SAINT NIKOLA WIND FARM

Logo (optional)

Document Prepared By: Elysium Carbon Trade & Investment

Contact Information: http://www.elysium.co.il/

Project Title	Saint Nikola Wind Farm
Version	Version 5
Date of Issue	18-October-2014
Prepared By	Elysium Carbon Trade & Investment
Contact	Ofer Ben-Dov, 6 Galgalei Haplada st. P.O.Box 12522, Herzliya, 46733, Israel, TEL +97299579399. ofer@elysium.co.il. http://www.elysium.co.il/

Table of Contents

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Saint Nikola Wind Farm (SNWF) project is a 156 MW, grid-connected, renewable energy wind farm in the Municipality of Kavarna, Bulgaria initiated and operated by "AES Geo Energy OOD." (the Project"). The Project consists of a new electrical substation, 52 Vestas V90 wind turbine, each with a capacity of 3MW, and an upgrade of the local grid to allow the export of the full capacity. The Project supplies the generated electricity to the national electrical grid owned by the National Electrical Company (initials in Bulgarian NEK). The area of the project site is approximately 6,000 hectares (60 km2) and apart for a small area around the turbines base and some supporting infrastructure, most of the land is used for agriculture. The Project Proponent, AES Geo Energy Ltd., is a joint venture between the AES Corporation and Geo Power Ltd. and was registered in Bulgaria in 2006 for the purpose of commissioning and operation of the described wind farm.

Prior to the project activity, electricity was generated by the existing power plants connected to the Bulgarian grid, mostly based on fossil fuels. In comparison, the project activity will generate electricity with zero associated greenhouse gas emissions. The bass for the project activity's emissions reductions is the fact that the project activity greenhouse gas emissions factor will be lower than that of the average kWh on the Bulgarian grid.

By producing electricity from a renewable energy source (wind turbines), the Project will contribute to the sustainable, socio-economic development of the region. The use of renewable sources will improve the use of local energy resources. In addition, the Project will bring a strong positive ecological impact by producing clean electricity from wind power. Thus, there will be reduced emissions of CO2, NOx, SOx, particles and other pollutants that would otherwise be emitted due to electricity generation in fossil fuel power plant. Implementation of the Project also contributed to the introduction of state-of-the-art wind power technologies. Finally the Project has a significant local social impact due to the creation of jobs, both skilled and unskilled. The project also contributed to local road upgrades and continually supports other local community need like health care technologies.

During its investment review and approval process, the Project Participant identified substantial investment, technological and regulatory barriers associated with the Project. Despite these barriers, the Project Participant elected to proceed with the Project, also counting on income from carbon credits to offset some of these risks

Since the Project was commissioned and until the present time, the amount of difficulties and barriers only increased. Some of the main obstacles include: capacity limits on the grid, new taxes, and reduction in feed-in-tariffs. As a result, the Project is not financially viable.

The Project is expected to reduce an average amount of 256,108 tCO_2e per year and 2,561,076 over 10 years.

1.2 Sectoral Scope and Project Type

Sectoral scope: 1. Energy (renewable/non-renewable)

The project is not a grouped project.

1.3 Project Proponent

Organization name	AES Geo Energy OOD
Contact person	Bisera Stoeva
Title	Commercial analyst
Address	Aries Office Building, 32 A Cherni vrah Blvd, 1407 Sofia, Bulgaria
Telephone	+359887773855
Email	Bisera.stoeva@aes.com

1.4 Other Entities Involved in the Project

Organization name	Elysium Carbon trade & investment
Role in the project	Carbon credit development
Contact person	Ofer Ben-Dov
Title	CTO
Address	6 Galgalei Haplada St. P.O.Box 12522, Herzliya, 46733, Israel
Telephone	+972.9.957.9399
Email	ofer@elysiumcarbon.com

1.5 Project Start Date

November 1st 2012

1.6 Project Crediting Period

Project crediting period is 10 years.

Project start date is November 1st 2012

Project end date is October 31st 2022

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2012 (November)	56,062
2013	228,704
2014	244,085
2015	259,433
2016	259,433
2017	259,433
2018	259,433
2019	259,433
2020	259,433
2021	259,433
2022 (October)	216,194
Total estimated ERs	2,561,076
Total number of crediting years	10
Average annual ERs	256,108

1.8 Description of the Project Activity

The Saint Nikola Wind Farm project is a 156 MW, grid-connected, renewable energy wind farm in the Municipality of Kavarna, Bulgaria initiated and operated by "AES Geo Energy Ltd." The area of the project site is approximately 6,000 hectares (60 km2) and apart for a small area around the turbines base and some supporting infrastructure, most of the land is used for agriculture. In practice, only 6 hectares will be used permanently for the operation of the wind farm, equivalent to 0.09% of the total area of the site.

The Wind Farm consists of 52 wind turbines, type V 90.3 manufactured by Vestas, each with nominal capacity of 3MW; an underground collection system and; a step-up substation 33/110 kV as well as an overhead high voltage line of 110 kV, connecting the substation with the grid. The wind generated electricity is transmitted through an underground energy collection system of 33 kV to a switchgear of 33 kV located in the step-up substation where it is transmitted to the grid through transformers of 33/110 kV and a switchyard of 110 kV.

The wind farm is expected to generate over 300,000 MWh/y depending on wind conditions and average wind turbines technical availability. The net average capacity factor of the wind farm over the last year was 20.48%. The design life time of the turbines according to the DNV Type Certificate of the V90-3.0 MW turbine is 20 years and therefore they are expected to operate at least until 2030. In the absence of the project activity, electricity will be generated by the existing power plants connected to the Bulgarian grid, mostly based on fossil fuels. In comparison, the project activity will generate electricity with zero associated greenhouse gas emissions. The bass for the project activity's emissions reductions is the fact that the project activity greenhouse gas emissions factor will be lower than that of the average kWh on the Bulgarian grid.

<u>The VESTAS V90-3.0 MW wind turbine</u>

The wind turbine VESTAS V90-3.0 MW is a type of turbine whose angle of blades can be regulated depending on the wind velocity having upwind adjustment of blades. The control system provides for optimization of the wind generation, low levels of noise and reducing the loads on the main wind turbine components.

The generator is an asynchronous generator with coiled rotor and with slip rings. The control system regulates the current in the rotor circuit of the generator, being capable of assuring precise reactive energy regulation. It also provides gradual synchronization of the generator to the grid.

Basic Technical Specifications of the Wind Turbine According to Manufacturer Data:

- Nominal capacity: 3000 KW
- Full capacity: 3125 KVA
- Generator type: asynchronous generator with coiled rotor and slip rings and VCS Control System (Vestas Control System)
- Protection Level (Generator): IP54
- Generator voltage: 1000 VAC
- Converter: 400 VAC
- Frequency: 50 Hz
- Number of poles: 4
- Stator coil connection: Star I Triangle

- Nominal efficiency coefficient with convertor: 96%
- Power factor (cos<p): 1.0
- Power factor cos<p regulation options capacitance 1 inductively: 0,98 I 0,96
- Current at full load at 33 KV: 53 A I 55 A (cos<p = 1.0 I 0.96)
- Rotor diameter:90 m
- Blades rotation surface area: 6362 m2
- Rotation speed:8,6- 18,4 rev/min
- Number of blades: 3
- Length of blades: 44 m
- Hub height: 105m

Underground Energy Collection System

The underground energy collection system consists of high voltage power cables of 33 kV, grounding circuit and optical cable network. It consists of aluminum cables with cross section of $150mm^2$ to $630mm^2$ depending on the location of the wind turbine. All 52 wind turbines are grouped into 8 branches. Each branch includes 5 to 7 connected wind turbines. The wind turbines of each branch are connected sequentially, while the branch itself is connected to the switchgear of 33 kV in the substation. The total length of the power cable network is approximately 60 km.

The grounding circuit, in a way similar to that of the collection system, encompasses all wind turbines, connecting them to the grounding circuit of the substation.

The optical network connects the wind turbines with the automated control system of the wind farm, adjacent to the server premises of the substation, assuring transfer of required data and control signals between the control system and the wind turbines. The optical network has been made using multimode cable, located in the trenches of the power energy collection system cables.

General arrangement of the wind farm

By producing electricity from a renewable energy source (wind turbines), the Project will contribute to the sustainable, socio-economic development of the region. The use of renewable sources will improve the use of local energy resources. In addition, the Project will bring a strong positive ecological impact by producing clean electricity from wind power. Thus, there will be reduced emissions of GHG emissions as well as other pollutants such as NOx, SOx, and particles that would otherwise be emitted due to electricity generation in fossil fuel power plant.

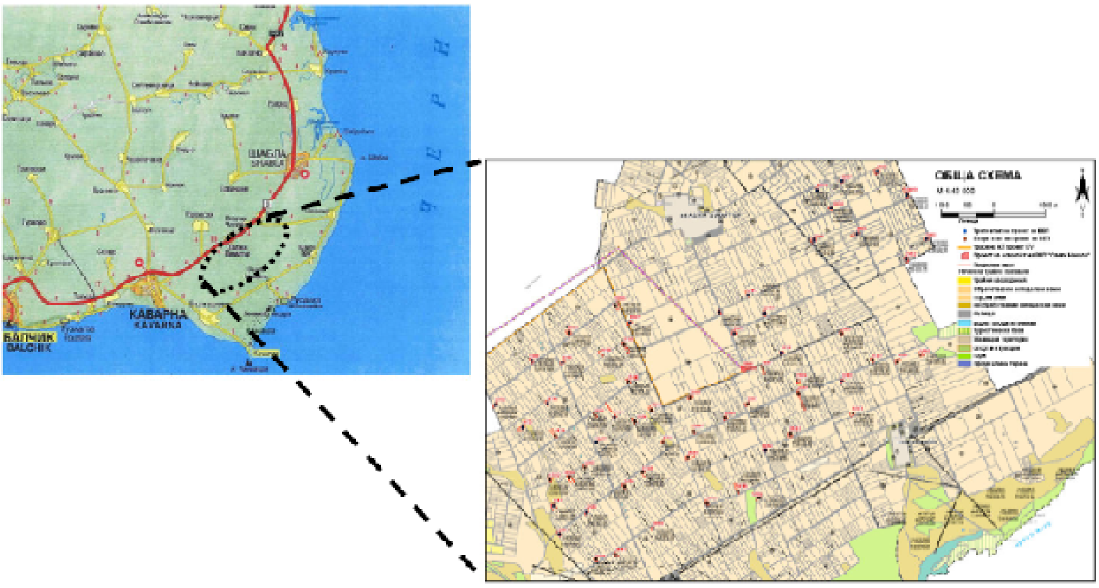
1.9 Project Location

The geographic coordinates of the plant are:

Site Latitude: 43.448008° or in degrees 43°56’22.83 N

Site Longitude: 28.454943° or in degrees 28°27’17.80 E

The Saint Nikola Wind Farm project is located in the Municipality of Kavarna, Bulgaria. The area of the project site is approximately 6,000 hectares (60 km2). The site of the Project is situated on the community land of the villages of Bulgarevo, Sveti Nikola, Hadji Dimitar, Rakovski and Porouchik Chounchevo, (see Figure below)



1.10 Conditions Prior to Project Initiation

Prior to the project implementation electricity in Bulgaria was generated by a mix of power plants using a variety of fuels. The project was developed and implemented to generate clean energy from wind and not for the sole purpose of generating GHG emissions reductions. The baseline scenario in the case of this project is the same as the conditions existing prior to the project initiation. Therefore, please refer to Section 2.4 - Baseline Scenario for further information.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

Following is a description of the main regulatory framework which is relevant to the SNWF.

EU law – Directive 2009/72/EC and Directive 2009/28/EC – transposed into the following Bulgarian legislation:

- BG Primary laws – Energy Act and Law for the Energy from Renewable Sources
- BG Secondary laws – Ordinance No 6 for Grid Connection, Ordinance No 10 for Curtailment, Electricity Trading Rules and Grid Code (Rules for Management of the Electricity System)

The Energy Act is the common law with respect to the general obligations in the energy sector concerning producers, including those from renewable energy sources (RES), in terms of grid connection and power off-take.

The Law for the Energy from Renewable Sources (LERS) is the special law with regard to the implementing policy for promotion of RES in Bulgaria. The main aspects of this policy are obligatory electricity off-take for a pre-defined period (12 years for producers from wind) and mandatory connection to the grid and priority of dispatch in so far as grid security is not concerned. For the SNWF the off-taker is the National Electricity Company EAD (NEK) as the wind farm is connected to the high voltage transmission grid.

Prior to the amendments of LERS at the end of last year 2013 the off-taker is obliged to purchase all the electricity produced from RES at the feed-in tariff in accordance with the reports of the meter reading. For the purposes of off-take at feed-in tariff Guarantees of Origin are issued and transferred to the off-taker. In accordance with these developments the feed-in tariff shall be payable only for the amount of electricity produced during the first 2250 hours (as stipulated with the Decision determining the applicable feed-in tariff). At this stage, there are no further regulations as to how this limitation on the feed-in tariff shall apply (no secondary implementing laws adopted yet).

The other important aspect is the pending implementation of the Electricity Trading Rules (ETRs) with regard to the producers from RES. By virtue of the ETRs all producers of RES (including those from wind) shall be obliged to transfer their balancing responsibility to either their default Coordinator of a Special Balancing Group (NEK for SNWF) or a Coordinator of Combined Balancing Group. Thus, SNWF shall be obliged to submit schedules on a daily basis and be charged for the imbalances incurred in accordance with the settlement notice to be issued monthly. There is a special mechanism envisaged for imbalance distribution for RES producers which involves a charge-back regardless of the overall result (the net position) of the coordinator.

Last but not least, curtailment is stipulated with the Energy Act, the Grid Code and the special ordinance for implementing curtailment orders. The general rule justifying curtailment shall be security of the electricity system; however, there is a special provision with respect to curtailment due to mismatch between demand and generation. LERS has envisaged liquidated damages payable to RES producers for curtailment, excluding non-available grid capacity, unless elsewhere agreed in a contract like in the case of the SNWF.

Currently, the SNWF is considered fully and legally “connected” to the transmission network in accordance with the provisions of the effective laws, including Ordinance No 6 for Connection.

1.12 Ownership and Other Programs

1.12.1 Right of Use

AES Geo Energy OOD was granted a "Permit of Use" for the wind farm by the Ministry of Regional Development and Public Works - Directorate for National Construction Supervision in two stages. On December 22nd 2009, a Permit of Use was granted for Saint Nikola sub-site C, and on March 15th 2010 for Saint Nikola sub-site A & B. Together, sub-site A, B, and C constitute the full operational wind farm and includes the 52 wind turbines, the energy collection system, the substation, and the overhead line connecting the wind farm to the grid.

1.12.2 Emissions Trading Programs and Other Binding Limits

There are no GHG emission reduction requirements in Bulgaria that the project is subject to and the project does not participate in any other emissions trading program. Any potential GHG reductions from this project will be voluntary and registered through the VCS.

1.12.3 Other Forms of Environmental Credit

The project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The project does intend to develop and apply to receive the Social Carbon standard as an add-on to the VCS registration.

1.12.4 Participation under Other GHG Programs

The project is not seeking registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The project was not rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

Not relevant.

Leakage Management

Not relevant

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

Not relevant.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

CDM ACM0002 Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources, Version 14.0, Sectoral scope: 01.

CDM TOOL01 Tool for the demonstration and assessment of additionality, Version 07.0.0

Guidelines on common practice, Version 02.0

Combined tool to identify the baseline scenario and demonstrate additionality, Version 05.0.0;

2.2 Applicability of Methodology

Applicability Condition – Methodology ACM0002 Grid-connected electricity generation from renewable sources	Project Description
Applicability condition number 3 - This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project is a grid-connected renewable power generation that was installed at a site where no renewable power plant was operated prior to the implementation of the project activity.
Applicability condition number 4a - The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project is a wind power plant.
Applicability condition number 4b - In the case of capacity additions, retrofits or replacements the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	The project does not include capacity additions, retrofits or replacements.
Applicability condition number 5 to 7 – refers to hydro project only.	Not relevant to project
Applicability condition number 8a – The methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy sources at the site of the	The project does not involve switching from fossil fuels to renewable energy sources at the site of the project activity.

project activity, since in this case the baseline may be the continued use of fossil fuels at the site	
Applicability condition number 8b – The methodology is not applicable to biomass fired power plants.	The project is not a biomass fired power plants.
Applicability condition number 8c – The methodology is not applicable to a hydro power plant that results in the creation of a new single reservoir or in the increase in an existing single reservoir where the power density of the power plant is less than 4 W/m2. Applicability condition number 9 - In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	The project is not a hydro power plant. The project is not a retrofits, replacements, or capacity additions.
Applicability Condition – TOOL07 v04.0 Tool to calculate the emission factor for an electricity system	**Project Description**
Applicability condition number 3 - This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The project substitutes grid electricity and supplies electricity to the Bulgarian grid.
Applicability condition number 4 - Under this tool, the emission factor for the project electricity system can be calculated either for	The emission factor for the project electricity system will be calculated for grid power plants only.

grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in "Appendix 2: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	
Applicability condition number 5 - In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project is nit a CDM project.
Applicability condition number 6 - Under this tool, the value applied to the CO2 emission factor of biofuels is zero.	Will be accounted for if biofuels will be found to be relevant to the Bulgarian grid.
Applicability Condition – TOOL01 v07.0.0 Tool for the demonstration and assessment of additionality	The tool does not include any relevant applicability conditions in addition to the fact that the methodology refers to the need to use it.
Applicability Condition – TOOL02 v05.0.0 Combined tool to identify the baseline scenario and demonstrate additionality	The tool does not include any relevant applicability conditions in addition to the fact that the methodology refers to the need to use it.

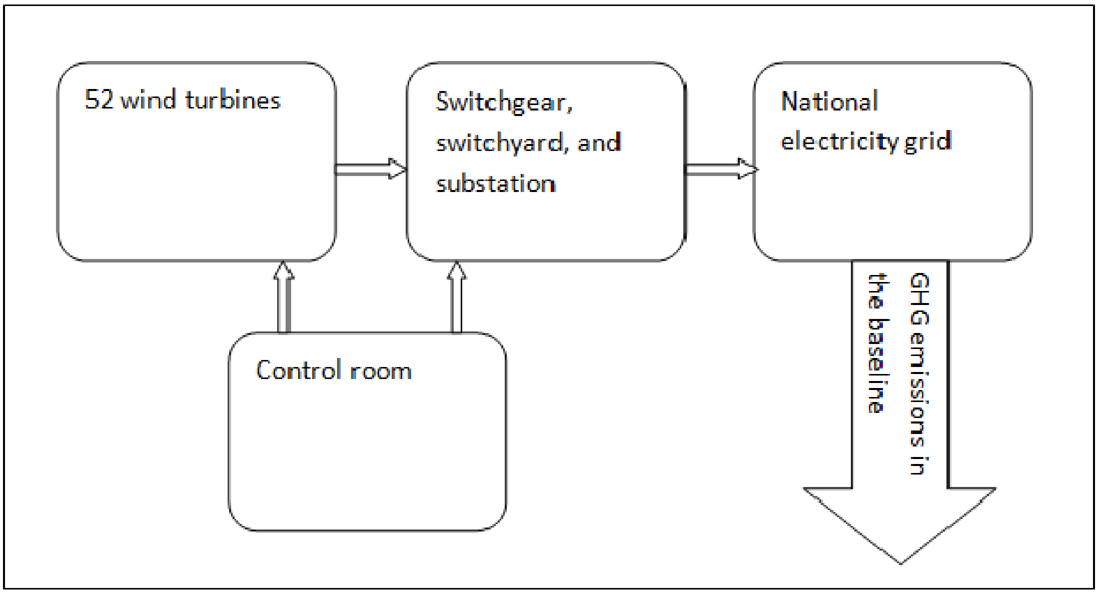
2.3 Project Boundary

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

The project boundary and identified relevant GHG sources based on the selected methodology.

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project	There are no GHG sources in the Project	CO_2	No	According to the methodology only geothermal, solar, and hydro power plants needs to consider GHG emissions of the Project.
		CH_4	No	According to the methodology only geothermal, solar, and hydro power plants needs to consider GHG emissions of the Project.
		N_2O	No	According to the methodology only geothermal, solar, and hydro power plants needs to consider GHG emissions of the Project.

A block diagram of the project boundary:



2.4 Baseline Scenario

According to the methodology if the project activity is the installation of a new grid-connected renewable power plant, the baseline scenario is the following: Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

As part of its obligation to the UNFCCC, Bulgaria commissioned a study in order to define the Baseline scenarios of the Bulgarian Electricity Power System and calculate the annual baseline carbon emission factor of the electric power sector. The results of this study include the electricity grid emission factor for the years 2006-2012, and it was made public to be used by developers of GHG reduction projects seeking to validate and register projects. Currently, no update is available for the 2013 electricity grid emission factor. Therefore, for the purpose of validation and registration of this project, the 2012 Maximum Demand scenario emission factor, including hydro power plant, will be used. The relevant value is 0.791 tCO_2/MWh

2.5 Additionality

The following Additionality analysis is based on the Tool for the demonstration and assessment of additionality. In this regard it is important to note that the project was originally developed with the support of the Bulgarian government to be approved as a JI project. However, the Bulgarian government did not have sufficient allowances for JI projects and the SNWF was constructed based on the assumption that other GHG reduction benefits like the VSC registration will be possible in the future.

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind

The project is not the first-of-its-kind.

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

Sub-step 1a: Define alternatives to the project activity

Realistic and credible alternatives to the project activity include:

1. The proposed project activity undertaken without being registered as a VCS project activity;
2. Electricity will be generated by other new Independent Power Producers (IPP) using renewable energy technologies;
3. The continuation of the current situation where electricity is generated by existing and new power plant connected to the Bulgarian electricity grid.

Sub-step 1b: Consistency with mandatory laws and regulations

All the alternatives identified in Sub-step 1a are in compliance with all mandatory applicable legal and regulatory requirements.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

A benchmark analysis (Option III) has been chosen to compare the original expected project IRR and the actual IRR.

Sub-step 2b: Option III. Apply benchmark analysis

As indicated above, the indicator chosen is the project IRR. The original investment proposal and the expected IRR were approved by the Bulgarian electricity regulators and therefore correspond to "Government/official approved benchmark where such benchmarks are used for investment decisions" (paragraph 38d of the Tool for the demonstration and assessment of additionality).

Sub-step 2c: Calculation and comparison of financial indicators

The financial model is based on an input output model. The main costs categories are: maintenance, O&M, insurance, land lease, access fees, financing costs and taxes. The only income (excluding potential income from GHG credits) is generated from electricity delivered to the national grid.

The analysis starts on November 1st 2012 and extends to 20 years as per the "Applicability of the “Guidelines on the assessment of investment analysis” version 1.

The model assumes that starting in 2015, the grid upgrade will be complete and there would be no curtailment losses from that point on.

As can be seen in the attached model, the project IRR is 5.4%.

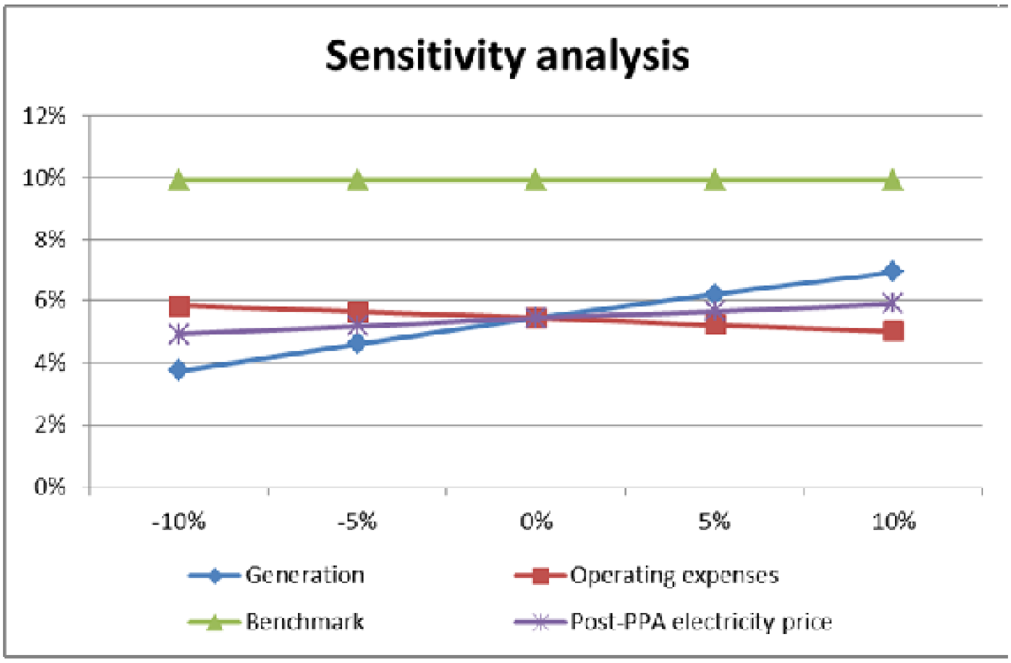
Sub-step 2d: Sensitivity analysis

As per the "GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS", a sensitivity analysis was conducted with ±10% on the main variables. The main variables are the operating expenses and income from electricity sales. In addition a ±10% sensitivity analysis was also conducted on the Post-PPA electricity price starting in 2025.

Following are the project IRR results for the ±10% variations on the main variables.

	-10%	-5%	0%	5%	10%
Generation	3.74%	4.59%	5.40%	6.17%	6.91%
Operating expenses	5.80%	5.60%	5.40%	5.19%	4.98%
Post-PPA electricity price	4.89%	5.15%	5.40%	5.63%	5.86%

Based on a the Bulgarian State Commission for Energy and Water Regulation resolution from March 15th 2010, the expected project IRR is 9.94%. The table below shows the sensitivity analysis against this benchmark.



As can be seen the project is not economically attractive for the full range of the sensitivity analysis.

Outcome of Step 2

The project is not economically attractive.

Step 3: Barrier analysis (similar to step 2 of the Combined tool to identify the baseline scenario and demonstrate additionality)

As additionality has been demonstrated using investment analysis and the project is additional. Hence Barrier Analysis has not been performed in accordance with paragraph 44 of "Tool for demonstration and assessment of additionality (version 7.0.0)"

Step 4: Common practice analysis

Sub step 4a: The proposed CDM project activity applies a measure that is listed in the definitions section

Renewable energy technologies are defined as a "measure" and therefore the “Guidelines on common practice” Version 02.0 should be used.

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity

The design capacity of the SNWF is 156MW and therefore the +/-50% range will be between 78-234MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfill conditions a-f in the guidelines (the full list of wind farms in Bulgaria and their installed capacities was provided to the validation team).

The SNWF is the largest wind farm in Bulgaria and therefore there are no wind farms in the +50% range. The second largest wind farm in Bulgaria is Suvorovo with 60MW of installed capacity, and therefore there are no wind farms in the -50% range.

Step 3: according to the above N_{all} = 1.

Step 4: as N_{all} includes only the SNWF, there are no projects within N_{all} that apply technologies that are different to the technology applied in the project. Terefore N_{diff} = 0.

Step 5: calculate factor $F=1-N_{diff}/N_{all}$

F = 1-0/1 = 1

Step 6: The proposed project activity is a “common practice” within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

F = 1, therefore greater than 0.2.

$N_{all}-N_{diff}$ = 1 – 0 = 1, therefore **not** greater than 3.

Based on the above the project is not “common practice”.

In addition to the above, all renewable energy power plants in Bulgaria are facing the same barriers, and most of the barriers were raised after the implementation of the projects when the

Bulgarian authorities unilaterally pulled back from contractual agreements, changed existing regulations and created new ones.

Outcome of sub step 4:

The project is not “common practice”. and therefore the project is additional.

2.6 Methodology Deviations

No methodology deviation.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

According to ACM0002, baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The following equation is used:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \qquad \text{Equation (6)}$$

Where:

BE_y	=	Baseline emissions in year y (t CO_2/yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO_2/MWh)

As part of its commitments under the Kyoto Protocol, the Bulgaria government commissioned a study to forecast and calculate the CO_2 emission factor of the Bulgaria grid for the Kyoto commitment period. The results of this study were made public to serve project developers in the validation and registration of GHG reduction projects.

In order to be conservative, the official calculated maximum demand forecast Dispatch Data Adjusted OM EF for 2012 was used.

3.2 Project Emissions

As the project is a wind based renewable energy power plant with no fossil fuel back up, there are no project emissions.

3.3 Leakage

According to the methodology no leakage emissions are considered.

3.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad \text{Equation (11)}$$

Where:

ER_y = Emission reductions in year *y* (t CO_2e/yr)

BE_y = Baseline emissions in year *y* (t CO_2/yr)

PE_y = Project emissions in year *y* (t CO_2e/yr)

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2012 (November)	56,062	0	0	56,062
2013	228,704	0	0	228,704
2014	244,085	0	0	244,085
2015	259,433	0	0	259,433
2016	259,433	0	0	259,433
2017	259,433	0	0	259,433
2018	259,433	0	0	259,433
2019	259,433	0	0	259,433
2020	259,433	0	0	259,433
2021	259,433	0	0	259,433
2022 (October)	216,194	0	0	216,194
Total	2,561,076	0	0	2,561,076

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year y calculated
Source of data	The value applied is based on the summary document: "Baseline Carbon Emission Factor of Bulgarian Electricity and Heat Power System" which was commissioned and published by the Bulgarian Ministry of Environment and Water (MoEW), Climate Change Policy Directorate, International Emission Trading Mechanisms Department. Available for download at: http://www.moew.government.bg/?show=top&cid=357 This document provides two forecasts for the grid emission factor. A higher value for minimum demand forecast and a lower value for maximum demand forecast. In order to be conservative we chose to use the lower value.
Value applied:	0.791 tCO_2/MWh
Justification of choice of data or description of measurement methods and procedures applied	Official report published by the Bulgarian Ministry of Environment and Water (MoEW), Climate Change Policy Directorate, International Emission Trading Mechanisms Department
Purpose of Data	Calculation of baseline emissions
Comments	No comments

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh/y
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*
Source of data	Electricity meter(s)
Description of measurement methods and procedures to be applied	The following parameters shall be measured: (a) The quantity of electricity supplied by the project plant/unit to the grid; and (b) The quantity of electricity delivered to the project plant/unit from the grid

Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value applied:	327,982 MWh/y
Monitoring equipment	There are two electricity meters which are owned and calibrated by the grid operator. Both are commercial measuring ELSTER AINRTAL-X static, accuracy class 0,2S. Serial number: No 07120785 Serial number: No 07120786 In addition there are two internal meters that are used to crosscheck the readings and will also serve as backup in case one of the main meters will malfunction. Both are Landis+Gyr static, accuracy class 0,2S. Serial number: No: 97600398 Serial number: No: 97600399
QA/QC procedures to be applied	Cross check measurement results with records for sold electricity
Purpose of data	Calculation of baseline emissions
Calculation method	Data is metered not calculated
Comments	Historic generation data is used to calculate future emissions reductions

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year *y*
Source of data	The value applied is based on the summary document: "Baseline Carbon Emission Factor of Bulgarian Electricity and Heat Power System" which was commissioned and published by the Bulgarian Ministry of Environment and Water (MoEW), Climate Change Policy Directorate, International Emission Trading Mechanisms Department. Available for download at: http://www.moew.government.bg/?show=top&cid=357 This document provides two forecasts for the grid emission factor. A higher value for minimum demand forecast and a lower value for maximum demand forecast. In order to be conservative we chose to use the lower value.
Description of	The Project Proponent chose the Ex ante option for determining

measurement methods and procedures to be applied	$EF_{grid,CM,y}$, and therefore no methods and procedures will be applied to update this parameter.
Frequency of monitoring/recording	The Project Proponent chose the Ex ante option for determining $EF_{grid,CM,y}$, and therefore this parameter will be fixed at registration.
Value applied:	0.791 tCO_2/MWh
Monitoring equipment	Not relevant
QA/QC procedures to be applied	Not relevant
Purpose of data	Calculation of baseline emissions
Calculation method	Not relevant
Comments	The Project Proponent chose the Ex ante option for determining $EF_{grid,CM,y}$, and therefore this parameter will be fixed at registration

4.3 Monitoring Plan

The equipment used for monitoring of the electricity generation by SNWF is listed in following table.

№	Site Name	Substation Name	Interconnection	Electrometers					
				Constant	Type	Accuracy class	Installation place	ID code	Manufacturer №
1	2	3	4	5	6	7	8	9	10
1	Saint Nikola Wind Farm	SS Saint Nikola	Trafo 1 E03	880000	Commercial measuring ELSTER AINRTAL-X static	0,2S	Control Room of SS Saint Nikola	9991801210	07120785
2	Saint Nikola Wind Farm	SS Saint Nikola	Trafo 2 E09	880000	Commercial measuring ELSTER AINRTAL-X static	0,2S	Control Room of SS Saint Nikola	9991801220	07120786
3	Saint Nikola Wind Farm	SS Saint Nikola	Trafo 1 E03	880000	Control measuring Landis+Gyr static	0,2S	Control Room of SS Saint Nikola	-	97600398
4	Saint Nikola Wind Farm	SS Saint Nikola	Trafo 2 E09	880000	Control measuring Landis+Gyr static	0,2S	Control Room of SS Saint Nikola	-	97600399

The measuring meters described under points 1 and 2 of the table are owned by the National Electricity Company (NEC or in Bulgarian NEK) and are used for the commercial measurement of the electricity. Commercial electrometer 1 is measuring the amount of the electricity exported through the HV step-up transformer 1, similarly commercial electrometer 2 is measuring the electricity exported through HV step-up transformer 2 into the grid. AES does not have access to the data from the commercial electrometers, except for visual reading.

The measuring meters under points 3 and 4 are owned by AES Geo Energy and are used for control measurement of the electricity and as a backup to the commercial meters.

Responsibility

The El. Maintenance Manager of the Wind Farm is responsible for implementing this monitoring plan. All duty engineers on shift are responsible for data collecting and recording.

Data collecting and recording

The data for the generated electricity measured by the commercial electrometers is sent via GSM modem connection to the NEK on a daily base – around midnight. There are two GSM connections, using two different mobile operators, to ensure the reliability of the data transfer.

The control electrometers are owned by AES Geo Energy and are used to control the accuracy of the commercial electrometers. They are connected to the internal network and are sending and recording their readings directly on the SNWF server. This process is automated and the data is regularly being uploaded. The data from the control electrometers can be accessed by using the manufacturers software or by a tool, developed for this purpose by the Wind Farm's Performance Engineer.

The Duty Engineer on night shift is obliged to record the visual readings of the electrometers, manually at 00:00 h. This data is stored on paper and in an excel sheet. The purpose of these records is to have backup data in case the electronic data from the electrometers is lost.

Frequency of the measurement and GHG calculations

Manual data reading and recording – once per 24h, at 00:00 h, for all commercial and control electrometers.

Automatic data recording – continuous. AES has access to the control electrometers measurements only.

GHG calculations will be performed on an annual basses at the AES Geo Energy head office or by the GHG consultant. GHG calculations will be based on the following equation:

$$\textit{Annual GHG reductions } (tCO_{2e}) = \textit{Annual electricity generation } (MWh_y) \text{ X } \textit{Bulgaria grid emission factor } (tCO_{2e}/MWh)$$

Control of the data recorded by the commercial electrometers

The commercial electrometers are recording the consumed and the generated electricity by SNWF. At the beginning of each month a representative of NEK is delivering the invoice for the consumed electricity along with the protocol for the generated electricity by the SNWF.

Obligation of the Duty Engineer on shift is to compare the data from the protocol with the data collected from the control electrometers, before signing the protocol. If the difference between the measurements of the commercial and control electrometers fall into the acceptable boundaries of 0.2%, the protocol can be signed. If the difference between the readings exceeds the limit of 0.2% the reason should be investigated. In such case the detailed data from the commercial and the control electrometers is to be compared.

Detailed instruction on the protocol checking procedure can be found in the internal Instruction 0-01.23 for monthly reporting of the readings from the control electrometers and comparing with the NEK protocol.

Quality control and quality assurance

The commercial and control electrometers are calibrated on annual base. Representatives of NEK, AES and the Institute of Metrology attend the calibration. Copies of the protocols for the Commercial electrometers are provided by NEK.

If the metering equipment fails to meet the standard technical and metrological features, the defected electrometer(s) shall be replaced and/or repaired at the cost of its owner.

Each party may request inspection of the commercial and control electrometers.

Provisions concerning inaccurate metering equipment

In the event of missing measurement, inaccurate and/or invalid measurement of electricity, or if, upon inspection, it has been found that the commercial metering device fails to meet the standard technical and metrological features, in order to calculate the corrections in the quantities of active net electricity the requirements for validation (recalculation) of the metering data as set forth in the Rules for Measurement of Electricity (RME) shall be applied- Article 38, Paragraph 4 of the RME.

Data validation shall be made for the period commencing on the date of missing measurement, inaccurate and/or invalid measurement of electricity (period of inaccurate measurement) until the date of repair or replacement of the revenue metering device where such period may commence on the date of the last signed bilateral protocol for reading of the delivered electricity which does not contain any findings of incorrect and/or invalid measurement.

The possibility of inaccurate and/or invalid measurement of electricity, as well as the procedure to follow in such case, is also covered under the PPA. A copy of the relevant section was provided to the validation team as confidential information.

Other monitoring requirements

According to the approved EIA, a bird monitoring program was established and annual reports are published on the SNWF website. The monitoring report should indicate the status of the bird monitoring annual reports and provide reference to reports which corresponds to the GHG verification periods.

Records

All documents and records will be kept in a secure and retrievable manner for at least two years after the end of the project crediting period.

5 ENVIRONMENTAL IMPACT

An Environmental Impact Assessment (EIA) was carried out and submitted in 2006. No significant negative environmental effects of the project were identified. Some of the main conclusions were:

"By the opinion of the experts concerning the components ambient air, climate, water, geological base, vegetation, landscape, protected natural objects, cultural and historical heritage, wastes, dangerous substances and health and hygienic aspects of the environment, the implementation of the investment proposal would not exert an adverse impact on the environment".

"As a conclusion, concerning the physical factors, the investment proposal for the construction of a wind farm on the territories of the villages Bulgarevo, Sveti Nikola, Hadji Dimitar, Rakovski and Porouchik Chounchevo, the municipality of Kavarna, does not contradict the existing standards and legislation and will not create additional conditions for an adverse impact on the population and the environment, in case the following recommendations are observed".

The following recommendations were made:

- Observing a hygienic protection zone of 500 m (not less than 350 m) around the generators where no construction of residential buildings, hotels, hospitals, schools, etc. is allowed, as stated in art.5 of the Amendment of Ordinance No 7. This zone must be marked for limiting the access of tourists, visitors, etc.

- The equipment shall have installed protective systems for switching off in case the velocity of the wind is over 25 m/s or in case their mechanical integrity is broken due to poor mechanical connections or for other reasons.

- Measurements shall be performed of the physical factors – noise, vibrations, non-ionizing radiation, electromagnetic fields, in order to evaluate the impact on the environment of the equipment during operation.

- Dialogue must be initiated as a basis of a steady communication of the risk from the harmful physical factors to the environment and the people with the population, by developing a program on the communication and the risk management, in order to avoid any non adequate reactions to the construction of the park and the eventual contradictions. This could be done after the punctual concept of the Investor on the way of installation – heights, distances, etc., so that the noise levels could be evaluated.

Based on the above recommendations the EIA concluded that "After the performed multi-factor analysis of the present state, the team of experts came to the conclusion, that in case of strict observation of the proposed measures for reducing and eliminating the adverse impacts , the investment proposal for the construction of a wind farm on the territories of the villages Bulgarevo, Sveti Nikola, Hadji Dimitar, Rakovski and Porouchik Chounchevo, the municipality of Kavarna, will not exert a negative effect on the environment and its health and hygienic aspects". And recommended to "take a positive decision of the EIA report".

Following the approval of the EIA and the approval of the project, all the above recommendations were implemented. In addition, a Supplementary Information Report was published in June 2008, and an Environmental Management and Monitoring Plan for the SNWF was made public in November 2008.

In addition, and in accordance to the EIA results, a detailed bird and bats monitoring program was established and annual reports are published and are available on the SNWF website (http://www.aesgeoenergy.com/site/index.html, http://www.aesgeoenergy.com/site/Studies.html).

Bat surveys were conducted for the first 3 years in accordance with the EIA requirement, after which, given lack of significant impact, the findings were included in the annual environmental report.

6 STAKEHOLDER COMMENTS

Both the EIA and the planning process involved a stakeholder dialogue. As a result, the Environmental Management and Monitoring Plan include specific provisions for community liaison and cultural heritage.

Following the publication of the EIA, there was a period of two months where any comment or suggestion could have been raised directly to AES Geo Energy or through the municipality. An open public meeting was also held where stakeholders could learn about the project and raise any issues they may have.

In May 2008 a Public Disclosure and Consultation Plan was published. The plan provides the framework for consultation during three distinguish stages: pre construction, during construction, and during operation.

To support the dialogue with stakeholders during the planning and construction phase, a special website was established that includes information on the project (http://www.geopowerbg.com/en/projects/view/1/St.-Nikola/), which was later transferred to the current website http://www.aesgeoenergy.com/.

Following are the main issues that were raised during the planning process and how they were resolved:

1. Potential for elevated dust levels during the construction period due to heavy use of the un paved agriculture roads – As this was raised by the community closest to the site, an agreement was reached that AES Geo Energy will pave the road used by the construction equipment were it passes by the village.

2. Potential noise disturbance – It was established that the requirements in the EIA suffice to prevent such disturbance.

3. Potential interference to birds and bats - It was established that the requirements in the EIA suffice to lower such disturbance to a minimum and that the ongoing monitoring requirements will also serve to evaluate if additional actions are required.

As the planning process involved the stakeholders from the outset, no new issues were raised during public meetings or during the construction.

AES Geo Energy and the SNWF maintain a very close relationship with the local community and contribute to several programs including in schools and hospitals. These ongoing efforts are managed by the CSR personal who's responsible for stakeholder's engagement and contributions to the local communities. The project website is used regularly to make the monitoring reports available to stakeholders (http://www.aesgeoenergy.com/site/Studies.html).