sreden Iskar Cascade Hydro Power Plants an installation of a new grid-connected hydro power plant, the methodology ("CBM") ACM0002 Version 07 assumes that all project electricity generation above baseline levels ($EG_{baseline}$) would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. As the project activity is the installation of a new grid-connected hydro power plant, the $EG_{baseline}$ is equal to zero. Baseline emissions are calculated by the following formula:

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

D.3.3. Leakage

The main emissions potentially giving rise to leakage (LE_y) in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation. Project participants do not need to consider these emission sources as leakage in applying the current methodology.

This project activity doesn't claim any credit for the project on account of reducing these emissions below the level of the baseline scenario.

$$Ly = 0$$

D.3.4. Summary of the emissions reductions during the monitoring period

Emission reductions are calculated as follows:

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

Joint Implementation Projects 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.
According to the "Monitoring Plan", the emission factor adopted for the CO_2 emission reductions comes from the document "*Baseline Study of Joint Implementation projects in the Bulgarian energy sector*"[2] performed annually by the NEK. The methodology used for Baseline Determination is 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. 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 relation between operation margin and build margin is assumed everywhere as 50/50 % for BCEF determination. Two analyses are performed:

1. Baseline emission factor for all plants, including nuclear and hydro-power plants;
2. Baseline emission factor for generation plants, less Nuclear, Pumped-Storage and Hydro-Power Plants;

The first approach is too imprecise to analyze the 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. The second analysis has been considered in the current Monitoring Report.

According to the "Monitoring Plan", should NEK miss to publish the annual update of the baseline study, it will be used the latest value officially published. In order to be conservative the maximum demand scenario, which is resulting in lower carbon emission factors, has been considered (as in PDD calculations). The next table summarises the latest emission factors published by the NEK (May 5th 2005) for the two scenarios.

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

Table 3: Dispatch data adjusted operating margin emission factor (latest emission factors)

The emission factor used to quantify the CO_2 emission reduction is 1.059 $tC0_2$/MWh. The table below summarise the achieved emission reductions in 2008.

[2] See Annex 3 and http://www.moew.government.bg/recent_doc/climate/Baseline%20CEF%20Summary.pdf

Year	Hydro Power Plant	Annual energy generation [3] (kWh)	Carbon Emission Factor (tCO2/MWh)	Amount of achieved emission reduction (tCO_2)
2008	Lakatnik (from July)	4,743,702	1.059	5,024
2008	Svrazhen (not in operation)	-	1.059[4]	-
Total	HPPs	4,743,702	-	5,024

Table 4: Achieved emission reductions in 2008

[3] See Annex 1, 2 and 3;

[4] See Annex 4;

Annex 1

Monthly invoices

JULY 2008

Вец Своге ООД VEZ SVOGHE OOD Доставчик / Supplier Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25 *Address* Sofia, str. 7, St. Karadja/B, app. 25 Идентификационен номер по ДДС / VAT indetification nimber B G 1 3 0 9 2 8 9 3 1 ЕИК/ЕГН / UIC/PIN 1 3 0 9 2 8 9 3 1	О Р И Г И Н А Л O R I G I N A L	ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД Н. Попов Получател / *Recipient* Адрес София, ул."Г.С.Раковски"№140 *Adress* Идентификационен номер по ДДС / VAT indetification nimber B G 1 7 5 1 3 3 8 2 7 ЕИК/ЕГН / UIC/PIN 1 7 5 1 3 3 8 2 7

☑ **ФАКТУРА / *INVOICE***
☐ **Дебитно известие / *Debit note***
☐ **Кредитно известие / *Credit note***

Номер / *Number*: 0000000009

Към фактура № / *To invoice No.*: ______

Дата на издаване / *Date of issuance*: 31/7/2008 г.

Място на сделката / *Place of the deal*: България

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	произведена електроенергия по споразумителен протокол	кВтч	1 024 624	0.05668		58 075.69
	от дата 31.07.2008					

Основание за нулева ставка или неначисляване на ДДС:
Legal ground for 0% VAT rate or nonapplication of VAT

Словом всичко / *Say*: шестдесет и девет хиляди шестстотин и деветдесет лева и 83 стотинки

Словом сума за плащане / *Amount to be paid say*:

Данъчна основа / *Tax base*	58 075.69
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	11 615.14
Всичко / *Total*	69 690.83
Сума за плащане / *Amount to be paid*	69 690.83

Дата на данъчното събитие / *Date of the tax event*: 31/7/2008 г.

Съставил / *Prepared by*: Пламен Дилков/ Plamen Dilkov (име и фамилия) (подпис) / (name) (signature)

Плащане / *Payment*: ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN / *Bank identification*: BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

При банка / *Bank institution*: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя / Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

ВЕЦ СВОГЕ · HYDRO ELECTRIC POWER STATION · SVOGE

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / Supplier

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25

Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber

| B | G | 1 | 3 | 0 | 9 | 2 | 8 | 9 | 3 | 1 |

ЕИК/ЕГН / UIC/PIN

| 1 | 3 | 0 | 9 | 2 | 8 | 9 | 3 | 1 |

ОРИГИНАЛ / ORIGINAL

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / *Recipient*

Адрес София, ул."Г.С.Раковски"№140

Adress

Идентификационен номер по ДДС / VAT indetification nimber

| B | G | 1 | 7 | 5 | 1 | 3 | 3 | 8 | 2 | 7 |

ЕИК/ЕГН / UIC/PIN

| 1 | 7 | 5 | 1 | 3 | 3 | 8 | 2 | 7 |

☑ **ФАКТУРА / *INVOICE***

☐ **Дебитно известие / *Debit note***

☐ **Кредитно известие / *Credit note***

Номер / *Number* 00000000010

Към фактура № / *To invoice No.* ____

Дата на издаване / *Date of issuance*: 31/7/2008 г.

Място на сделката: България / *Place of the deal*

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	произведена електроенергия по протокол за 72 часови проби	кВтч	87 762	0.09712		8 523.45
	произведена електроенергия по протокол от 31.07.2008	кВтч	224 878	0.09712		21 840.15

Основание за нулева ставка или неначисляване на ДДС:

Legal ground for 0% VAT rate or nonapplication of VAT

Словом всичко : тридесет и шест хиляди четиристотин тридесет и шест лева и 32 стотинки

Say

Словом сума за плащане :

Amount to be paid say

Данъчна основа / *Tax base*	30 363.60
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	6 072.72
Всичко / *Total*	36 436.32
Сума за плащане / *Amount to be paid*	36 436.32

Дата на данъчното събитие: 31/7/2008 г.

Date of the tax event

Съставил: Пламен Дилков/ Plamen Dilkov

Prepared by (име и фамилия) (подпис) / (name) (signature)

Плащане: ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

Payment

По IBAN BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

Bank identification

При банка: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя

Bank institution Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

AUGUST 2008

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / Supplier

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25

Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber

| B | G | 1 | 3 | 0 | 9 | 2 | 8 | 9 | 3 | 1 |

ЕИК/ЕГН / UIC/PIN

| 1 | 3 | 0 | 9 | 2 | 8 | 9 | 3 | 1 |

ОРИГИНАЛ / ORIGINAL

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / Recipient

Адрес София, ул."Г.С.Раковски"№140

Adress

Идентификационен номер по ДДС / VAT indetification nimber

| B | G | 1 | 7 | 5 | 1 | 3 | 3 | 8 | 2 | 7 |

ЕИК/ЕГН / UIC/PIN

| 1 | 7 | 5 | 1 | 3 | 3 | 8 | 2 | 7 |

☑ **ФАКТУРА / *INVOICE***

☐ **Дебитно известие / *Debit note***

☐ **Кредитно известие / *Credit note***

Номер / *Number* 0000000012

Място на сделката: България / *Place of the deal*

Към фактура № / *To invoice No.* ______

Дата на издаване / *Date of issuance*: 31/08/2008 г.

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	произведена електроенергия за месец Август 2008	кВтч	521.556	0,09712		50.653,52
	по споразумителен протокол от дата 31.08.2008					
	Energy production from Lakatnik HPP for August '08					
	according to agreement protocol from 31.08.2008					

Основание за нулева ставка или неначисляване на ДДС:

Legal ground for 0% VAT rate or nonapplication of VAT

Словом всичко: шестдесет хиляди седемстотин осемдесет и четри лева и 70 стотинки

Say

Словом сума за плащане:

Amount to be paid say

Данъчна основа / *Tax base*	50.653,52
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	10.130,70
Всичко / *Total*	60.784,22
Сума за плащане / *Amount to be paid*	60.784,22

Дата на данъчното събитие: 31/08/2008 г.

Date of the tax event

Съставил: Пламен Дилков/ Plamen Dilkov

Prepared by (име и фамилия) (подпис) / *(name) (signature)*

Плащане: / *Payment* ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

Bank identification

При банка: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя

Bank institution Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

SVOGE

SEPTEMBER 2008

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / *Supplier*

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25

Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber: BG130928931

ЕИК/ЕГН / UIC/PIN: 130928931

ОРИГИНАЛ / ORIGINAL

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / *Recipient*

Адрес София, ул."Г.С.Раковски"№140

Adress

Идентификационен номер по ДДС / VAT indetification nimber: BG175133827

ЕИК/ЕГН / UIC/PIN: 175133827

☑ **ФАКТУРА / *INVOICE***

☐ **Дебитно известие / *Debit note***

☐ **Кредитно известие / *Credit note***

Номер / *Number*: 0000000013

Към фактура № / *To invoice No.*: ____

Дата на издаване / *Date of issuance*: 30/9/2008 г.

Място на сделката / *Place of the deal*: България

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	Произведена електроенергия от МВЕЦ Лакатник	кВтч	549,695	0.09712		53,386.38
	за м.Септември по споразумителен протокол от 30.09.2008					
	Energy production from Lakatnik HPP for September '08					
	according to agreement protocol from 30.09.2008					

Основание за нулева ставка или неначисляване на ДДС:

Legal ground for 0% VAT rate or nonapplication of VAT

Словом всичко: шестдесет и четири хиляди шестдесет и три лева и 65 стотинки

Say sixty four thousand sixty three 0.66 BGN

Словом сума за плащане:

Amount to be paid say

Данъчна основа / *Tax base*	53,386.38
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	10,677.28
Всичко / *Total*	64,063.66
Сума за плащане / *Amount to be paid*	64,063.66

Дата на данъчното събитие / *Date of the tax event*: 30/9/2008 г.

Съставил / *Prepared by*: Пламен Дилков/ Plamen Dilkov (име и фамилия) (подпис) (name) (signature)

Плащане / *Payment*: ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

Bank identification

При банка / *Bank institution*: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя / Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

HYDROELECTRIC POWER STATIONS SVOGE

OCTOBER 2008

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / Supplier

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25
Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber
BG130928931

ЕИК/ЕГН / UIC/PIN
130928931

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / *Recipient*

Адрес София, ул."Г.С.Раковски"№140
Adress

Идентификационен номер по ДДС / VAT indetification nimber
BG175133827

ЕИК/ЕГН / UIC/PIN
175133827

☑ **ФАКТУРА / *INVOICE***
☐ **Дебитно известие / *Debit note***
☐ **Кредитно известие / *Credit note***

Номер / *Number*: 0000000014

Място на сделката / *Place of the deal*: България

Към фактура № / *To invoice No.*:

Дата на издаване / *Date of issuance*: 31/10/2008 г.

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	Произведена електроенергия от МВЕЦ Лакатник	кВтч	803.506	0,09712		78.036,50
	за м.Октомври по отчетен протокол от 31.10.2008					
	Energy production from Lakatnik HPP for October '08					
	according to protocol from 31.10.2008					

Основание за нулева ставка или неначисляване на ДДС:
Legal ground for 0% VAT rate or nonapplication of VAT

Данъчна основа / *Tax base*	78.036,50
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	15.607,30
Всичко / *Total*	93.643,80
Сума за плащане / *Amount to be paid*	93.643,80

Словом всичко: деветдесет и три хиляди шестстотин четиредесет и три лева и 80 стотинки
Say ninety three thousand six hundred fourty three 0.80 BGN

Словом сума за плащане:
Amount to be paid say

Дата на данъчното събитие / *Date of the tax event*: 31/10/2008 г.

Плащане / *Payment*: ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN / *Bank identification*: BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

При банка / *Bank institution*: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя / Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

Съставил / *Prepared by*: Пламен Дилков/ Plamen Dilkov
(име и фамилия) (подпис) / (name) (signature)

HYDROELECTRIC POWER STATION • SVOGE • ВЕЦ СВОГЕ

NOVEMBER 2008

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / Supplier

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25

Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber

B G 1 3 0 9 2 8 9 3 1

ЕИК/ЕГН / UIC/PIN

1 3 0 9 2 8 9 3 1

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / *Recipient*

Адрес София, ул."Г.С.Раковски"№140

Adress

Идентификационен номер по ДДС / VAT indetification nimber

B G 1 7 5 1 3 3 8 2 7

ЕИК/ЕГН / UIC/PIN

1 7 5 1 3 3 8 2 7

☑ **ФАКТУРА / *INVOICE***

☐ **Дебитно известие / *Debit note***

☐ **Кредитно известие / *Credit note***

Номер / *Number* 0000000015

Към фактура № / *To invoice No.*

Дата на издаване / *Date of issuance*: 30/11/2008 г.

Място на сделката: България / *Place of the deal*

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	Произведена електроенергия от МВЕЦ Лакатник	кВтч	627.338	0,09712		60.927,07
	за м.Ноември по отчетен протокол от 30.11.2008					
	Energy production from Lakatnik HPP for November '08					
	according to protocol from 30.11.2008					

Основание за нулева ставка или неначисляване на ДДС:

Legal ground for 0% VAT rate or nonapplication of VAT

Словом всичко: седемдесет и три хиляди сто и дванадесет лева и 48 стотинки

Say seventy three thousand one hundred twelve 0.48 BGN

Словом сума за плащане:

Amount to be paid say

Данъчна основа / *Tax base*	60.927,07
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	12.185,41
Всичко / *Total*	73.112,48
Сума за плащане / *Amount to be paid*	73.112,48

Дата на данъчното събитие: 30/11/2008 г.

Date of the tax event

Съставил: Пламен Дилков/ Plamen Dilkov

Prepared by (име и фамилия) (подпис) / (name) (signature)

Плащане: / *Payment* ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

Bank identification

При банка: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя

Bank institution Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

HYDROELECTRIC POWER STATIONS • SVOGE • ВЕЦ СВОГЕ

DECEMBER 2008

Вец Своге ООД

VEZ SVOGHE OOD

Доставчик / *Supplier*

Адрес гр. София, ул. Ст. Караджа, 7/В, ап. 25

Address Sofia, str. 7, St. Karadja/B, app. 25

Идентификационен номер по ДДС / VAT indetification nimber

B G 1 3 0 9 2 8 9 3 1

ЕИК/ЕГН / UIC/PIN

1 3 0 9 2 8 9 3 1

ЧЕЗ ЕЛЕКТРО БЪЛГАРИЯ АД

Получател / *Recipient*

Адрес София, ул."Г.С.Раковски"№140

Adress

Идентификационен номер по ДДС / VAT indetification nimber

B G 1 7 5 1 3 3 8 2 7

ЕИК/ЕГН / UIC/PIN

1 7 5 1 3 3 8 2 7

☑ **ФАКТУРА / *INVOICE***

☐ **Дебитно известие / *Debit note***

☐ **Кредитно известие / *Credit note***

Номер / *Number* 0000000016

Към фактура № / *To invoice No.* ____

Дата на издаване / *Date of issuance*: 31/12/2008 г.

Място на сделката: България

Place of the deal

№	Наименование на стоките или услугите / *Name of goods or services*	Мярка / *Measure*	Количество / *Quantity*	Един. цена / *Unit price*	Отстъпка / *Discount*	Стойност в BGN / *Value BGN*
	Произведена електроенергия от МВЕЦ Лакатник	кВтч	904 343	0.09712		87 829.79
	за м.Декември по отчетен протокол от 31.12.2008					
	Energy production from Lakatnik HPP for December '08					
	according to protocol from 31.12.2008					

Основание за нулева ставка или неначисляване на ДДС:

Legal ground for 0% VAT rate or nonapplication of VAT

Данъчна основа / *Tax base*	87 829.79
Данъчна ставка ДДС % / *Tax rate VAT*	20%
Стойност на ДДС / *VAT*	17 565.96
Всичко / *Total*	105 395.75
Сума за плащане / *Amount to be paid*	105 395.75

Словом всичко: сто и пет хиляди триста деветдесет и пет лева и 75 стотинки

Say one hundred five thousand three hundred ninety five 0.48 BGN

Словом сума за плащане:

Amount to be paid say

HYDROELECTRIC POWER STATIONS ВЕЦ СВОГЕ SVOGE

Дата на данъчното събитие / *Date of the tax event*: 31/12/2008 г.

Съставил / *Prepared by*: Пламен Дилков/ Plamen Dilkov (име и фамилия) (подпис) / (name) (signature)

Плащане / *Payment*: ☐ в брой / *in cash* ☑ с преводно нареждане / *bank transfer*

По IBAN / *Bank identification*: BG33UNCR763010VZSVBGN1 BIC UNCRBGSF

При банка / *Bank institution*: Уникредит Булбанк АД, София, ЦУ, офис Св. Неделя / Unicredit Bulbank AD, Sofia, branch Sv. Nedelia

Annex 2

Annual electricity production

Year	Hydro power plant	Lakatnik
UoM	UoM	MWh
2008	January	
	February	
	March	
	April	
	May	
	June	
	July	1,337.264
	August	521.556
	September	549.695
	October	803.506
	November	627.338
	December	904.343
	TOTAL 2008	4,743.702

Monthly electricity production (from invoices)

Annex 3

CO_2 Emission reduction calculations

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

Efficiency Measure: Establishment of Hydro power plant

BASELINE CALCULATION		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity saved from the grid	MWh	0	4,744	0	0	0	0	Imported from Annex II
CO_2 emissions from electricity production	tCO_2	0	5,024	0	0	0	0	

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

Efficiency Measure: Establishment of Hydro power plant

PROJECT EMISSIONS		Year						Note
		2007	2008	2009	2010	2011	2012	
Annual electricity production from the HPP	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 Lakatnik

Efficiency Measure: Establishment of Hydro power plant

EMISSIONS REDUCTION		Year						Note
		2007	2008	2009	2010	2011	2012	
Baseline scenario emission	tCO_2	0	5,024	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	5,024	0	0	0	0	Total crediting period 2008-2012= 5,024

Annex 4

Natsionalna elektricheska kompania
“Baseline study of joint implementation projects in the bulgarian energy sector”
Sofia

Latest document - 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	31 246,76	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	0,969	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