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:

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Kaliakra Wind Power Project (KWPP)

Version 1.2
01/06/2007

A.2. Description of the project:

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Purpose of the Project

From the perspective of the Project participants, the purpose of the project is to demonstrate that the Kaliakra Wind Power Project (KWPP) will offset greenhouse gas (GHG) emissions that otherwise would be generated by fossil-fuel fired thermal power plants (mostly by coal) in Bulgaria.

And as the Project sponsor, the objective is to install 35 MW wind power capacity at a competitive rate of return—by adding the revenue of ERUs—to the Project investors.

In addition, the Project participants believe that the adding new renewable power supply to Bulgarian power grid system contributes to the Bulgarian energy security[1] as well as the environmental perspectives.

Outline of the Project

Almost all the wind power projects now planned in Bulgaria are located along the coast of the Black Sea. No technical limitations (*e.g.*, grid connection) prohibit the installation of such machines in that location. The Kaliakra Wind Power Project (KWPP) is an initiative of MHI and INOS, which will develop the Project jointly. The Project includes within its scheme the construction of 35 aerial generators of Wind Turbine technology MWT-1000A of 1,000 kW for a total of 35 MW, with a swept area of 2,960 m^2. The energy will be delivered to Bulgarian national grid.

The area identified for the Project shows to be a good wind location, and the Project will diversify the sources of renewable energy in Bulgaria.

The main components of the project are:

(1) 35 aerial generators of 1,000 kW each one of 69 m of height covering a total area of 2,960 m^2. Due to the fact that the aerial generators will be installed in the area isolated from living area, there will not be significant environmental damages;

(2) Control center located in the project; and

(3) Transmission line to be connected at the nearest substation.

The Project will be developed jointly by MHI and INOS in order to supply electricity to Bulgarian national grid. The energy will be totally taken off by NEK, Bulgarian national transmission company on preferential basis.

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[1] Bulgaria may become a net importer of electricity after the retirement of units 3 and 4 of the Kozloduy nuclear plant in 2008, and during the refurbishment of the majority of old coal and lignite-fired plant, until the new Belene nuclear power plant comes on line in 2012. The utilization of local renewable energy power supply may alleviate the energy deficits.

The location of the KWPP power generation facilities was chosen after careful consideration of the economic, geophysical, environmental and settlement characteristics of the area. INOS has already obtained license to use the land owned by Municipality for the Project. Preliminary monitoring of the wind condition shows the feasibility of the Project. Due to its characteristics, the Project infrastructure is small thus minimizing the environmental impact. During construction, minimum environmental impact is expected due to the very little infrastructure needed that at the end doesn't affect adversely the economic activity of the area.

There are no communities adjacent to the Project site. The latest design of the turbines and its blades make the Project almost soundless and environmentally friendly.

It will be part of the operation of the park to have a maintenance program that will be in accordance with the demand characteristics as well as the wind regime, so the maintenance will be programmed in the less windy season.

A.3. Project participants:

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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)	Kaliakra Wind Power AD (Project Company)	No
	INOS – 1 OOD (INOS)	
Japan	Japan Carbon Finance, Ltd. (JCF)	No
Japan	Mitsubishi Heavy Industries, Ltd. (MHI)	No

INOS and MHI are jointly developing this Kaliakra project and invest jointly to the Special Purpose Company, Kaliakra Wind Power AD (SPC) in order to execute this project. The ratio of the investment is MHI : INOS = 70 : 30. The purpose of Japan Carbon Finance is to develop greenhouse gas reduction projects and to purchase ERUs for the first commitment period, between 2008 and 2012.

A.4. Technical description of the project:

A.4.1. Location of the project:

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Bulgaria

A.4.1.1. Host Party(ies):

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Bulgaria

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

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Municipality of Kavarna

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

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Bulgarevo Village

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

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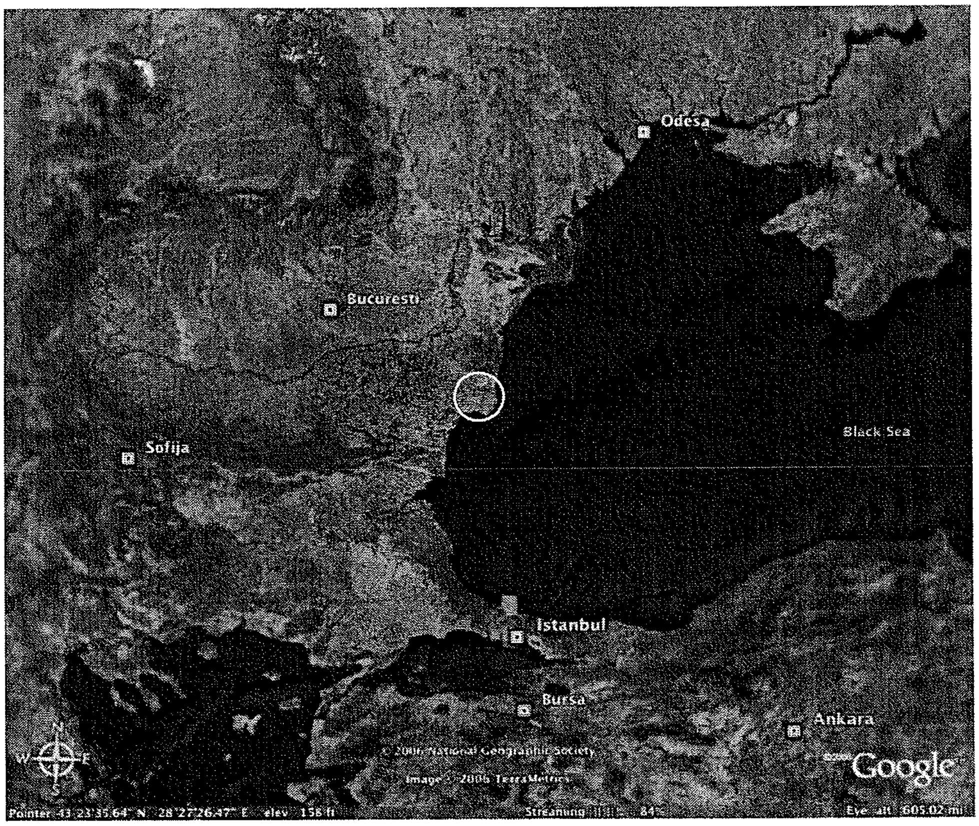
The KWP Project is constructed on the land owned by the Municipality of Kavarna and leased to SPC near the village of Bulgarevo, approximately 420 km north eastern of the capital city of Sofia and 4 km from the coast of the Black Sea at the Kaliakra cape, Bulgaria (43°23′ N, 28°27′ E).



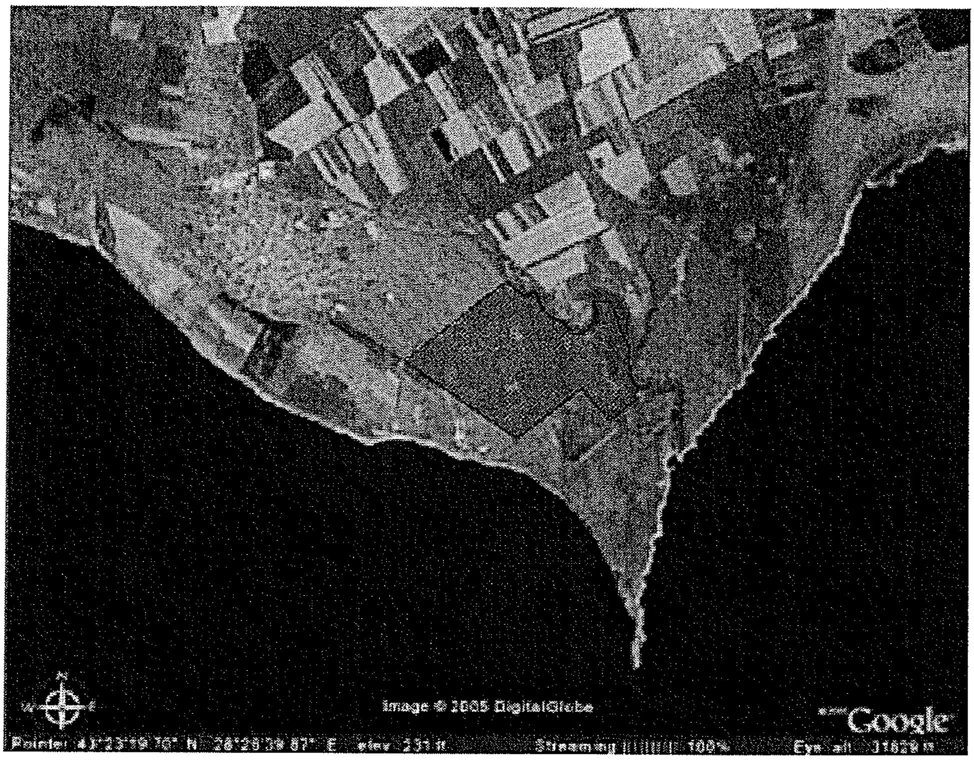


Fig. 1: Geographical Location of the Project Site

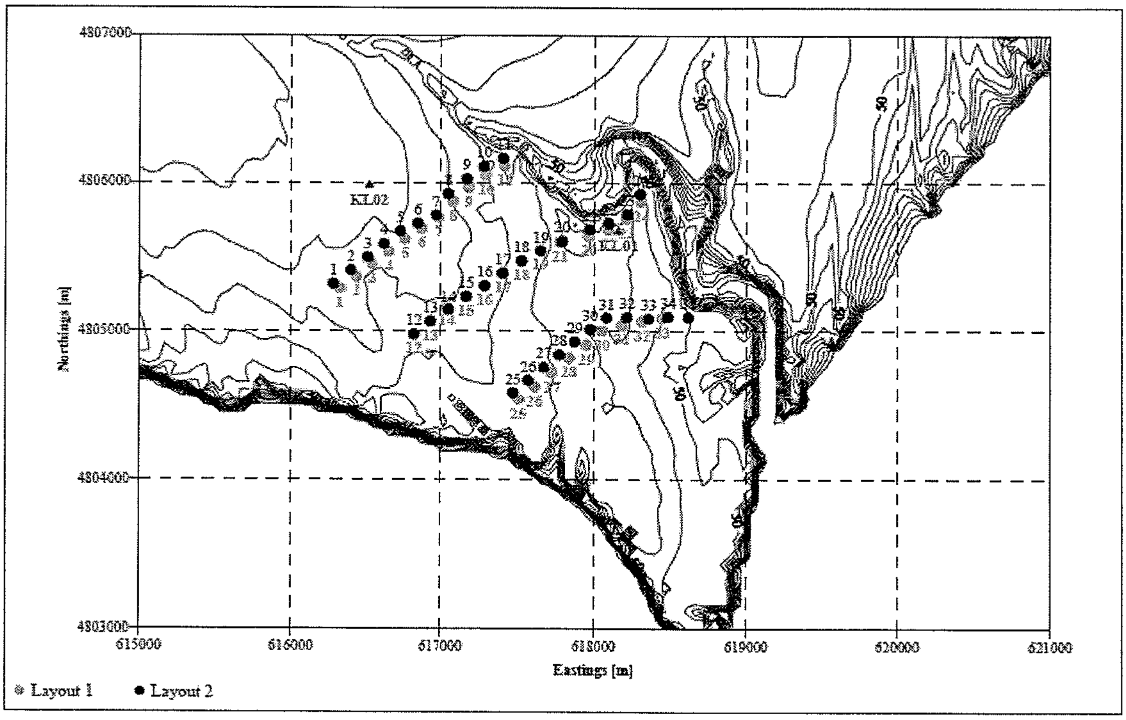


Fig. 2: Construction Layout of the Wind Turbines

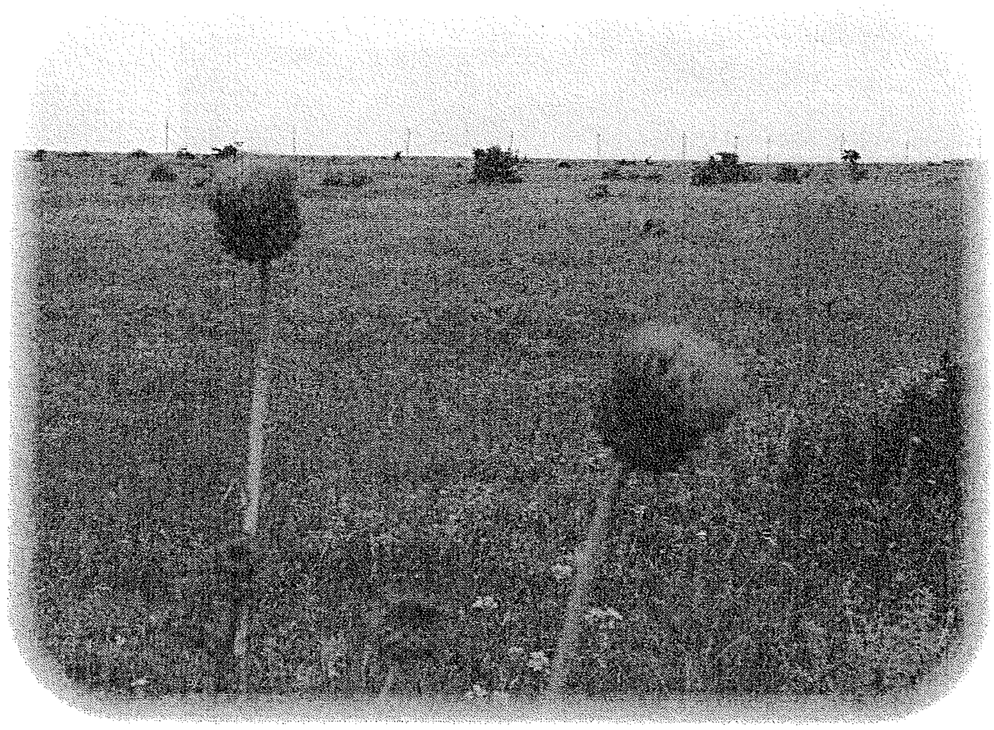


Fig. 3: Current Circumstance of the Project Site

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

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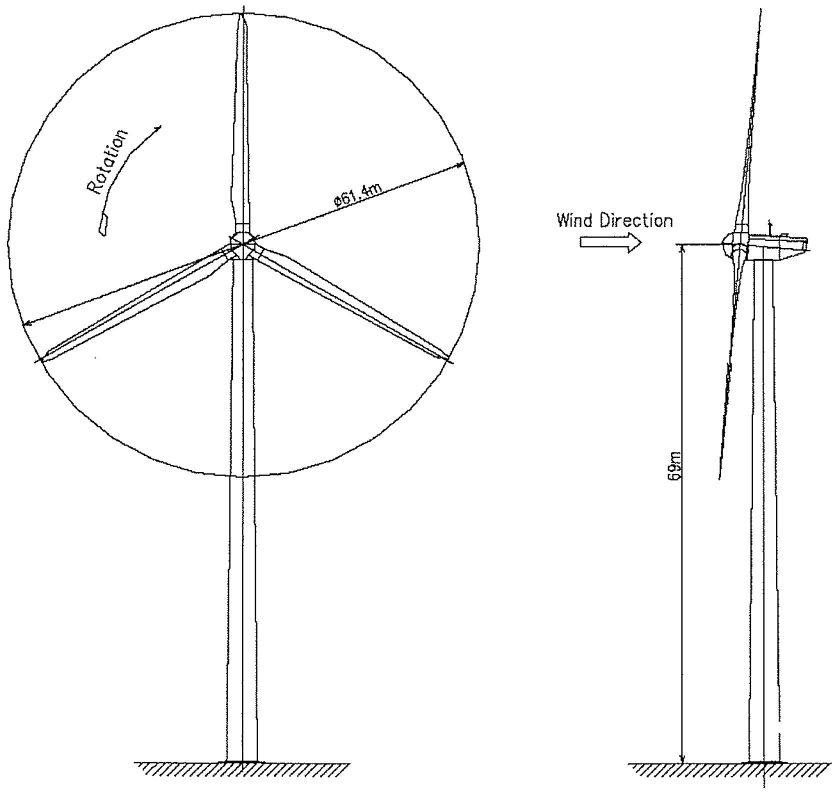
The technology to be used for the Kaliakra Wind Power Project (KWPP) is very standard for wind farm projects throughout the world, including existing projects in other European countries. This technology has been commercially available for several years and has been proven to be an excellent means by which to generate power.

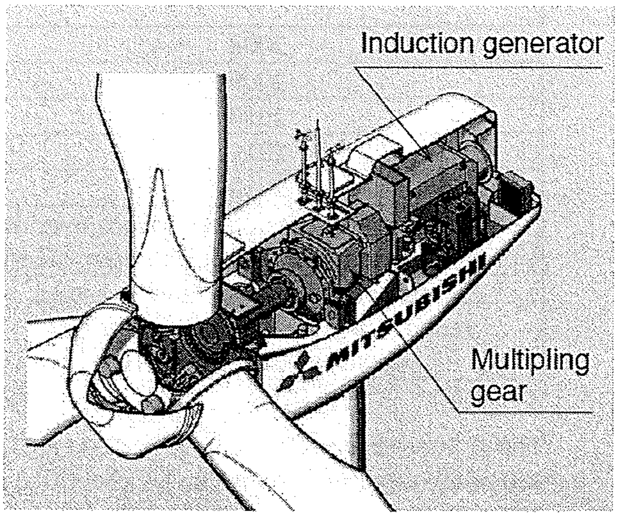


The 35 wind turbines will be mounted in 69 meters height structures. A control center for monitoring the performance of the wind turbines will be mounted. The movement of the blades activates a series of gears that ensures an uniform speed for the generators, which are the ones that produce the energy that is transmitted using internal cables that descend by the body of the tower toward a transformer that send it to a sub-station and then to the transmission line of NEK.

To date, more than 400 units of MWT-1000A (1,000 kW electrical generation capacity) are in service worldwide. Each unit generates 2.27 million kWh per year if capacity factor is 25.86% which is equivalent to the annual electricity needs of about 700 households.

The turbines to be used in the KWPP have the following characteristics:

- Has a power rating of 1,000 kW and a 61.4-metre diameter, 3-blade rotor made of polyester fibers.
- Has a hub height of 69 meters and an induction generator of 690 volts at 1500 rpm.
- Starts from a wind speed of 3 m/s and shuts down at 25 m/s, its rated speed being about 12.5 m/s.
- Has an overall weigh of 170 tons, the weight of the nacelle and rotor being 77 tons and the weight of the tower being 93 tons.



For layout of the wind turbines on site, please see Figure 2.

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:

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It is unfeasible that MHI and/or INOS decide to invest in the Project without JI framework because of the existence of risk factors associated with uncertainties. The risk factors include the uncertainties associated with the level of tariffs under the renewable off-take obligation throughout the project life, and the introduction of the Green Certificate scheme. This may be confirmed by the fact that there are no commercial wind farm projects to date in Bulgaria without JI incentive. In addition, the feasibility study funded by JBIC is based on the intension of the realization of the project under JI framework.

While, the JI credits (ERUs) provide enough incentives to overcome such barriers.

The resulted baseline scenario is the continuation of current practice, namely the generated electricity by the Project would be generated by other power plants (especially coal-fired) connected by to the grid. Therefore, we see significant CO_2 emission reductions by the Project which is carbon-free power generation.

Related baseline emissions can be calculated by the least cost method—using a simulation model incorporating the Bulgaria specific situations—provided and recommended to use by Bulgarian Government. .

We expect that Track 1 would be available for Bulgaria, while it is uncertain at this moment. In case Track 1 is applicable in Bulgaria, some modification may be necessary for the calculation.

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

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	Years
Length of the crediting period	5 years (see the explanation below)
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	81.4 $ktCO_2/yr$
2009	81.4 $ktCO_2/yr$
2010	81.4 $ktCO_2/yr$
2011	81.4 $ktCO_2/yr$
2012	81.4 $ktCO_2/yr$
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	406.9 $ktCO_2$
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	81.4 $ktCO_2/yr$

The JI Supervisory Committee (JISC) stated at its third meeting that “6. The JISC clarified that the end of the crediting period can be after 2012 subject to the approval by the host Party. The status of emission reductions generated by JI projects after the end of the first commitment period may be determined by any relevant agreement under the UNFCCC. The JISC decided to further discuss the issue of baseline in the case of crediting period that extends beyond 2012.”

The project participants are going to discuss on this issue with Bulgarian Government taking into the current provision specified by the JISC into account. Therefore, the crediting period may be prolonged or would be renewed in the future.

A.5. Project approval by the Parties involved:

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Written approvals by Bulgaria and Japanese Government will be attached.

Endorsement letter by Bulgarian Government (Bulgarian and English) is attached in Annex 4.

SECTION B. Baseline

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

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Outline of the baseline

The baseline scenario can be identified through two major steps:

1. Additionality demonstration of the project
   - A Barrier analysis
   - B Financial analysis
   - C Common practice analysis
2. Confirmation of no alternative options
3. Leakage concern

As the result, it is concluded that the baseline scenario is the "continuation of current practice".

Next, mathematical expression of the amount of emission reductions is to be provided.

Step 1: Additionality demonstration of the project

The additionality of the project is concluded by the following several considerations on barriers and financial obstacles supported by the common practice analysis.

A. Barrier analysis

While investment in renewable like wind, geothermal, biomass and solar projects have promising prospects in the Bulgarian market, the growth of these energies is highly dependent on the level of tariffs under the renewable off-take obligation, and the introduction the Green Certificate scheme. To date, Bulgarian government has not prepared the firm institutional framework, for addressing the above issues, to penetrate/promote power generation by renewable sources.

Therefore, the associated uncertainties are significant at this moment for the project participants and are source of big barrier for investment. To date, no power purchase agreement has been concluded with NEK.

B. Financial analysis

Financial analyses are undertaken based on the following assumptions with sensitivity analysis.

Average electricity generation through project life: 79,284 MWh / year

Expected electricity tariff: 8.95 euro cent / kWh[2]

Total project cost including VAT: 64,696,000 euro

O&M cost: 1,300,000 euro /year

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[2] The original tariff rate assumption is BGN 175/MWh. Calculation based on the official exchange rate between Bulgarian Leva (BGN) and Euro as BGN 1.95583/Euro (http://www.bnb.bg/bnb/home.nsf/vPages/S_ER_F?OpenDocument&EN).

The results are provided as follows. The details of the calculation are to be provided to the independent entity for underlying calculations as a spread sheet.

IRR of the base case

	10 Years	15 Years	20 Years
Project IRR	0.88 %	5.88 %	7.63 %
Equity IRR	Negative	6.57 %	10.08 %

The project IRR for 10 years is far below the rate of Bulgarian bond that yields interest rate of 4.1% per year. Even looking at the project IRR for 20 years, this rate, 7.63 % is much less than the IRR normally expected by the investors of central and eastern European electricity field. The minimum line of IRR for the investors in central and eastern European electricity field can be calculated as follows. The explanation/source of "risk free rate" and "market premium" are provided to the independent entity in the validation process.

Risk free rate (Rf) + Market risk premium (MRP)
= 5.6% + 7.2 % (*Data of Ibbotson 1926-2004)
= 12.8 %

The following table shows the sensitivity analysis:

			Project IRR (20 years)	Equity IRR (20 years)
Base Case			**7.63%**	**10.08%**
Sensitivity Analysis	Capacity Factor	5% higher	8.41%	11.67%
		5% lower	6.81%	8.48%
	EPC Cost (Hard Cost)	10% lower	8.84%	12.53%
		10% higher	6.52%	8.06%
	O&M Cost	10% lower	7.92%	10.67%
		10% higher	7.33%	9.48%
	Electricity Tariff	5% higher	8.41%	11.68%
		5% lower	6.81%	8.86%

As shown in the above calculation, various uncertainties in the project, less wind, cost over-run, less electricity tariff, *etc.* would result in much lower IRR.

Same as the cases in other countries, this type of renewable energy project generates insufficient rate of return to investor, even though there is a rule to off-take renewable energy on preferential basis. ERU accrued from JI may help improving economic viability of Project.

Neither INOS nor MHI have intension to invest in the project with project IRR less than 8% as a usual investment criteria, even without consideration of uncertain circumstances as shown in the barrier analysis.

Considering ERU revenue into account with $7/t$CO_2$, the following figure is obtained. It is expected that when the ERU is generated, the spot price of ERU may be linked to the EU Allowance (EUA) price in the second phase, which is currently around the range of 15–20 Euro/tCO_2 (much above $7/t$CO_2$). Therefore, it is a satisfactory incentive for INOS and MHI to implement the project if it can generate ERUs.

	Project IRR	Equity IRR
Base Case	**7.63%**	**10.08%**
With ERU Case ($7 / t$CO_2$)	**8.12%**	**11.07%**
With ERU Case (15 euro / tCO_2)	**9.20 %**	**12.99%**

In addition, it is much easier to obtain a loan of JBIC, if the project is implemented under JI.

C. Common practice analysis

The development of wind power in Bulgaria is at a very early stage, with no commercial wind turbine currently in operation. In addition, Bulgaria has no local manufacturing capacity for wind turbines at present. Therefore, it is concluded that the Kaliakra Wind Power Project is regarded as the first-of-this-kind in Bulgaria.

Some 295 MW of wind projects by 2008 are currently in the proposal or planning stage, which could be operational by 2008. The Bulgarian wind energy potential is assessed to be 2,200 to 3,400MW in total, with the most promising areas (exhibiting adequate wind speeds and stability of wind directions) being the northern part of the Black Sea coast and the central and southwestern mountainous regions. These areas can provide approximately 500 MW energy capacity. Many attractive sites for wind turbine development coincide with major bird migration routes. While fears of bird impacts in other markets (*e.g.*, the UK or Germany) have generally proved unfounded, they may still pose a barrier to initial wind developments. An additional consideration which might restrict construction of wind turbines is their impact on air traffic control and national defense radars.

Step 2: Confirmation of no alternative options

Apparently, the Municipality of Kavarna does not have any other plan or opportunity to utilize the site for "reduction of GHG" activities. In addition, neither NEK nor INOS have alternative plan to this project to implement some less carbon power generation.

Therefore, it is concluded that the baseline scenario is the continuation of current practice. In other words, the grid of Bulgaria would supply electricity, which will be generated by KWPP, by using the power plants connected to the grid, *i.e.*, additional power generation by such plants.

Step 3: Leakage concern

The logic of the emission reduction is that the electricity generated by the project would result in reduction of electricity generation by other (especially fossil-fired) power plants connected to the grid. On the other hand, the fossil-fired power plants are regulated under the EU ETS. Therefore, there remains a concern (of leakage) that the targeted fossil-fuel power plants would meet their targets under EU ETS anyway, with or without the proposed Project.

At this moment, the European Commission requests the member states to set aside some portion of EUAs in the NAP. Bulgarian Government has prepared its draft NAP for 2008–12 with an intension to set aside some portion of the EUAs to be allocated for the renewable energy-type JI projects. The draft is under review by the European Commission. At this stage, we assume that we do not have to care about the leakage originated by the 'double-counting'.

Mathematical expression of the emission reductions (baseline emissions)

As there are no captive power plants to this project, *i.e.*, "continuation of current practice" is regarded as the baseline scenario, the amount of baseline emissions $BE(t)$ (identical to the emission reductions $ER(t)$) is expressed as the product of the supplied electricity to the grid by the project and the displaced grid emission factor.

$$ER(t) = BE(t) = GEN(t) * CEF(t) \qquad (1)$$

where

$ER(t)$:	Emission reductions in a year t [tCO_2/yr];
$BE(t)$:	Baseline emissions in a year t [tCO_2/yr];
$GEN(t)$:	Electricity generated and supplied to the grid by the project in a year t [MWh/yr];
$CEF(t)$:	CO_2 emission factor of the "marginal" power plants connected to the grid available in a year t [tCO_2/MWh].

It is noted that the data are those of the latest available one.

There are several methods to calculate *CEF.*

The method used in the PDD is the "least cost planning method"[3] developed and recommended to use Bulgarian Government.[4] It is based on merit order dispatch analysis. The document denotes:

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3 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. (http://www.moew.government.bg/recent_doc/international/climate/carbon_emission_joint.pdf)

4 See, http://www.moew.government.bg/international/conventions/climate/joint_e_main.html. The latest version of the information (based on 2005 data) is also provided to the project participants. The calculation in the PDD is based on this latest version.

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 Electric 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.

The method specified by the Bulgarian Government is a composite method, *i.e.*, basically follows the method of AM0002 (ver. 6). On the other hand, the IRP model identifies the low-cost/must-run plants (in the calculation of the operating margin emission factor).

The calculation method of emission factor applied in the PDD follows that of the ACM0002 (version 6) under CDM based on the data provided by Bulgarian Government.

Step 1: <u>Calculation of the Operating Margin Emission Factor</u> (CEF_{OM}):

Simple adjusted OM method is applied (prioritized dispatch data method cannot be applied due to the non-availability of data).

The Simple adjusted OM emission factor is calculated using the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission *ex ante*.

Step 2: <u>Calculation of the Build Margin Emission Factor</u> (CEF_{BM}):

Calculate the Build Margin emission factor ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

Step 2: <u>Calculation of the Overall Emission Factor</u> (*CEF*):

The overall emission factor CEF is calculated as a linear combination of CEF_{OM} and CEF_{BM} with the weight factor of 75% and 25% (for wind power projects) as specified in ACM0002 (ver. 6):

$$CEF = 0.75 * CEF_{OM} + 0.25 * CEF_{BM} \quad (2)$$

It is noted that *CEF* is calculated by using the method specified above *ex ante* and keeps constant throughout the crediting period.

For the information provided by Bulgarian Government, see Annex 2 and the attachments to the PDD. It includes the forecast information, however, the CEF is determined by using the past (and fixed) data as required by ACM0002. The reason why the *ex ante* fixed value is used is for the certainty of business environment as well as uncertainty to obtain annual *ex post* data from Bulgarian Government. The reason why Simple adjusted OM is applied is that both Dispatch OM and Simple OM cannot be applied due to the non-availability of data or the ratio of low-cost/must-run plants is greater than 1/2 in the grid, respectively. It is noted that selected Simple adjusted OM is more conservative than Simple OM.

The calculation of emission reductions is provided in Section E.

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:

>>

As shown in Step 2 in B.1, the "continuation of current practice" is concluded as the baseline scenario. It implies that some fossil fuel (mainly coal) power plants would supply electricity, which is supplied by the Project in the project scenario, in the baseline.

As the Project supplies carbon-free electricity, the Project is going to deliver "additional" CO_2 reductions to the baseline scenario.

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

>>

The project boundary encompasses the project site and whole of the Bulgarian power grid.

No significant leakage is found, as far as the 'double-counting' issue explained in B.1. is absent.

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

>>

Date of completion: 01/06/2007

Dr. Naoki Matsuo
Climate Experts Ltd.(*)
n_matsuo@climate-experts.info

* Climate Experts Ltd. is not a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

>>

01/01/2008

C.2. Expected operational lifetime of the project:

>>

20 years

C.3. Length of the crediting period:

>>

5 years[5]

[5] The project participants are going to discuss on this issue with Bulgarian Government taking into the current provision specified by the JISC into account at its third meeting. Therefore, the crediting period may be prolonged or would be renewed in the future.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

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Monitoring has two major components:

- The amount of electricity supplied/sold to the grid monitored by energy meter.
- CO_2 emission factor if it is provided by the governmental agency.

Details are provided below and in Annex 3.

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

The option 1 is not selected.

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):

>>

n.a.

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

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

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n.a.

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

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
1. GEN(t)	*Electricity generated and supplied to the national grid*	*Energy meter (Watt-hour meter)*	*MWh*	*Measured*	*Continuously*	*100%*	*electronic*	*Double-checked by the sales record to the NEK (NEK also monitors GEN(t)).*
2. CEF	*CO_2 emission factor of the national grid*	*Governmental document[6] provided by*	*tCO_2/MWh*	*Cited from document*	*Once at the preparation stage of the PDD*	*100%*	*electronic*	*2005 data is applied (fixed ex ante)*

6 The latest document is "Baseline Study of Joint Implementation Projects in the Bulgarian Energy Sector — Carbon Emission Factor".

		MOEW						

[All of the data are archived for "crediting period + 2 years"]

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):

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The amount of baseline emissions $BE(t)$ (identical to the emission reductions $ER(t)$) is expressed as the product of the supplied electricity to the grid by the project and the displaced grid emission factor.

$$ER(t) = BE(t) = GEN(t) * CEF \quad (3)$$

where

$ER(t)$: Emission reductions in a year t [tCO_2/yr];

$BE(t)$: Baseline emissions in a year t [tCO_2/yr];

$GEN(t)$: Electricity generated and supplied to the grid by the project in a year t [MWh/yr];

CEF: CO_2 emission factor of the "marginal" power plants connected to the grid available for 2005 (calculated as the weighted average of 2003 to 2005) [tCO_2/MWh].

The underlying data of *CEF* is those provided and recommended to use by the Bulgarian Government (see Section B.1 and Section E as well as the Annex 2 and the attachments).

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

No significant leakage is found.

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):

>>

n.a.

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):

>>

Same as Section D.1.2.2.

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:

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The KWPP shall conduct all necessary monitoring, collection and archiving of information on environmental impact in accordance with the conditions of EIA approved by RIOS-Varna of MOEW. This information include bird migration which shall be monitored and recorded by the Radar system and the noise which shall be checked at the points designated by the conditions of EIA.

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	*Low*	*NEK (buyer) or NEK-authorized lab is going to check at the site after installation.*

		The calibration will be undertaken at regular interval. It is noted that both buyer-side and seller-side monitors the electricity supplied to the grid.
2	*Low*	*These parameters are not under control by the project participants.*

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

>>

The monitoring is very simple and automatically undertaken electronically. Therefore, no specific monitoring management structure is needed in addition to the regular data check on business. The electricity supply data is also monitored and recorded by NEK (buyer).

The general manager is responsible for all monitoring items.

The training program will be undertaken before commissioning of the project activity by KWP AD.

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

>>

Dr. Naoki Matsuo
Climate Experts Ltd.
n_matsuo@climate-experts.info

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

>>

No significant project emissions.

E.2. Estimated leakage:

>>

No significant leakage.

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

>>

Zero.

E.4. Estimated baseline emissions:

>>

The amount of baseline emissions *BE(t)* (identical to the emission reductions *ER(t)*) is expressed as the product of the supplied electricity to the grid by the project and the displaced grid emission factor.

$$ER(t) = BE(t) = GEN(t) * CEF \quad (4)$$

where

ER(t):	Emission reductions in a year *t* [tCO_2/yr];
BE(t):	Baseline emissions in a year *t* [tCO_2/yr];
GEN(t):	Electricity generated and supplied to the grid by the project in a year *t* [MWh/yr];
CEF:	CO_2 emission factor of the "marginal" power plants connected to the grid for 2005 (calculated as the weighted average of 2003 to 2005) [tCO_2/MWh].

The baseline emissions are that of CO_2 only.

The data/information on *CEF* is those provided and recommended to use by the Bulgarian Government. ACM0002 (v.6) under CDM is used to calculate *CEF*.

The relevant information provided by Bulgarian government is as follows:

Calculation of CO_2 emission factor *CEF* for the latest year (2005, calculated as the weighted average of 2003 to 2005) by using the simple adjusted operating margin method for the operating margin part for solar/wind power projects (see Annex 2):

$$CEF = 1.026 \ tCO_2/MWh \ (fixed) \quad (5)$$

For other parts (previous years, future forecasts by scenario, CEF by using Simple OM method, CEF for hydro power, *etc.*) and underlying information provided by Bulgarian Government, see Annex 2 and/or attachments.

Annual power supplied to the grid is assumed to be

GEN = 79.3 GWh/yr (assumed to be constant) (6)

This value will be replaced ex post by the monitored value.

Therefore, the expected emission reductions in a typical year is

ER = 1.026 tCO_2/MWh * 79.3 GWh/yr = 81.4 $ktCO_2$/yr (7)

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

>>

Same as Section E.4.

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)	Estimate of annual emission reductions (tonnes of CO_2 equivalent)
2008	0	0	81.4 $ktCO_2$/yr	81.4 $ktCO_2$/yr
2009	0	0	81.4 $ktCO_2$/yr	81.4 $ktCO_2$/yr
2010	0	0	81.4 $ktCO_2$/yr	81.4 $ktCO_2$/yr
2011	0	0	81.4 $ktCO_2$/yr	81.4 $ktCO_2$/yr
2012	0	0	81.4 $ktCO_2$/yr	81.4 $ktCO_2$/yr
Total (tones of CO_2 equivalent)	0	0	406.9 $ktCO_2$	406.9 $ktCO_2$

[note] The crediting period may be prolonged or would be renewed in the future.

SECTION F. Environmental impacts

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

>>

The Kaliakra Wind Power Project undertook the environmental impact assessment (EIA) in conformity with the Bulgarian governmental regulations "Environmental Protection Act" as well as the "JBIC Guidelines for Confirmation of Environmental and Social Considerations."

"Preliminary Environmental Management Plan for Kaliakra Wind Power Project" as well as "Environmental Checklist for Kaliakra Wind Power AD Bulgaria" for JBIC were submitted to the independent entity for validation purpose. The latter document is the rearrangement of the EIA report submitted to the Bulgarian government according to the JBIC Checklist questions. Those are the documents which were developed for Kaliakra Wind Power AD to declare its intention to observe all Bulgarian regulations related to the environment and the conditions of approval of EIA, incorporating the actions required, management system and responsibilities, preventive actions, QA/QC requirement,etc.

Bulgarian governmental regulations

Methodology for EIA:

According to the Ordinance on the terms and procedure for making environmental impact assessment of investment proposals for construction, activities and technologies, the EIA shall be made in the following order:

1. Notification to the competent authorities and the public affected;
2. Assessment of the need for EIA;
3. Holding of consultations; identification of the scope, the contents and the form of the EIA report;
4. Assessment of the quality of the EIA report;
5. Organization of public discussion on EIA report;
6. Taking decision on the EIA;
7. Exercising control over implementation of the conditions set forth in the decision of EIA

Conclusion

According to the above methodology from 1 to 7, public discussion was held on May 31 2005 and questions raised during the public discussion were answered by KWP. Considering the EIA report and the public discussion, Regional Inspection on Environment and Water - Varna issued Decision No.2-2(101) 2005 which approved the realization of the investment proposal of Kaliakra Wind Power Project, on June 23 2005. In the Decision, Regional Inspection on Environment and Water - Varna admitted,

a) EIA report has reviewed the existing state of environment and all expected impacts of the project. Significant and permanent negative impacts are unlikely.
b) The quantitative assessment of the risk for the birds were carried out. The radar system provided by the project for early warning and locating of the migrating birds will prevent the collision of the birds with the turbines.

And set several conditions to be observed by KWP such as,

(1) Within one month after operation, to carry out one-year ornithological monitoring at the site, in order to report the risk for the birds.

(2) To execute measures, which would guarantee the continuous work of the radar system and the stopping of the turbines while birds are flying through the site

Also, Decision No.2-2(101) 2005 was confirmed by the Resolution No.128, which was issued on July 25 2005 by Minister of Ministry of Environment and Waters.

JBIC Guidelines for Confirmation of Environmental and Social Considerations.

Overview

JBIC establishes and makes public 'JBIC Guidelines for Confirmation of Environmental and Social Considerations' with the objective of contributing to efforts by the international community through consideration of the environmental and social aspects in all projects subject to lending or other financial operations by JBIC. The Guidelines apply commonly to JBIC's International Financial Operations and Overseas Economic Cooperation Operations. The Guidelines have been formulated on the basis of Japan's approach to international co-operation in environmental conservation, discussions about the international framework on environmental and social considerations and human rights, and discussions held at the Organization for Economic Co-Operation and Development (OECD) regarding common approaches to the environment and public expert credits, which requires consistency between public export credit policies and environmental conservation policies, and also regarding good environmental practices of the Development Assistance Committee (DAC) and other issues.

Confirmation of Environmental and Social Considerations by JBIC

JBIC does the following to confirm environmental and social considerations; Classifies the project into one of the categories; Conducts a review of environmental and social considerations when making a decision on funding, to confirm that the requirements are duly satisfied; and Conducts monitoring and follow-up after the decision has been made on funding.

Procedures for Confirmation of Environmental and Social Considerations

(1) Screening

Before starting an environmental review of a project, JBIC classifies the project into one of the following categories. The subsequent environmental review will then be conducted in accordance with the procedures for that category. During the screening process, JBIC classifies each project in terms of its potential environmental impact, taking into account such factors as: the sector and scale of the project, the substance, degree and uncertainty of its potential environmental impact and the environmental and social context of the proposed project site and surrounding areas.

(2) Categorization

Category A:
A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment. A project with complicated impact or unprecedented impact which are difficult to assess is also classified as Category A. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors (*i.e.*, sectors that are liable to cause adverse environmental impact) or with sensitive characteristics (*i.e.*, characteristics that are liable to cause adverse environmental impact) and projects located in or near sensitive areas. Kaliakra Wind Power Project

was classified as Category A, because the project site is located near sensitive areas as listed in the JBIC Environment Guidelines.

(3) Environmental Review for Category A

After the screening process, JBIC carries out environmental reviews according to the following procedures for category A.

Category A:
Environmental reviews for Category A projects examine the potential negative and positive environmental impact of projects. JBIC evaluates measures necessary to prevent, minimize, mitigate or compensate for potential negative impact, and measures to promote positive impact if any such measures are available. Borrowers and related parties must submit Environmental Impact Assessment (EIA) reports for Category A project. For projects that will result in large-scale involuntary resettlement, basic resettlement plans must be submitted. JBIC undertakes its environmental reviews based on the EIA and other reports prepared by the project proponents and submitted through the borrower. KWP submitted same EIA report to JBIC and independent entity which was submitted to Bulgarian government.

Monitoring

JBIC in principle confirms through the borrower over a certain period of time, the results of monitoring the items which have a significant environmental impact by the project proponents. This is in order to confirm the project proponents' undertaking of environmental and social considerations for category A and B projects.

Content of Disclosed Information

After executing a loan agreement, JBIC provides the results of its environmental reviews of projects in Categories A and B for public perusal on the JBIC website.The Environmental Check Report regarding Kaliakra Wind Power Project was made publicly available on Mar.20 2007 on the JBIC website[7].

Conclusion

.As the result of the JBIC's review regarding Kaliakra Wind Power Project, no particular concern is raised about measures taken during work, as stated on the JBIC website. Also, no additional requirement for monitoring was raised, compared with the conditions stated in Decision No.2-2(101) 2005 which was issued by Regional Inspection on Environment and Water – Varna.

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:

>>

No significant environmental impacts are found and expected.

[7] JBIC's homepage : http://www.jbic.go.jp/english/environ/joho/review.php

The Decision of the approval of EIA states that the project will not lead to any significant and permanent negative impact on the environment under the condition that the measures required in the Decision are strictly observed.

The preliminary environmental management plan with the procedure to observe the conditions in EIA approval was prepared by the KWP, which was submitted to the independent entity.

SECTION G. Stakeholders' comments

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

>>

The public discussion on environmental impact of the project took place on 31 May 2005 in the hall of Kavarna Municipality with the attendance of the officials of Municipality, the habitants of local community, NGOs, *etc.*

The Municipality of kavarna was naturally supportive to construct wind farm in the proposed area, since the Municipality was the initiator of the project by calling tender to let their own land be used for wind farm.

The majority of the opinions were found favorable to the proposed renewable energy project in the public discussion, while some concerns were raised by certain NGOs with respect to the issue of noise, wild life and migrant birds. After the discussion among the project sponsor, NGOs and the Varna Regional Directorate of Ministry of Environmental and Water (MOEW), the Varna Regional Directorate issued the approval on EIA on 23 June 2005, which was supported by the decision of MOEW on 25 July 2005. The decisions of MOEW and discussion papers prepared after the public discussion were submitted to the independent entity. One appeal was filed with the Bulgarian court by certain NGO against the decision of MOEW with respect to the issue of migrant birds and Varna District Court announced the termination of this appeal by the sentence dated October 27, 2006. After that, certain attorney issued private complaint to Supreme Administrative Court against the above announcement of Varna District Court. On Mar.16 2007, Supreme Administrative Court announced that the case returned to the Varna District Court and procedure actions to be resumed, due to the difference of interpretation of 14-days statute of limitation period for appeal of the EIA resolution. In this current situation, the procedure actions are ongoing.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	Mitsubishi Heavy Industries, Ltd.
Street/P.O.Box:	3-1, Minato-Mirai 3-Chome, Nishi-Ku
Building:	
City:	Yokohama
State/Region:	
Postal code:	220-8401
Country:	Japan
Phone:	81-45-224-9537
Fax:	81-45-223-1725
E-mail:	yoshio_minato@mhi.co.jp
URL:	
Represented by:	
Title:	Manager
Salutation:	Mr.
Last name:	Minato
Middle name:	
First name:	Yoshio
Department:	Power Systems International Operations Department
Phone (direct):	
Fax (direct):	81-45-223-1725
Mobile:	81-45-224-9537
Personal e-mail:	

Organisation:	INOS 1 Ltd.
Street/P.O.Box:	114, V. Levski Blvd.
Building:	
City:	Sofia
State/Region:	
Postal code:	1504
Country:	Bulgaria
Phone:	359-2-943-3060
Fax:	359-2-943-4484
E-mail:	george@inos.1.com
URL:	
Represented by:	
Title:	Managing Director
Salutation:	M.Sc.Eng.
Last name:	Petkov
Middle name:	
First name:	George
Department:	
Phone (direct):	
Fax (direct):	359-2-943-3060
Mobile:	359-2-943-4484

Personal e-mail:	

Organisation:	Kaliakra Wind Power AD
Street/P.O.Box:	App. 104, 8th Floor, Entr. D, Dimitar District
Building:	
City:	Sofia
State/Region:	Poduence Region,
Postal code:	
Country:	Bulgaria
Phone:	
Fax:	
E-mail:	
URL:	
Represented by:	Mitsubishi Heavy Industries, Ltd.
Title:	Manager
Salutation:	Mr.
Last name:	Ueno
Middle name:	
First name:	Shinji
Department:	Power Systems International Operations Department
Phone (direct):	
Fax (direct):	81-45-224-9905
Mobile:	81-45-224-9637
Personal e-mail:	

Annex 2

BASELINE INFORMATION

Baseline Carbon Emission factor of the Bulgarian Power Grid

		Unit	2000	2001	2002	2003	2004	2005	
1.	Total system power generation	GWh	41,805	44,785	41,943	41,990	43,621	44,259	
2.	Total system heat generation	$MW_{th}h$	########	########	17,104,183	########	########	17,793,681	
3.	Total CO2 emission of power generati	kt/a	20,686.07	24,186.09	21,130.37	23,502.96	26,141.93	22,772.84	
4.	Total CO2 emission of energy transfor	kt/a	25,364.83	29,868.93	27,206.40	29,968.99	31,566.24	29,112.31	
	Baseline Emission Factor - BEF								
	Hydropower Projects								
1.	Dispatch Data_OM_EF	tCO2/MWh	1.215	1.287	1.214	1.226	1.199	1.133	
2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1.159	1.222	1.150	1.160	1.138	1.055	
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1.269	1.307	1.231	1.237	1.239	1.003	
	Windpower and Solarpower Projects								
1.	Dispatch Data_OM_EF	tCO2/MWh	1.144	1.184	1.106	1.160	1.165	1.186	
2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1.065	1.106	1.032	1.067	1.078	1.069	
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1.101	1.149	1.040	1.073	1.108	0.991	
	Windpower and Solarpower Projects								
1.	Dispatch Data_OM_EF	kg/GJ	106.38	109.57	110.86	111.24	110.03	111.52	
2.	Dispatch Data Adjusted_OM_EF	kg/GJ	106.93	109.05	110.68	111.09	109.91	111.41	
3.	Average Dispatch Data_OM_EF	kg/GJ	109.43	108.79	109.00	109.47	110.63	110.13	
	Forecast								
	Minimum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	40,045	36,771	37,516	39,364	42,717	45,946	47,303
2.	Total system heat generation	$MW_{th}h$	########	########	18,320,175	########	########	19,195,632	19,358,651
3.	Total CO2 emission of power generati	kt/a	21,216.91	22,848.06	23,292.43	24,632.51	27,104.06	30,039.61	31,301.85
4.	Total CO2 emission of energy transfor	kt/a	27,775.03	29,342.39	29,879.38	31,248.56	34,081.16	36,520.92	37,811.49
	Baseline Emission Factor - BEF								
	Hydropower Projects								
1.	Simple_OM_EF	tCO2/MWh	1.126	1.106	1.079	1.063	1.050	1.039	1.030
2.	Simple Adjusted_OM_EF	tCO2/MWh	1.037	1.006	0.968	0.944	0.938	0.929	0.922
3.	Average_OM_EF	tCO2/MWh	1.053	1.040	0.994	0.974	0.980	0.977	0.971
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	tCO2/MWh	1.177	1.167	1.149	1.139	1.114	1.102	1.097
2.	Simple Adjusted_OM_EF	tCO2/MWh	1.044	1.017	0.982	0.960	0.946	0.938	0.935
3.	Average_OM_EF	tCO2/MWh	1.067	1.068	1.021	1.005	1.009	1.010	1.009
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	kg/GJ	111.471	109.737	109.843	106.529	106.911	107.214	108.266
2.	Simple Adjusted_OM_EF	kg/GJ	110.759	108.619	108.841	105.459	106.221	106.363	107.424
3.	Average_OM_EF	kg/GJ	109.404	106.441	108.852	104.524	106.255	107.329	108.645
	Forecast								
	Maximum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	41,734	38,499	39,439	42,124	45,338	48,703	51,398
2.	Total system heat generation	$MW_{th}h$	########	########	20,240,498	########	########	21,368,569	21,607,576
3.	Total CO2 emission of power generati	kt/a	21,066.58	23,655.19	24,152.02	26,413.92	28,987.29	31,873.18	33,733.14
4.	Total CO2 emission of energy transfor	kt/a	28,319.76	30,859.61	31,512.57	33,920.09	36,470.81	39,077.01	41,430.77
	Baseline Emission Factor - BEF								
	Hydropower Projects								
1.	Simple_OM_EF	tCO2/MWh	1.125	1.104	1.081	1.049	1.046	1.030	1.018
2.	Simple Adjusted_OM_EF	tCO2/MWh	1.034	0.998	0.963	0.937	0.936	0.925	0.919
3.	Average_OM_EF	tCO2/MWh	1.043	1.032	0.992	0.969	0.978	0.969	0.963
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	tCO2/MWh	1.172	1.158	1.145	1.126	1.104	1.088	1.072
2.	Simple Adjusted_OM_EF	tCO2/MWh	1.035	0.998	0.968	0.958	0.940	0.930	0.923
3.	Average_OM_EF	tCO2/MWh	1.050	1.050	1.012	1.006	1.002	0.996	0.989
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	kg/GJ	110.719	112.284	109.872	106.072	106.647	106.583	106.529
2.	Simple Adjusted_OM_EF	kg/GJ	109.677	111.289	108.871	105.418	105.889	105.843	106.745
3.	Average_OM_EF	kg/GJ	108.893	111.013	109.137	104.861	106.284	106.629	108.380

Source: "Baseline Study of Joint Implementation Projects in the Bulgarian Energy Sector: Carbon Emission Factor, Summary Table", MOEW, 2006.

For the CEF calculation, "Dispatch Data Adjusted OM" for "Windpower and Solarpower Projects" is applied for OM part calculation. The CEF is calculated *ex ante* as a fixed value of weighted average of most recent three years, *i.e.*, 2003, 2004 and 2005 data following the method specified in ACM0002 (v.6).

The document provides the combined margin calculations for "Hydro Power Projects" (weight factor: OM : BM = 0.5 : 0.5) and "Windpower and Solarpower Projects" (weight factor: OM : BM = 0.75 : 0.25). From these results, operating margin and build emission factors are solved as follows:

$$\begin{pmatrix} CM(w_1) \\ CM(w_2) \end{pmatrix} = \begin{pmatrix} w_1 \cdot OM + (1-w_1) \cdot BM \\ w_2 \cdot OM + (1-w_2) \cdot BM \end{pmatrix} = \begin{pmatrix} w_1 & 1-w_1 \\ w_2 & 1-w_2 \end{pmatrix} \begin{pmatrix} OM \\ BM \end{pmatrix}$$

for $(w_1, w_2) = (0.5, 0.75)$. Therefore,

$$\begin{pmatrix} OM \\ BM \end{pmatrix} = \begin{pmatrix} w_1 & 1-w_1 \\ w_2 & 1-w_2 \end{pmatrix}^{-1} \begin{pmatrix} CM(w_1) \\ CM(w_2) \end{pmatrix} = \frac{1}{w_1 \cdot (1-w_2) - (1-w_1) \cdot w_2} \begin{pmatrix} 1-w_2 & -(1-w_1) \\ -w_2 & w_1 \end{pmatrix} \begin{pmatrix} CM(w_1) \\ CM(w_2) \end{pmatrix}$$

for the latest three years 2003, 2004 and 2005.

The result is

	2003	2004	2005	Weighted average
Operating Margin (OM)	0.974	1.018	1.083	1.026
Build Margin (BM)	1.346	1.258	1.027	-

with the unit of tCO_2/MWh. The weighted average of the OM for the latest three years are calculated by using the power generation data for these years:

	2003	2004	2005	total
Power Generation (GWh/yr)	41,990	43,621	44,259	129,870

For wind power projects, the emission factor based on ACM0002 (ver.6) is given by

$$\begin{aligned} CEF &= 0.75 * 1.026 + 0.25 * 1.027 \\ &= 1.026\ (tCO_2/MWh). \end{aligned}$$

The reason why the *ex ante* fixed value is used is for the certainty of business environment as well as uncertainty to obtain annual *ex post* data from Bulgarian Government.

The baseline information prepared by Bulgarian Government is attached to this annex 2.

Expected Power Generation by the Project

The projected energy capture of the proposed wind farm is 79.284 GWh/year. This includes calculation of the topographical, array and air density effects and assumptions or estimates for electrical transmission losses, availability, power curve adjustment, high wind hysteresis, substation maintenance, and the effect of blade fouling or icing.

This number is an indicative one only for the *ex ante* calculation of emission reductions.

[Source] Feasibility Study Report

Attachment to Annex 2

Additional Baseline information

I. The Bulgarian Electricity Sector

1. Short History of the Bulgarian Electricity Sector

The Bulgarian electricity sector was dominated by the vertically integrated state-owned Natsionalna Elektricheska Kompania EAD (NEK) until its unbundling in 2000. The firm has been converted to a transmission company with a single buyer division, transmission system maintenance division, hydro power plants division, and dispatch center (operator of the power transmission system:National Dispatch Center (NDC)). The NDC, as a specialized unit of NEK-EAD, performs the functions of real time dispatching of the electric power system of Bulgaria. Its main assignment is to guarantee reliable and economic operation of the Bulgarian electric power system.

The decision on the new restructuring of the Company has been issued by the Board of Directors of NEK on 11 April 2006. The adopted model of new unbundling of NEK is through establishment of a new subsidiary company -EPSO, 100% owned by NEK, which will perform the functions of Transmission System Operator, Balancing Market Administrator and Operation and Maintenance of the Transmission System, that will remain property of NEK -EAD. Following its restructuring NEK will perform the functions of Public Provider, Hydropower Generator and Electricity Trader.

The NEK unbundling model, so adopted, will be submitted for approval by the Minister of Economy and Energy in his capacity as sole owner of the capital and will be implemented following effectiveness of the amendments to the Energy Act.

Bulgaria is dependent on imports for 70% of its energy supplies. With virtually no supplies of oil and small reserves of gas, Bulgaria has had to pay for energy in hard currency at world market prices, resulting in less reliable supplies or price fluctuations.

The installed capacity of the Bulgarian power system in 2005 was 12.016 MW. A historical summary of installed electricity generating capacity in the Bulgarian EPS is shown in the following table.

Installed Electricity Generation Capacity								
	Unit	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Hydroelectric	MW	2.839	2.839	2.839	2.839	2.838	2.838	2.878
Nuclear	MW	3.760	3.760	3.760	3.760	2.880	2.880	2.880
Geothermal/Solar/Wind/Biomass	MW	0	0	0	0	0	83	95
Conventional thermal	MW	6.487	6.477	6.412	6.477	6.613	6.613	6.258

Total Capacity Installed	MW	**13.086**	**13.076**	**13.011**	**13.076**	**12.331**	**12.331**	**12.016**

Source: MEE and NEK

Table 1: Installed Capacities 1999-2005

An historical summary of Bulgarian electricity net generation and net consumption is shown in the following table.

Bulgarian Electricity Generation and Consumption								
	Unit	1999	2000	2001	2002	2003	2004	2005
Net Generation	**GWh**	**34.298**	**36.887**	**39.618**	**38.595**	**38.428**	**37.598**	**40.555**
hydroelectric	GWh	2.934	2.881	2.021	2.708	3.276	3.246	4.571
nuclear	GWh	14.529	18.449	18.237	18.949	16.040	15.596	17.347
geo/solar/wind/biomas s	GWh	0	0	0	0	0	73	159,2
conventional thermal	GWh	16.835	15.557	19.360	16.938	19.112	18.756	18.637
Net Consumption*	**GWh**	**25.522**	**25.486**	**25.800**	**25.312**	**26.430**	**26.359**	**31.491**
Imports	GWh	1.670	964	1.092	2.040	1.283	741	0
Exports	GWh	3.627	5.584	8.017	8.335	6.772	6.620	7.642
Net Exports	GWh	1.957	4.620	6.925	6.295	5.489	5.879	7.642

Source: NEK

*Final consumption in the country

Table 2: Electricity Generation and Consumption

Over the past 7 years, the Bulgarian electricity net generation has no uniform tends and its varied, with a peak in 2005. In accordance with the Bulgarian government.s commitments to the European Union and as confirmed by a decision of the Bulgarian Council of Ministers, Units No.1 and No.2 of Kozloduy NPP were disconnected from the Bulgarian EPS at the end of 2002. As a result the net generation from nuclear sources decreased in 2003. 2006 is the last year of operation also to Units No.3 and Units No.4 of Kozloduy NPP which must be shut down according to next commitment with EC.

Bulgaria is a major exporter of electricity, supplying power to Turkey, Greece, Yugoslavia, Macedonia, and Albania. In 2005 Bulgaria exported about 7.642 GWh and without import of electricity at all.

2. Current status of the Bulgarian Electricity Sector

1) Generating Capacities

In 2005, the Bulgarian EPS had a total of 12.012 MW installed generating capacities. 4740 MW of the thermal power plants are public utilities, 880 MW are co-generation plants which have the main purpose of supplying district heating, and 993 MW are co-generation plants belonging to large industrial enterprises. Thermal power plants (53.4%) and nuclear generation (28.0%) dominated the available generation capacities. Installed and available capacities for 2004 and 2005 are shown in the following table.

	Installed Capacities 2004		Available Capacities 2004		Installed Capacities 2005		Available Capacities 2005	
Category	**MW**	%	**MW**	%	**MW**	%	**MW**	%
Thermal Power Plants	6613	53,6%	5015	52,7%	6258	52.1%	5155	53.4%
Nuclear Power Plants	2880	23,4%	2700	28,4%	2880	24.0%	2700	28.0%
HPPs and PSHPPs	2838	23,0%	1800	18,9%	2874	23.9%	1800	18.6%
Total	**12331**	**100%**	**9515**	**100%**	**12012**	**100%**	**9655**	**100%**

Source: NEK

Table 3: Installed and Available Generation Capacities in 2004 and in 2005

The **available capacity** of the existing power generating resources, however, is considerably lower than their installed capacity and amounts to about 9655 MW. This difference compared to the installed capacity is mainly caused by the following factors:

- Due to economic reasons, district heating plants do not operate at their total installed capacity 590MW, but only at the level corresponding to the heat load in combined electricity and heat generation, which amounts to **about 330 MW.**
- After privatization, the existing industrial co-generation plants considerably decreased their available capacity due to closure of companies and decrease of the heat load. Thus, out of 1088MW installed capacity in the large industrial plants, currently their available capacity about 650MW.
- HPP and PSHPP together participate in covering the maximum load in the system during a moderately humid year with **1800 MW** total capacity.
- Part of the installed capacity of the existing thermal power plants cannot be reached due to wear of their facilities. Thus, of 4175MW of installed capacity in large thermal power plants, the available capacity is **about 3808MW** (or 8,8% less).

The age structure of thermal power plants and nuclear units shown in the table below is very similar to that of other European countries and demonstrates the need for rehabilitation. Investments in rehabilitation will also take place in the Bulgarian energy sector in the coming years.

Age Structure of Power Plants						
	over 35 yrs.	31-35 yrs.	26-30 yrs.	21-25 yrs.	16-20 yrs.	below 15 yrs.
TPPs	24,8%	17,4%	12,7%	25,5%	10,9%	8,7%
District heating TPPs	59,0%	0,7%	19,2%	6,0%	15,2%	0,0%
Industrial TPPs	41,2%	33,0%	1,0%	12,4%	5,0%	7,4%
NPPs	0,0%	0,0%	0,0%	30,6%	34,7%	34,7%

Table 4: Age Structure of Bulgarian Power Plants

2) Transmission Infrastructure

Bulgaria's high-voltage power transmission network consists of transmission lines of 750 kilovolt (kV), 400 kV, 220 kV, and 110 kV; step-down substations; one 400 kV switching station; and medium and low voltage distribution networks that supply the industrial, public and residential customers. The system of 400, 220 and 110 kV lines, which has a total length of about 14.427 km, operates in a ring mode. The 750 kV-line runs along a total distance of 235.4 km from Varna in Bulgaria to Isaccea in Romania (85 km on Bulgarian territory), and it is operated at 400 kV.

An overview of Bulgaria's high-voltage electricity grid system is shown in Figure A.

BULGARIAN ENERGY SYSTEM

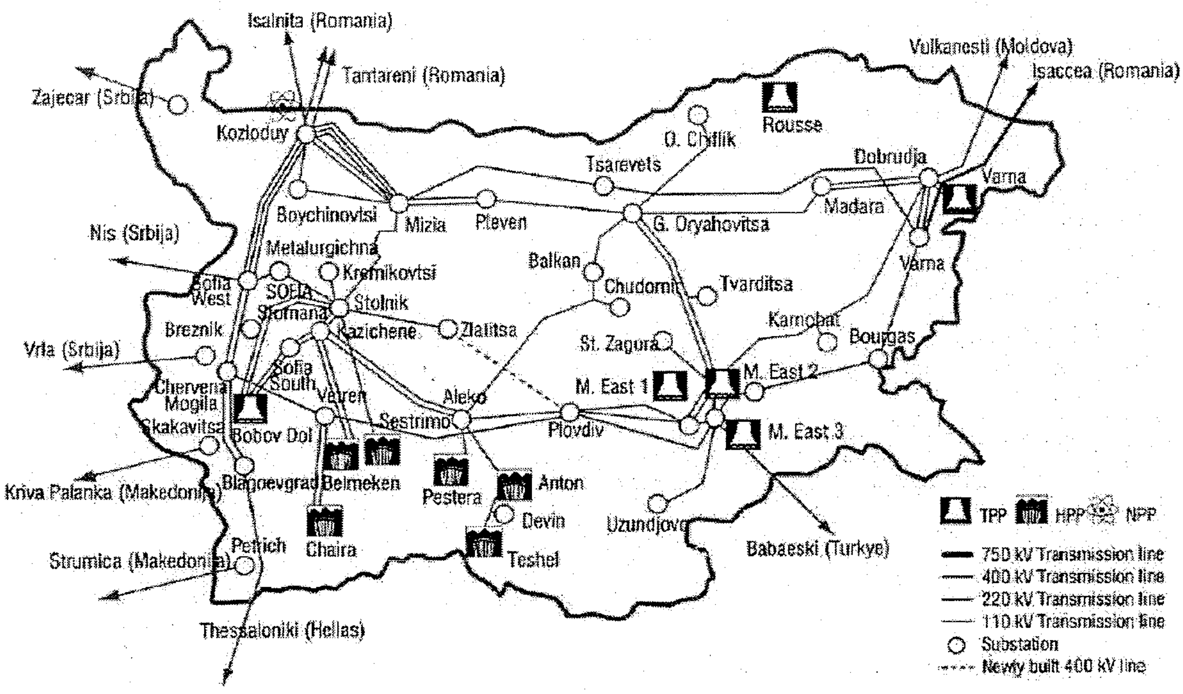

Figure A: Bulgarian High-Voltage Electricity Transmission System

II. Bulgarian Electricity Demand Forecast

1. Background

The latest Least Cost Development Plan of the Bulgarian power sector for the period 2004-2020 was published in December 2005, and it is used as a reference in this PDD. It reflects the latest forecast macro-economic data for the Republic of Bulgaria, developed by the Economic Analyses and Forecasts Agency (EAFA) in 2005, as well as the considerable changes that have occurred in the structure of the electricity sector in the recent years. The plan is based on the national priorities and principles of market integration. It implies the requirements for a stable economic growth and adequate way of living under the expected conditions of national economy growth.

The Bulgarian forecast of generation requirements for the power system is prepared by NEK. A number of scenarios have been worked out for the electricity sector development in the country until 2020. All scenarios are developed by taking into account the same energy fuel price forecast. Out of these scenarios, 2 scenarios have been identified as most likely to represent the future development of electricity demand in Bulgaria. These scenarios have been named "Minimum - Stagnation Scenario" and "Maximum - Prosperity Scenario" and are described in the following chapter.

2. Minimum and Maximum Scenarios

NEK's forecasts involve the so-called "maximum" and "minimum" scenarios. The main difference is the assumptions on the rate of improvement of energy efficiency that the Bulgarian economy would achieve over time and on the rate of future development of renewables.

3. Macro-economic Determinants

The forecasts of electricity demand in the country directly and indirectly imply the macroeconomic growth forecast for Bulgaria. The most frequently investigated macro-economic indicators influencing electricity demands are:

- Gross Domestic Product (GDP) and its structure;
- Development of the GDP structure by major branches: industry, agriculture and services;
- Inflation rate;
- Population;
- Electric power price;
- Per capita income by current and comparable prices;

The envisaged rates of GDP growth in the period under consideration are as follows:

GDP 2000 - 2020

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Rate of GDP Growth %	5.0	3.5	5.0	4.2	5.3	5.6	5.5	6.0	6.2	5.8	5.3	5.7	5.6	5.6	5.5	5.4	4.9	4.9	4.4	4.3	3.8

Source: EAFA

Table 5: GDP 2000–2020

4. Electricity Power Demand

The total electricity power demand forecast for Bulgaria consists of the following forecasts:

1.) Public sector demand;

2.) Household sector demand;

3.) Auxiliary consumption of power plants;

4.) Transmission and distribution losses;

5.) Electric power export

1.) Public sector demand

For the public sector electricity demand forecast, the macro-economic development data for Bulgaria as well as forecasts of electricity intensity by sectors of the economy (Industry, Services, and Agriculture and Forestry) are used.

All assessments made by local and foreign macro-economists show that the GDP electricity intensity in Bulgaria is several times higher compared to West European countries. So, a policy that improves this factor will be a major priority in the economic development in the forthcoming years.

The following table shows a forecast of electricity intensity for electric power consumed in the public sector with respect to the GDP.

Electricity Intensity per GDP			
Phases	Minimum Scenario	Maximum Scenario	EU 15
	toe/EUR1000	toe/EUR1000	toe/EUR1000
2000	0.617	0.617	0.112
2005	0.568	0.568	0.106
2010	0.450	0.462	0.99
2015	0.384	0.407	0.92
2020	0.345	0.376	0.85
2025	0.313	0.344	0.79
2005–2025	-2.9%	-2.5%	-1.5%

Source: NEK

Table 6: Electricity Intensity 2002 - 2020

2.) Household sector demand

For the household sector electricity demand forecast, the input data are: population forecast, household income forecast, electricity price forecast, and the forecast of electric power saving in the households.

In order to forecast the electricity demand of the households, the following function is applied:

$E = \alpha + \beta I + \gamma P + \delta N$, with a multiple correlation factor $R = 0.9987$.

Where as:

E: average household electricity demand;

I: average household income;

P: average household electricity price;

N: number of households.

The sum of the public sector and household sector electricity demand forecasts forms the end-consumer electricity demand forecast.

3.) Transmission and distribution losses

In the next step, a forecast of auxiliary consumption by power plants as well as the transmission and distribution losses is made. For this purpose, the period 1990–2005 was analysed and it was found that electric power consumption for the auxiliary load of power plants will be 9.6–9.9% of the gross electricity production. Furthermore, the transmission and distribution losses were found to be very high, reaching 18% of distributable electric power. The decrease of process losses in the future is one of the main methods of reducing electricity intensiveness in Bulgaria.

4.) Electric power exports

The final element in the electricity demand forecast is the export of electricity. In the Least Cost Development Plan, an annual export of 5000 GWh is assumed until the end of 2006. At the end of 2006, two units in the Kozloduy NPP will be decommissioned in order to comply with EU recommendations. Hence, it is assumed that 1500 GWh of electricity will be exported annually after 2006.

5. Gross electricity power demand forecast

The Gross Electricity Power Demand Forecast for the country is equal to the sum of forecasts for final electricity consumption in the public sector and in the households plus the forecasts for auxiliaries of the power plants and T&D losses.

The following table shows the electricity demand forecast in GWh/yr:

Year	2000	2005	2010	2015	2020	2025	2005–2025
Minimum scenario Annualy Growth, %	36.307	36.610 0.17%	40.711 1.88%	50.970 5.04%	54.320 1.31%	58.850 4.16%	3.04%
Maximum scenario Annualy Growth, %	36.307	36.610 0.17%	42.338 2.14%	52.710 4.90%	58.310 2.12%	64.720 2.20%	3.84%

Source: NEK

Table: 7 Bulgarian Gross Power Electricity Demand Forecast

These analyses demonstrate the increasing trend of electricity power demand in Bulgaria, except for a decrease after the year 2006 due to the decommissioning of Kozloduy NPP. Furthermore, the assumptions lead to different electricity power demands in the different scenarios.

The Minimum scenario reports an electricity demand of 36.610GWh in 2005 and 58.850 GWh in 2025,which means an increase of about 60.0%. During the same period, the Maximum scenario shows an increase of the electricity demand from 36.610GWh to 64.720 GWh (76,8%).

6. Decision on the Baseline scenario

The analysis of the future electricity demand shows that there is quite a difference in the additional electricity consumption in the 2 scenarios. While in the Minimum scenario there will be an increase in demand of about 22.543 GWh between 2000 and 2025, the increase demand will be about 28.413 GWh in the Maximum scenario for the same time period.

This difference between the 2 scenarios will of course have an influence on the marginal load and most probably also on the Least Cost Development Plan. So a decision has to be made as to which scenario will be used for the further analyses.

The demand increase in the Minimum scenario between 2000 and 2025 is about 62.0%, whereas in the Maximum scenario the demand increase in this time period is estimated to be 78.25%, thus requiring more electric capacity.

Power plants currently on the margin are mainly coal-fired power plants with rather low efficiencies. When demand is increased, the following developments are possible:

- Existing plants will have a higher load factor, which increases overall efficiency of the plants and therefore also decreases the specific CO_2 emission factor per MWh.
- New plants will be built to cover additional demand. Options for new plants will mainly include coal-and gas-fired units, which have lower specific CO_2 emission factors than the existing coal fired power plants.

These potential developments show the tendency that a higher demand will lead to lower specific CO_2 emission factors for the marginal plants. In order to be conservative in the assumptions in this baseline scenario, the Maximum prosperity scenario is taken as a basis for the further calculations.

III. Development prospects of generating capacity extension

1. Decommissioning of capacities

The integration of Bulgaria into the European Union is a high priority in the program of the Bulgarian government. A key issue in Bulgaria.s accession to the EU is the requirement for the early closure of Kozloduy units No.3 and No.4. Based on the negotiations between Bulgaria and the EU, the decommissioning of Kozloduy units No.3 and No.4 (commissioned in 1980 and 1982, respectively) are expected by the end of 2006.

Due to the expiry of the service life of some facilities and the restrictions posed by the Directive 2001/80/EC that sets Permission Emission Standards, the following TPP generating capacities will be decommissioned:

- Maritsa 3 TPP - in the end of 2015,
- Brikel TPP - in the end of 2011.

2. Commissioning of capacities

The period 2007–2010 is crucial to the Bulgarian EPS, especially if Kozloduy units 3 and 4 are decommissioned before a new nuclear unit is commissioned. About 1700 MW of new capacities will be constructed during this time, and the Least-Cost Development Plan 2004–2020 includes the commissioning of the following projects:

- New TPP burning indigenous lignites - 600 MW, 2009/2010
- Tsankov Kamak HPP - 80 MW, 2009
- Rousse East TPP Unit 3 - 110 MW, 2006/2007
- CCGT in DHSs Zemliane and Lulin - each of 65 MW, 2009
- CCGT in DHS Sofia - 100 MW, 2008
- Belene NPP - 1000MW, 2013/2014.

Furthermore, following measures are listed in the Least-Cost Plan for preserving the level of electricity supply security and creating new generating capacities:

- Increased share of electricity output from renewable energy sources;
- Rehabilitation of TPPs that will continue to operate after 2010;
- Preservation of the share of nuclear energy in the overall energy balance through construction of new nuclear capacities;
- Increased share of co-generation plants;
- Reduction of transmission and distribution losses;
- Gasification of households to replace consumption of electric power, fuel oil and coal for heating by natural gas.

3. Rehabilitation

Instead of constructing new capacities, rehabilitation of existing power plants is one way to provide electric capacity for the future. The rehabilitation of large TPPs in Bulgaria should fulfill the following general requirements:

- Facilities and machines operational life extension by at least 15 years.
- Energy cycle efficiency improvement.
- Increase of the energy units' gross electric power.
- Increase of the availability and the manoeuvrability of the energy units.
- Meeting the technical requirements for the units operation within the UCTE Electric Power System.
- Meeting of all legislative requirements for environmental safety and operation of the energy capacities.

The TPP rehabilitation projects differ by scope and envisaged refurbishment and take into account the condition and the operational life of the machines and the equipment in the different power plants. The following table gives an overview on the rehabilitation program in the Bulgarian electricity sector.

Electricity Sector Rehabilitation Program				
			Available Capacity	**Available Capacity**
Rehabilitation Program	**Fuel**	**Period**	**existing**	**new**
			MW	**MW**
TPP Varna	steam coal	2009–2014	1200	1260
TPP Maritsa Iztok #2 part 150 MW	lignite	2006–2008	540	610
TPP Maritsa Iztok #2 part 200 MW	lignite	2008–2010	800	840
TPP Maritsa Iztok #3	lignite	2004–2008	800	840
TPP Bobov dol	brown coal	2009–2011	555	615
TPP Rousse (condensate plant)	steam coal	2007–2008	100	200
TPP Rousse (cogeneration plant)	steam coal	2008–2011	60	75
PSHPP Chaira	hydro	2007–2009	420	630

Source: NEK

Table 9: Rehabilitation Program -Baseline Scenario

IV. Baseline Scenarios (Least Cost Development Plan)

1. Introduction to the Baseline Scenario

The most important part of the preparation for a greenhouse gas reduction project is determination of the Baseline Scenarios. 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 consider uncertainty. 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 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 favored. 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, and the preferences of Carbon Credit buyers, respective the parties to the Contract, the Baseline author's experience, etc.

2. 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 scenario 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. Because 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.

c) 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 scenario.

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 using 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 scenario 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.

3. 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 overall capacity exceeding 15MWe, 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 with 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 base load 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 hydropower (about 50%) is large within the power system of Bulgaria.

2.) Mean specific emissions less Nuclear, Pumped-Storage and Hydropower 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 Hydropower Plant and the four large existing hydro-power cascades with hydro-power plants built downstream of the dams 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 hydropower 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 using the weighted mean between the operating margin and building 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.

V. Baseline Determination and Computation of the Baseline Emission Factor (BEF)

1.) Mean specific emissions (all plants included)

The scenario enables determination of the mean specific emissions and the corresponding BEF 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 BEF and, respectively, reduction of CO_2

emissions in a Joint-Implementation Project, because the operation of nuclear power plants and, are not influenced by the implementation of such projects.

2.) Mean Specific Emissions (less NPP and HPP)

The scenario calculates and determines the mean specific emissions and the corresponding BEF 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 Hydropower Cascades 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 hydropower capacities of the system (HPP or gas-fired combined-cycle power plant over 15 MW).

3.) Mean Specific Emissions for Each Load Category

This approach is not considered in detail because it requires BEF 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.

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.

5.) Operating 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.

VI. Selection of Baseline Scenario 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 IRP Model provides and coordinates an extended "Tool Box" of included resource planning opportunities including chronological demand and source simulation, computer-aided development of resource strategies, decision analysis and complete impact forecasts from all angles.

VII. Baseline Scenarios

1. Electricity supply in the Baseline scenario

When combining electricity demand, current structure of electricity supply and options for capacity extension/rehabilitation, the IRP Manager Model delivers as an output the Least-Cost Development Plan for the Bulgarian electricity system.

The following list summarizes the main assumptions for the Least-Cost Development Plan:

Electricity demand of the country: will increase from 44.259GWh in 2005 to about 47.303GWh (+6,8% growth) at minimum demand forecast and 51.398GWh (+16,1% growth) at maximum demand forecast in 2012.

Decommissioning:

- Units No. 3 & 4 of Kozloduy NPP by end of 2006;
- TPP Brikel by the end of 2011;
- TPP Maritsa 3 by the end of 2015;
- In Bobov Dol TPP, one coal-fired unit will be stopped for refurbishment in 2008, a second one in 2011, and a third one in 2014.

Commissioning:

- o HP Cascade Dolna Arda, 170MW, in 2009/2010;
- o New TPP burning indigenous lignites, 670MW, in 2010/2011;
- o Expansion of cogeneration combined cycle power plants, 130MW, in 2008/2009;
- o New NPP Belene, 2000 MW, in 2013/2014.

Rehabilitation:

- TPP Varna
- TPP Maritsa Iztok #2 part (150MW)
- TPP Maritsa Iztok #2 part (210MW)
- TPP Maritsa Iztok #3
- TPP Rousse
- The power generation of the Pumped Storage Hydro Power Plant Chaira will increase due to the Yadenitsa reservoir project, which foresees the construction of an additional lower compensation basin by 2010.

The computations of the IRP Manager Model report the following generations per power plant in the year 2006 to 2012 are shown in file: < Baseline Study Bulgarian Pool 210906 final.xls >. The calculations are detailed in a spreadsheet attached in Annex No 2. The Excel spreadsheet shows the available capacities, generation, heat rates, carbon contents and the emission factors on an annual basis. The gross heat rate and net calorific values are based on average figures for the years 2000-2005.

The Bulgarian Least-Cost Development Plan reports the following new power plants in the period 2006 to 2012.

Electricity Sector			
New Capacities 2005–2012	**Fuel**	**Year of Commissioning**	**Capacit y MW**
Expansion of cogeneration CCPPs	nat. gas	2008–2009	130
New TPP burning indigenous lignite	lignite	2009–2009	670
New NPP	nuclear	2013–2014	2.000
HPP Tsankov Kamak	hydro	2009	80
Total			**2.880**

Table 10: Commissioning of New Capacities 2006–2014

2. CO_2 emissions in the Baseline scenario

The CO_2 emissions in the Baseline scenario per plant and year for the time span 2006-2012 are shown in the file: < Baseline Study Bulgarian Pool 250806 ver_final.xls >. Total baseline emissions are calculated by multiplying the annual plant specific power generation with corresponding specific emission factors. In the period 2008 to 2012, total baseline CO_2 emissions caused by the Bulgarian electricity sector are between 136.370 to 144.177 kilotons CO_2. The CO_2 emission reductions in commitment period are due to the commissioning of a 500MW renewable in 2008/2012.

3. Determination of Baseline Emission Factor (BEF) according to Baseline Scenario

The forecast power balances obtained by merit order dispatching are used to develop the Baseline scenario. The scenario itself was developed using the ACM0002 Methodology, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 06, sectoral scope 01, 19th May, 2006, of UNFCCC CDM - Executive Board.

The Power Plants are classified in 4 main categories according to there merit order and operating costs computed by IRP Model:

- Operating Margin Power Plants;
- Build Margin Power Plants:
  1.) Most recent Power Units and Plants;
  2.) Future Build Margin Power Plants.
- Least Cost Power Plants;
- Must-run Power Plants.

The output datasets computed by IRP Model incorporated in Baseline Minimum and Maximum Scenarios are use as input data for modeling of the relevant Operation Margin Emission Factor (OM_EF) in the applied determination methodology. OM_EF is determined in 3 methods:

- **Simple OM_EF** - is the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants;

- **Simple Adjusted OM_EF** - is a variation on the previous method, where the relevant power sources (including imports) include a fraction (λ) of least-cost and must-run power plants. For determination of (λ) is plotted the load duration curve for certain year and with a horizontal line across load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from least-cost and must-run power plant generation. The intersection of the horizontal line plotted and the load duration curve plotted gave the number of hours (out of the total of 8760 hours) to the right of the intersection. This is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, it may conclude that low-cost/must-run sources do not appear on the margin and (λ) is equal to zero. Lambda (λ) is the calculated number of hours divided by 8760.
- **Average OM_EF** - is the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including Build Margin Power Plants.

The determination of **Build Margin emission factor** (BM_EF) as the generation-weighted average emission factor of a sample of power plants, consists of either the 5 most recent, or the most recent 20% of power plants built or under construction, whichever group average annual generation is greater (in MWh);

In order that the scenario can be as complete as possible, all methods offered in determination of operation margin methodology are applied. In accordance with ACM 00002 for determination of compound Baseline Emission Factor the relation between Operation Margin and Build Margin is assumed as 50/50 % for hydropower subprojects and 75/25% for wind power subporjects.

The findings for BEF are given in the following Table 11. For further determination of Project Scenario will be use the most conservative BEF which is received of Baseline Maximum Scenario when Simple Adjusted Method is implemented.

		Unit	2000	2001	2002	2003	2004	2005	
1.	Total system power generation	GWh	41 805	44 785	41 943	41 990	43 621	44 259	
2.	Total system heat generation	$MW_{th}h$	14 398 244	17 092 947	17 104 183	18 945 487	15 622 107	17 793 681	
3.	Total CO2 emission of power generation	kt/a	20 686,07	24 186,09	21 130,37	23 502,96	26 141,93	22 772,84	
4.	Total CO2 emission of energy transformation	kt/a	25 364,83	29 868,93	27 206,40	29 968,99	31 566,24	29 112,31	
	Baseline Emission Factor – BEF								
	Hydropower Projects								
1.	Dispatch Data_OM_EF	tCO2/MWh	1,215	1,287	1,214	1,226	1,199	1,133	
2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1,159	1,222	1,150	1,160	1,138	1,055	
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1,269	1,307	1,231	1,237	1,239	1,003	
	Windpower and Solarpower Projects								
1.	Dispatch Data_OM_EF	tCO2/MWh	1,144	1,184	1,106	1,160	1,165	1,186	

2.	Dispatch Data Adjusted_OM_EF	tCO2/MWh	1,065	1,106	1,032	1,067	1,078	1,069	
3.	Average Dispatch Data_OM_EF	tCO2/MWh	1,101	1,149	1,040	1,073	1,108	0,991	
	Windpower and Solarpower Projects								
1.	Dispatch Data_OM_EF	kg/GJ	106,38	109,57	110,86	111,24	110,03	111,52	
2.	Dispatch Data Adjusted_OM_EF	kg/GJ	106,93	109,05	110,68	111,09	109,91	111,41	
3.	Average Dispatch Data_OM_EF	kg/GJ	109,43	108,79	109,00	109,47	110,63	110,13	
	Forecast								
	Minimum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	40 045	36 771	37 516	39 364	42 717	45 946	47 303
2.	Total system heat generation	$MW_{th}h$	18 563 095	18 057 503	18 320 175	18 746 936	19 428 566	19 195 632	19 358 651
3.	Total CO2 emission of power generation	kt/a	21 216,91	22 848,06	23 292,43	24 632,51	27 104,06	30 039,61	31 301,85
4.	Total CO2 emission of energy transformation	kt/a	27 775,03	29 342,39	29 879,38	31 248,56	34 081,16	36 520,92	37 811,49
	Baseline Emission Factor - BEF								
	Hydropower Projects								
1.	Simple_OM_EF	tCO2/MWh	1,126	1,106	1,079	1,063	1,050	1,039	1,030
2.	Simple Adjusted_OM_EF	tCO2/MWh	1,037	1,006	0,968	0,944	0,938	0,929	0,922
3.	Average_OM_EF	tCO2/MWh	1,053	1,040	0,994	0,974	0,980	0,977	0,971
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	tCO2/MWh	1,177	1,167	1,149	1,139	1,114	1,102	1,097
2.	Simple Adjusted_OM_EF	tCO2/MWh	1,044	1,017	0,982	0,960	0,946	0,938	0,935
3.	Average_OM_EF	tCO2/MWh	1,067	1,068	1,021	1,005	1,009	1,010	1,009
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	kg/GJ	111,471	109,737	109,843	106,529	106,911	107,214	108,266
2.	Simple Adjusted_OM_EF	kg/GJ	110,759	108,619	108,841	105,459	106,221	106,363	107,424
3.	Average_OM_EF	kg/GJ	109,404	106,441	108,852	104,524	106,255	107,329	108,645
	Forecast								
	Maximum demand	Unit	2006	2007	2008	2009	2010	2011	2012
1.	Total system power generation	GWh	41 734	38 499	39 439	42124	45 338	48 703	51 398
2.	Total system heat generation	$MW_{th}h$	20 360 486	19 909 333	20 240 498	20 506 857	20 970 354	21 368 569	21 607 576
3.	Total CO2 emission of power generation	kt/a	21 066,58	23 655,19	24 152,02	25 431,35	28 987,29	31 873,18	33 733,14
4.	Total CO2 emission of energy transformation	kt/a	28 319,76	30 859,61	31 512,57	32 937,51	36 470,81	39 077,01	41 430,77
	Baseline Emission Factor - BEF								
	Hydropower Projects								
1.	Simple_OM_EF	tCO2/MWh	1,125	1,104	1,081	1,049	1,046	1,030	1,018
2.	Simple Adjusted_OM_EF	tCO2/MWh	1,034	0,998	0,963	0,937	0,936	0,925	0,919
3.	Average_OM_EF	tCO2/MWh	1,043	1,032	0,992	0,969	0,978	0,969	0,963
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	tCO2/MWh	1,172	1,158	1,145	1,126	1,104	1,088	1,072
2.	Simple Adjusted_OM_EF	tCO2/MWh	1,035	0,998	0,968	0,958	0,940	0,930	0,923

3.	Average_OM_EF	tCO2/MWh	1,050	1,050	1,012	1,006	1,002	0,996	0,989
	Windpower and Solarpower Projects								
1.	Simple_OM_EF	kg/GJ	110,719	112,284	109,872	106,424	106,647	106,583	106,529
2.	Simple Adjusted_OM_EF	kg/GJ	109,677	111,289	108,871	105,440	105,889	105,843	106,745
3.	Average_OM_EF	kg/GJ	108,893	111,013	109,137	104,794	106,284	106,629	108,380

Table 11: Baseline Emission Factor

Annex 3

MONITORING PLAN

1. Objective:

The objective of the present plan is to assure the complete, consistent, clear and accurate monitoring and calculation of the emission reductions within the boundary of Kaliakra Wind Power Project during the crediting period. As the project company established by MHI and INOS, Kaliakra Wind Power AD is responsible to conducting necessary monitoring in accordance with this monitoring plan.

2. Methodology:

For this Kaliakra Wind Power Project, monitoring parameters and methodology shall be as follows:

- Electricity generated by this Kaliakra Wind Power Project to be metered at the Kavarna substation of NEK that Kaliakra Wind Power Project connects the generated electricity.

3. Boundaries:

The boundaries of the project activity will remain constant during the crediting period as defined in B.3 described in PDD.

4. Equipment to be used:

The equipment to be used to meter the generated electricity is the electrometer connected to associated potential transformers and current transformers in accordance with Connection Agreement. The equipment is owned by NEK and is to be calibrated according to the regulation of NEK.

5. Installation Point of the Electrometer:

The commercial meter is installed in the Kavarna substation, which measures the electricity generated by Kaliakra Wind Power Project.

6. Personnel responsible:

- Operation and maintenance Manager is responsible to the electricity energy measurement,
- Administration Manager is responsible to invoicing to NEK based on the measurement data obtained by Operation and Maintenance Manager and is in charge of monitoring process at verification,
- General Manager is responsible to the monitoring plan. For generated electricity, he/she may undertake a review if it is judged so.

The personnel who carry out the monitoring function are the operators who are trained continuously according to the training program. New personnel have to follow up a training program and are formed in the specific skills required to carry out the Monitoring Plan.

7. **Operational and Management Structure:**

The monitoring of the GHG emission reduction will be done according to the operational and management structure shown below.

- The shift operators are to record the SCADA data and fill the daily generation report. This generation report shall be checked periodically and maintained by Operation and Maintenance Manager (O&M Manager).
- Administration Manager is to calculate annual GHG emission reduction based on the generation report mentioned above and the Baseline Carbon Emission factor of the Bulgarian Power Grid issued by MOEW annually.
- General Manager is responsible to review of the results of calculation. General Manager will develop the monitoring manual and the procedure for internal audit according to QA/QC manual.

SHIFT OPERATOR
• Record of hourly SCADA data • Fill in the generation daily record and reporting to O&M Manager

⇓

O&M MANAGER
• Measurement of annual electricity generation

⇓

ADMINISTRATION MANAGER
• Verification of the measurement • Calculation of the annual GHG emission reduction

⇓

GENERAL MANAGER
• Review and analysis of the results • Internal audit

8. **Measuring and calculation procedure**

(1) Measuring

The O&M Manager shall collect monthly generation data from daily generation report filled by shift operators. The generation data is reported in a spreadsheet for measuring and register. This data of monitoring month shall be prepared in the first week of the following month. The measuring of electricity generation shall be shown in the spreadsheet shown below:

KALIAKRA WIND POWER PROJECT	
Year:	
Month	Electricity generation (MWh)
January	
February	
March	
April	
May	
June	
July	
August	
September	
October	

November December	
TOTAL	

(2) Calculation of electricity generated and verification

Administration Manager is in charge of the monitoring process and shall verify the accuracy of the recorded generation data. For this purpose, Administration Manager shall make comparison of generation record with the commercial measurement published by NEK in the monthly Transaction Report in accordance with the Power Purchase Agreement (PPA). If there is any discrepancy between the two data, Administration Manager shall consult with O&M Manager to find the reason of this discrepancy and make collective action to maintain the accurate data for the monitoring. If the reason of discrepancy is a loss of electricity at the transmission or is not found, the commercial measurement published by NEK shall be used as generation data for monitoring and verification purpose.

(3) Calculation of emission reductions

Administration Manager shall calculate the emission reductions using the following formula:

The amount of baseline emissions *BE(t)* (identical to the emission reductions *ER(t)*) is expressed as the product of the supplied electricity to the grid by the project and the displaced grid emission factor.

$$ER(t) = BE(t) = GEN(t) * CEF$$

where

ER(t):	Emission reductions in a year *t* [tCO_2/yr];
BE(t):	Baseline emissions in a year *t* [tCO_2/yr];
GEN(t):	Electricity generated and supplied to the grid by the project in a year *t* [MWh/yr];
CEF:	CO_2 emission factor of the "marginal" power plants connected to the grid in 2005. 1.071 [tCO_2/MWh].

The data for *GEN(t)* is annual generation report as described in the above **8** (1).

9. Quality control and assurance procedures:

An internal audit procedure and a nonconformance and corrective / preventive action procedure will be developed by General Manager and will be followed by each personnel in charge of monitoring process, in order to reduce the remaining uncertainties of the emission reduction monitoring.

10. Monitoring of non-GHG factors:

The general manager of Kaliakra Wind Power AD will develop the environmental manual based on the conditions of the approved EIA, preliminary environmental management plan and other documents related to the environmental protection, based upon which the necessary monitoring of non-GHG factors shall be conducted by Kaliakra Wind Power AD.

The factors below are significant factors to be monitored.

(a) Noise level in resort village "Zelenka", Bulgarevo and onsite:
Continuous monitoring system is installed and reported electronically.

(b) Condition of ornitofauna on the territory of WF:
Annual assessment is undertaken by the expert.

Annex 4

Endorsement Letter by Bulgarian Government

REPUBLIC OF BULGARIA

MINISTRY OF ENVIRONMENT AND WATER

Turnessa Co.

Dragomir Karaneshev
Translation Agency

Translation from Bulgarian:

JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM / Version 01
Joint Implementation Supervisory Committee page 56

REPUBLIC OF BULGARIA
MINISTRY OF ENVIRONMENT AND WATER

Ref. No. 48-00-392
Sofia, Sep. 14, 2005

To: Mr. Mishio Ishibashi
Mitsubishi Heavy Industries
Business Park Sofia
Mladost 4, Bldg. 4, Office 402
1715 Sofia

Re: Issuance a Letter of Endorsement for JI Project Kaliakra Wind Farm

Dear Mr. Ishibashi,

As a reply to your request ref. no. 48-00-392/11.08.2005 for the issuance of a Letter of Endorsement for the PIN Kaliakra wind Farm Project, the Ministry of Environment and Water herewith informs you about its principle support for the development of the PIN under JI mechanism as indicated in the Letter of Endorsement attached herewith.

We would like to draw your attention on the following:

Our support is based on EIA Decision No.2-2(101) 2005 issued by the director of the Environmental Directorate – Varna and in consideration of decision No. 128 of the Minister of Environment and Water dated July 25, 2005. However, due to the claims filed by NGOs and the pending court dispute against the EIA Decision, there may be a risk for non-execution of the project in case of a court decision in favor of the claimant.

Турнеса Драгомир Каранешев София

H. Dimitar 151/D/127
BG - 1510 Sofia, Bulgaria
tel.: +359 896830461; fax: +359 2 8409003
e-mail: turnessa@mail.bg

-2-

The realization of the project under the JI mechanism in accordance with Art.6 of the Kyoto Protocol to the Frame Convention of the UN on the Climatic Change can be started only after carrying out of the established procedure for approval of the project.
Attachments: Letter of Endorsement

With Respect: sign (ill.)

Mrs. Nona Karadjova, Director of Strategy, European Integration and Cooperation Division.

I, the undersigned Reni Kirilova Georgieva, do hereby certify the correctness of this translation made by me from Bulgarian into English of the document attached hereto: ***Letter from the Ministry of Environment and Water of Republic of Bulgaria, ref. no. 48-00-392/14.09.2005.*** *The translation consists of 2 pages including this one.*

Translator:..................

ЕТ „Турнеса - Драгомир Каранешев" • София •

РЕПУБЛИКА БЪЛГАРИЯ

МИНИСТЕРСТВО НА ОКОЛНАТА СРЕДА И ВОДИТЕ

Изх. No.: 48-00-392
София, 14.09. 2005 г.

ДО
Г-Н МИКИО ИШИБАШИ
МИЦУБИШИ ХЕВИ ИНДЪСТРИЗ
Бизнес парк София
ж.к. Младост 4, сграда No 4, офис 402
1715, София

ОТНОСНО: Издаване на Писмо за подкрепа на проект за съвместно изпълнение "Вятърна електроцентрала Калиакра"

УВАЖАЕМИ ГОСПОДИН ИШИБАШИ,

В отговор на Ваша молба, внесена с писмо № 48-00-392/11.08.2005 г. за издаване на Писмо за подкрепа на проектна идея "Вятърна електроцентрала Калиакра", Министерство на околната среда и водите Ви информира, че изразява своята принципна подкрепа за развитие на проектната идея по механизма "съвместно изпълнение" в приложеното Писмо за подкрепа.

Бихме искали да Ви обърнем внимание на следното:

Изразената подкрепа е на основата на Решение по ОВОС № 2-2(101) 2005 г., издадено от Директора на РИОСВ – гр. Варна и предвид Решение № 128 на министъра на околната среда и водите от 25 юли 2005 г., но предвид наличието на жалби от неправителствени организации и оспорване в съда на издаденото Решение по ОВОС това може да представлява **риск за нереализиране на проекта в случай на съдебно решение в полза на жалбоподателя.**

Към реализация на проекта по механизма "съвместно изпълнение", съгласно член 6 на Протокола от Киото към Рамковата конвенция на ОН по изменение на климата, може да се пристъпи само след провеждане на установената процедура за одобрение на проекта.

Приложения: Писмо за подкрепа

С уважение,

Директор "Стратегия, европейска интеграция и международно сътрудничество":

(Нона Караджова)

София 1000, ул "Уилям Гладстон" 67 тел. 940 61 01; факс 981 66 10

REPUBLIC OF BULGARIA

MINISTRY OF ENVIRONMENT AND WATER

Letter of Endorsement

Undersigned, as a legal and authorized representative of the Republic of Bulgaria,

Acknowledging that the Republic of Bulgaria has ratified the United Nations Framework Convention on Climate Change in 1995

Taking into consideration that the Republic of Bulgaria has ratified the Kyoto Protocol in 2002

Referring to:

Proposal number / Date	**48-00-392/11.08.2005**
Name of the project	**Kaliakra Wind Power Project**
Located in	**Municipality of Kavarna**
Name of the company proposing the project / Supplier Company Name	**Mitsubishi Heavy Industries, Ltd.**

hereafter to be referred to as "the JI project" and as the 'Supplier',

Hereafter to be referred to as "the JI project",

declares that:

1. The Republic of Bulgaria is a Party to the Kyoto Protocol.
2. In order to participate in activities under Article 6 of the Kyoto Protocol the Republic of Bulgaria is aware that it should comply with the eligibility requirements as stated in the Marrakech Accords.
3. The Republic of Bulgaria has taken notice of the JI project and is aware that Supplier intends to sell ensuing Claims on ERUs. It should be noted that the transfer of ERUs is only possible to a country that has a *Memorandum of Understanding on co-operation under Article 6 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change* that has entered into force.

4. The Republic of Bulgaria:

  - Will assess the JI project against the Bulgarian criteria for Joint Implementation projects;
  - Acknowledges the fact that the JI Project will already be operational prior to 2008 and will reduce GHG emissions in that period. The Republic of Bulgaria will consider transferring Assigned Amount Units (AAUs) through the Emissions Trading mechanism of Article 17 of the Kyoto Protocol to the carbon buyer identified by the Supplier. This may be through the Green Investment Scheme in Bulgaria after its establishment, , using the same method of verification as is used for the verification of ERUs;
  - Endorses the further development of the JI project in accordance with Article 6 of the Kyoto protocol and is committing itself to render such assistance as may be necessary in the future validation, verification and transfer of the ERUs.

  Remark: At the time of the issuance of the current letter some uncertainties have arisen related to the Environmental Impact Assessment. Those uncertainties are described into details in the cover letter and have to be taken into account in the further development of the project.

5. In case the results from the assessment and discussion, as mentioned above, are positive, the Republic of Bulgaria will consider granting a Letter of Approval for the JI project.

Signed for the Host Country
Republic of Bulgaria

National Focal Point for UNFCCC

(Daniela Stoycheva)

Date: September, 2005
Sofia, Bulgaria

- - - - -

Annex 5

EIA Decision

REPUBLIC OF BULGARIA

MINISTRY OF ENVIRONMENT AND WATER

Regional Inspection of Environment and Water - Varna

MINISTRY OF ENVIRONMENT AND WATER

Regional Inspection on Environment and Water – Varna

Ref. No. 2573 / 23.06.2005

DECISION ON ENVIRONMENTAL IMPACT ASSESSMENT No. 2-2 (101) 2005

On the grounds of art. 99, item 2 of the Environmental Protection Act and art. 19, item 1 of the Regulation on the terms and order for carrying out EIA of investment proposals for construction, activities and technologies,

I APPROVE

the realization of the investment proposal Kaliakra Wind Farm in land plots No.000386, 000387 and 000388 in the area of the village of Bulgarevo, Municipality of Kavarna,

with Investor Inos-1 Ltd. – town of Sofia,

based on the following REASONS:

1. The EIA report has reviewed the existing state of environment and all expected impacts from the construction and operation of the wind farm have been assessed. The conclusion of the EIA experts is that the realization of the investment proposal on the chosen site and the consequent operation would not lead to any significant and permanent negative impact upon the components of environment under the condition that the measures, which are included in the Plan for avoiding, reducing or liquidating of the significant negative impact upon environment in the report, are strictly observed;

2. During the EIA preparation process consultations with the interested parties were carried out. Public access to the EIA report was provided and also a public hearing was held. The statement of opinion of the investor under the results of the public hearing is that the recommendations, proposals and concerns (mainly about the flora and fauna) regarding the realization of the site, have been included in the EIA report;

3. A monitoring was carried out at the site of the autumn (2004) and spring (2005) migration of the birds. The results of the autumn migration were used in the EIA report for quantitative assessment of the risk for the birds during the operation of the wind farm;

4. The radar system, which is foreseen in the investment proposal for early (preventative) warning and location of migrating birds through or in proximity of the site, will prevent the collision with the turbines by stopping their operation for the time while the flock is passing;

5. The investment proposal foresees the production of electric power from renewable sources (wind force) and is in compliance with the energy strategy of Republic of Bulgaria and with the signed Kyoto Protocol for the reduction of the harmful impact of greenhouse gas emissions;

6. With a decision dated 17.06.2005 the Expert Council at RIOS-Varna proposed the approval of the realization of the investment proposal;

and under the following CONDITIONS:

General:

1. To execute the measures for mitigation of negative impact upon environment, which are included in the Plan for execution of the measures under section 7 of the EIA report (Attachment No. 1 to this decision);

Before Design:

2. The location of the wind generators and the other facilities in the site and the roads, which fall within the concession area for gas exploration, to be coordinated with the concessionaire Research and Exploration of Oil and Gas JSC, Sofia;

3. To clarify the construction conditions at the site with detailed engineering-geological survey;

Design:

4. The endmost turbines No. XVI, XVII and XVIII in the southeast part of the site to be located at a distance of atleast 100 m from the border of the buffer area of Kaliakra protected area and from the road Kaliakra – Bulgarevo;

5. The facilities to be designed in compliance with the Norms for design of buildings and facilities in earthquake areas;

6. A layer of humus to be foreseen to be put upon the concrete foundations of the wind generators, in order to recover the disturbed habitats and to secure their second settling with the respective plant and animal species;

7. The wind generators to be appropriately painted and signaled, the propellers to be covered with anti-reflexive paint, in order to reduce the visual impact upon people and the impact upon birds in conditions of low visibility and during night time;

8. The fencing of the site to allow accessibility of movement for reptiles, rodents and mammals;

9. To identify areas for temporary storing of the humus layers and the excavated land masses;

10. To prepare Plan for construction organization and execution, which is to include measures for limitation of the impact upon environment during construction;

11. To prepare a plan for own monitoring of the ornitho-fauna and the noise at the closest sites, which are subject of health protection, as well as monitoring of Kaliakra protected area. The plan and the methodologies shall be coordinated with RIOS-Varna before the putting of the site into operation;

12. An Emergency Plan to be prepared, which is to consider the impact upon the environment and the health of the people during natural calamities;

13. To prepare a Plan for Re-cultivation in accordance with the requirements of Regulation No.26/1996 for re-cultivation of disturbed areas, improvement of low fertility areas, extraction and utilization of the humus layer (the State Gazette, issue 89, amended and supplemented);

14. Before submission for approval under the order of the Territorial Arrangement Act, the investment project shall be coordinated with RIOS-Varna and RIOS-Dobrich regarding the observance of the conditions of this decision;

During Construction:

15. The construction debris and the land masses to be disposed of based on a contract with persons licensed for debris or having registration document under art. 12 of the Law on Waste Management. Copies of the signed contracts to be submitted to RIOS-Varna within 14 days after signing;

16. Construction debris under item 15 to be transported via specified routes and to be disposed at places determined by the Mayor of the Municipality of Kavarna in accordance with art. 18, item 2 of the Law on Waste Management;

17. The opening of the construction site to be informed in writing to RIOS-Varna within a period of 3 days after opening;

18. During the period from April 15 to June 25 no construction activities are allowed, including excavation work, using construction equipment, in order to avoid the reproduction period of the birds;

19. To execute measures for limitation of dust spreading, including sprinkling of the site and the roads in dry weather;

20. No trampling, polluting and destroying of soil and flora shall be allowed in the buffer area of Kaliakra protected area and in the other areas neighboring the investment proposal;

21. The construction works to be carried out in the light part of the day. The municipal authorities may consider the limitation of the construction works during the tourist period, regarding which the investor shall be notified in writing;

22. After completion of the construction works re-cultivation of the disturbed areas in the site to be carried out as per item 13 of this decision;

Before Putting the Site / Stages into Operation:

23. To make measurements of the levels of day and night noise at the borders of the village of Bulgarevo and vacation village Zelenka in the points closest to the site, in order to prove the compliance with Hygienic Norms No. 0-64 for allowable levels of noise in housing and public buildings and areas. The protocols with the results to be submitted to RIOS-Varna and RIOS-Dobrich;

24. In case of non-observance of the norms under item 23, to execute the respective measures for reducing of the noise and to make measurements once again. The results of the measurements with information about the fulfilled measures to be submitted to RIOS-Varna and RIOS-Dobrich;

25. To make measurements of the values of electromagnetic field under the most unfavorable regime of operation for the village of Bulgarevo and vacation village Zelenka (when the 2 radars are in operation), in order to prove the compliance with the allowable norms in accordance with Regulation No. 9/1991 of Ministry of Health and Ministry of Environment and Water (the State Gazette, issue 35, amended and supplemented);

26. To make a one-time measurement of the vibrations at the borders of the village of Bulgarevo and the planned vacation village Zelenka eliminating the car traffic and other sources of vibration, in order to prove the absence of vibrations in the investment proposal;

27. The protocols with the results under items 25 and 26 to be submitted to RIOS-Varna and RIOS-Dobrich;

28. The measurements under items No. 23, 24, 25 and 26 to be carried out under conditions of 72-hours samples under operation;

29. To file in an application form in RIOS-Varna for the issuance of a permission for activities with hazardous wastes (used oils, cooling liquids, etc.) under art. 37 of the Law on Waste Management, based on art. 7, item 1 of the same law;

During Operation and Decommissioning:

30. Within one month after putting of the site into operation to commence the carrying out of one-year ornithological monitoring at the site, in order to report the risk for the birds. The monthly results to be submitted to RIOS-Varna by the end of each month following the monitored month;

31. A report to be prepared on the final results under item 30 comparing the results with the autumn (2004) and spring (2005) base monitoring. The report with the conclusions to be submitted to RIOS-Varna within one month after completion of the monitoring.

32. To execute measures, which would guarantee the continuous work of the radar system and the stopping of the turbines while birds are flying through the site;

33. Up to 3 months before starting of decommissioning activities, a Plan for removal of the facilities after termination of operation to be submitted to RIOS-Varna.

On the grounds of art. 99, item 8 of the Environmental Protection Act, the decision for not started construction is valid for 3 years after the date of issuance.

Interested persons can claim against the decision under the order of the Administrative Proceedings Code within a period of 14 days after the announcement of the decision under art. 99, item 4 of the Environmental Protection Act.

In case of change of the investor, the new investor shall be announced to RIOS-Varna, in compliance with art. 99, item 7 of the Environmental Protection Act.

In case of finding out of non-fulfillment of the conditions contained in the EIA decision, the guilty persons shall bear responsibility under art. 166, item 2 of the Environmental Protection Act.

Date: 23.06.2005

Director: Teodora Karaivanova (Seal, Signature)

ATTACHMENT No. 1

PLAN FOR EXECUTION OF THE MEASURES FOR MITIGATION OF THE NEGATIVE IMPACT UPON THE COMPONENTS OF ENVIRONMENT DURING THE CONSTRUCTION AND OPERATION OF KALIAKRA WIND FARM IN THE AREA OF THE VILLAGE OF BULGAREVO

No	Measure	Term
1.	For minimization of the expected temporary unfavorable impact during the construction of the wind farm:	
1.1	Construction works to be carried out only in the light part of the day, in consideration of not allowing noise load above the norms in the areas of the village of Bulgarevo and vacation village Zelenka (in case it is built and put into operation before the wind farm).	The measure shall be carried out during the construction stage.
1.2	Excavation works to be coordinated with Research and Exploration of Oil and Gas JSC, in order to avoid eventual damages on the gas transmission facilities.	The recommendation shall be executed during the design preparation stage of the wind farm.
1.3	Technical re-cultivation of the land within the construction area to be carried out.	Re-cultivation shall be carried out up to 6 months after completion of the construction works.
1.4	In case possible, the construction-installation works to be carried out not during the reproduction period of the birds (May and the 1st half of June).	The measure shall be executed during the construction stage and a schedule of works, which are not related to noise impact above the norms, shall be prepared for this period.
1.5	The speed of the vehicles, which will be used during construction, to be limited up to 30 km/h, in consideration of reducing the danger of running over birds and animals.	The measure shall be executed during the construction stage.
2.	Measures for reduction of the visual impact of the wind turbines upon the people:	
2.1	In order to reduce the visual contrast of the wind turbines on the background of the sky, the latter are to be painted in gray nuances.	The recommendation shall be considered during placing the order for the equipment, or shall be realized during the construction works.
2.2	The blades of the propellers to be covered with anti-reflexive paint, in order to avoid reflection of the light.	The recommendation shall be considered during placing the order for the equipment, or

		shall be realized during the construction works.
3.	To execute the requirement for a minimum 1-year monitoring over the ornitho-fauna in the area of the wind farm.	A contract shall be signed for continuation of spring migration monitoring during summer period until the end of August 05. By the end of September 05 the report with monitoring results shall be submitted to RIOS-Varna.
4.	After the construction of the wind farm a monitoring on the level of noise to be carried out in the area of the village of Bulgarevo, vacation village Zelenka (after putting of the plant into operation) and the site (levels of noise in the various frequency bands and general level of noise under filter "A").	The monitoring shall be carried out after the construction of the plant.
5.	In case that the measurements show exceeding of the allowable limits of noise on the territory of vacation village Zelenka after its construction, a schedule of operation of the turbines to be implemented, that would secure the observance of the norms for areas of rest and during night time. The possibility of eventual switching off of the turbines No. I, II, VII and VII of quarter 2 (as per the site map) – fig. 7.1 can be considered as an example of this schedule, night time from 22:00 to 06:00 during the active tourist season – June, July and August.	The measure shall be executed during the period June – August. An additional investigation, modeling and measurements of the level of noise should be carried out, in order to determine how many and which turbines are to be switched off during night time.
6.	The requirements of Attachment No. 2 to art. 2, item 3 of Regulation No. 7 of the Ministry of Health on the hygienic norms for health protection of settlements and regulation No. 16 on the service areas of energy sites to be taken into consideration during the preparation of the project documentation for the construction of the respective grid and electricity distribution devices in the consequent design stages.	The recommendation shall be considered during the preparation for the design work.
7.	Control measurements of the electromagnetic field of the 2 radars after the installation of the system for early detection of birds – Deltatrack to be carried out at 3 points for each radar in the closest areas to the wind farm – at village of Bulgarevo and vacation village Zelenka, in compliance with art. 7 and art. 9, item 2 of Regulation No. 9 for maximum allowable electromagnetic field levels in settlements and for hygienic-protected areas around radiant objects.	The measurement shall be carried out after the construction of the plant.
8.	In order to determine the actual impact upon the ornitho-fauna by the wind farm after its putting into operation, an impact ornitho-fauna monitoring to be	The planning of the impact monitoring shall be carried out based on the results of the base

	carried out.	monitoring. The tasks under captioned monitoring shall be prepared as at the time of putting of the plant into operation.
9.	For decreasing of the negative impact upon the flora and fauna:	
9.1	Operating staff at the site to be acquainted with the species typical for the area, which have nature protection status, as well as with the necessity of their protection	Staff shall undergo respective instructions before employment at the site
9.2	Sign boards to be placed requiring more attention to the animal species in the area.	The sign boards shall be placed before putting of the plant into operation.
9.3	In case of a signal for a possible flying over of big flocks of birds through or in close proximity with the site of the wind farm by the radar system Deltatrack for early detection of birds, the staff of the plant to stop the turbines for the time while the flock is passing.	Before putting of the plant into operation instructions shall be prepared regarding action in case of big flocks of birds flying, with which operating staff shall be acquainted.
10.	A company Program for waste activities management to be prepared, in order to regulate the ways for collection, storing, preliminary treatment, transportation and final disinfection or utilization/recycling of all type of waste. The Program to foresee measures for avoiding the access of birds to the collected garbage.	The Program shall be prepared as at the time of receiving the construction permit.
11.	Contracts with firms, who have the respective licenses for activities under the order of the Law on limitation of the harmful impact of waste upon environment to be signed for the disposal of the various types of waste.	The contracts for disposal of the various types of waste shall be concluded before the receipt of the construction permit.
12.	In case of finding remains from architectural and historical monuments and/or separate objects of cultural heritage during the execution of the construction works, the construction activity to be temporarily stopped until consultations with the competent authorities of the Ministry of Culture regarding how to proceed with the construction so that to avoid damaging of the objects found.	The measure shall be executed during the construction stage.

The Investor of the investment proposal for the construction of Kaliakra Wind Farm in the area of the village of Bulgarevo, Municipality of Kavarna, is responsible for the execution of all measures above, in the person of the Manager of Inos-1 Ltd. G. Petkov