CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Ckani Wind Farm Project
Version 03
23/05/2012

A.2. Description of the project activity:

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Ckani is a wind electricity generation power plant project activity to be developed by AM Eolica Alto Loa SpA. The Project aims to generate electricity using Non-Conventional Renewable Energy, in this case wind power. The electricity generated will be supplied to the Great North Interconnected Grid (SING[1]).

The project will be located in the Calama Commune, El Loa Province, in the Region of Antofagasta and involves the construction, installation and operation of a wind farm with an total installed capacity of 240 MW provided by 160 wind turbines with a capacity of 1.5 MW each one, connected by underground and ground transmission lines of 34.5 kV, to two project substations (located at the north and south side of the project site respectively) that elevate the energy from 34.5kV to 220kV and connect the wind farm with the SING grid.

Wind turbines have a hub height of 75 meters and a rotor diameter of 87 meters. The annual production of energy of the 160 turbines wind farm will be approximately 688.3 GWh in average per year considering a plant load factor of 32.7%

The construction of the Ckani´s Wind Farm project activity will be performed in 3 phases:

- 01/01/2013. Construction of 47 wind turbines with a total installed capacity of 70.5 MW for that year.
- 01/01/2014. Addition of 47 wind turbines with a total of 94 turbines and an installed capacity of 141 MW for that year.
- 01/01/2015. Addition of 66 wind turbines with a total of 160 turbines and an installed capacity of 240 MW for that year and the rest of the crediting period.

Ckani Wind Farm Project is a Greenfield project that will displace the dispatch of thermoelectric power plants currently operating in the system, therefore, the baseline scenario, so as the scenario existing prior to the start of the implementation of the project activity, is the electricity delivered by the grid by the project activity that would otherwise been generated by the operation of grid-connected power plants and by the addition of new power plants. The project will contribute with the greenhouse gases (GHG) emission reductions delivering clean energy to the grid, and specifically by avoiding the emissions of CO_2 produced by the combustion of fossil fuels, considered the main source of GHG.

[1] Spanish acronym for "Sistema Interconectado del Norte Grande"

The energy generation of the project will allow to diversify the energy pool through the implementation of Non-Conventional Renewable Energy (NCRE) sources, contribute to reduce the dependence of the Chilean electricity system in imported fossil fuel and assist the assurance of the electricity supply, thus contributing with the sustainable development of the country.

The implementation of this project activity is the result of detailed technical reports and large environmental studies that have helped to adapt the layout design in order to minimize environmental impacts.

A.3. Project participants:

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Table 1 Project participants

Name of Party involved	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Chile (host party) *Chile ratified the Kyoto Protocol on August, 2002.*	AM Eolica Alto Loa SpA	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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The project activity is located in South America.

A.4.1.1. Host Party(ies):

>>

The host party is Chile.

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

>>

The project activity is located in El Loa Province, II Region of Antofagasta

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

>>

Calama Commune

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

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Ckani Wind Farm Project activity will be located in the Calama Commune, El Loa Province, II Region of Antofagasta, specifically 45 km northeast from the city of Calama.

The area selected for the project site is propitious for the installation of wind turbines since it is a flat land, well exposed to prevailing winds and close to a substation interconnecting the project to the SING.

Figure 1. Project Location
Source: Google Earth, 2011

The approximate geographic coordinates in UTM (DATUM WGS84, Zone 19 South) that demarcate the location of the wind turbines of the project are detailed in Table 2.

Table 2. Wind Turbines coordinates

Turbine	E	N	Turbine	E	N
1	543653.2	7566314.3	81	541426.2	7557445.0
2	544064.7	7566313.9	82	542283.8	7557288.2
3	544476.2	7566313.9	83	542695.3	7557288.2
4	542760.4	7565184.7	84	543119.1	7557259.9
5	543172.0	7565184.7	85	543525.9	7557287.8
6	543584.9	7565186.0	86	543930.0	7557287.8
7	543996.4	7565185.6	87	544341.5	7557287.9
8	544407.9	7565185.7	88	544753.1	7557287.9
9	544819.5	7565185.7	89	545164.6	7557287.9
10	545231.0	7565185.7	90	545576.2	7557287.9

Turbine	E	N	Turbine	E	N
11	542282.1	7564047.3	91	539663.3	7556277.1
12	542693.5	7564057.8	92	540070.9	7556261.1
13	543105.0	7564057.8	93	540486.4	7556277.1
14	543516.6	7564057.8	94	540898.0	7556277.2
15	543928.1	7564057.4	95	541309.5	7556277.2
16	544318.5	7564054.0	96	542215.5	7556159.7
17	544751.2	7564057.5	97	542627.0	7556159.7
18	545162.8	7564057.5	98	543043.8	7556141.4
19	545566.3	7564040.3	99	543450.1	7556159.4
20	542213.7	7562929.5	100	543861.6	7556159.4
21	542625.2	7562929.5	101	544273.3	7556159.6
22	543036.8	7562929.6	102	544684.7	7556163.4
23	543448.3	7562929.6	103	545507.9	7556159.5
24	543859.8	7562923.9	104	540175.5	7554980.2
25	544686.6	7562938.8	105	540751.0	7555077.9
26	545090.9	7562923.5	106	541147.5	7555044.4
27	545506.1	7562929.3	107	541574.4	7555108.9
28	541122.2	7562136.2	108	542147.2	7555031.5
29	541614.1	7562074.2	109	542561.2	7555038.7
30	542145.4	7561801.1	110	542970.3	7555031.5
31	542556.9	7561801.1	111	543381.8	7555031.2
32	542968.5	7561801.1	112	543793.4	7555031.2
33	543380.0	7561801.2	113	544204.9	7555031.2
34	543791.6	7561795.8	114	544616.5	7555031.2
35	544203.1	7561800.8	115	545028.1	7555031.3
36	544614.8	7561801.0	116	545429.0	7555023.3
37	545026.2	7561800.8	117	540240.7	7554052.5
38	545437.8	7561800.9	118	540683.0	7553894.8
39	545849.3	7561800.9	119	541100.7	7553914.3
40	540793.0	7560838.8	120	541548.1	7553900.4
41	541201.3	7560820.1	121	542079.0	7553903.2
42	541614.9	7560822.8	122	542899.7	7553903.2
43	542077.1	7560672.9	123	543313.6	7553902.8
44	542488.7	7560672.9	124	543725.1	7553902.8
45	543311.8	7560672.9	125	544136.7	7553902.9
46	543723.3	7560672.5	126	544548.2	7553902.9
47	544134.8	7560672.6	127	544959.8	7553902.9
48	544546.4	7560672.6	128	540573.0	7552701.1
49	544957.9	7560672.6	129	541084.3	7552740.8
50	545369.5	7560672.7	130	541530.8	7552771.3
51	545785.6	7560658.2	131	542010.7	7552774.9
52	540733.0	7559662.1	132	542832.0	7552775.9
53	541144.5	7559688.8	133	543245.3	7552774.6
54	541552.5	7559702.9	134	543656.9	7552774.6

Turbine	E	N	Turbine	E	N
55	542008.8	7559544.6	135	544068.4	7552774.6
56	542420.3	7559544.6	136	544480.0	7552774.7
57	542831.9	7559544.6	137	540590.5	7551695.1
58	543243.4	7559544.6	138	541051.3	7551647.9
59	543654.9	7559544.2	139	541480.3	7551639.0
60	544066.5	7559544.3	140	541942.4	7551646.7
61	544478.0	7559544.3	141	542354.0	7551646.7
62	544889.6	7559544.3	142	542765.6	7551646.8
63	545301.2	7559544.4	143	543177.1	7551646.4
64	545712.7	7559544.4	144	543588.6	7551646.4
65	540652.8	7558541.5	145	544000.2	7551646.4
66	541064.3	7558541.6	146	541003.9	7550495.5
67	541480.9	7558577.3	147	541470.3	7550486.2
68	541940.6	7558416.4	148	542285.7	7550518.3
69	542352.1	7558416.4	149	542697.2	7550518.3
70	542763.6	7558416.4	150	543108.7	7550517.9
71	543173.0	7558410.1	151	543520.3	7550518.0
72	543586.7	7558416.0	152	543932.0	7550518.1
73	543998.2	7558416.0	153	540976.2	7549342.2
74	544821.3	7558416.1	154	541399.4	7549348.2
75	545232.9	7558416.1	155	542217.4	7549390.1
76	545644.5	7558416.2	156	542629.0	7549390.1
77	539734.7	7557400.8	157	543040.5	7549389.7
78	540141.0	7557403.8	158	541476.5	7548137.0
79	540576.5	7557406.5	159	542070.1	7548132.7
80	540988.1	7557406.5	160	542482.1	7548141.1

Source: Project Layout by SGA, 2011.

The following figure gives a better understanding of the Layout of the project.

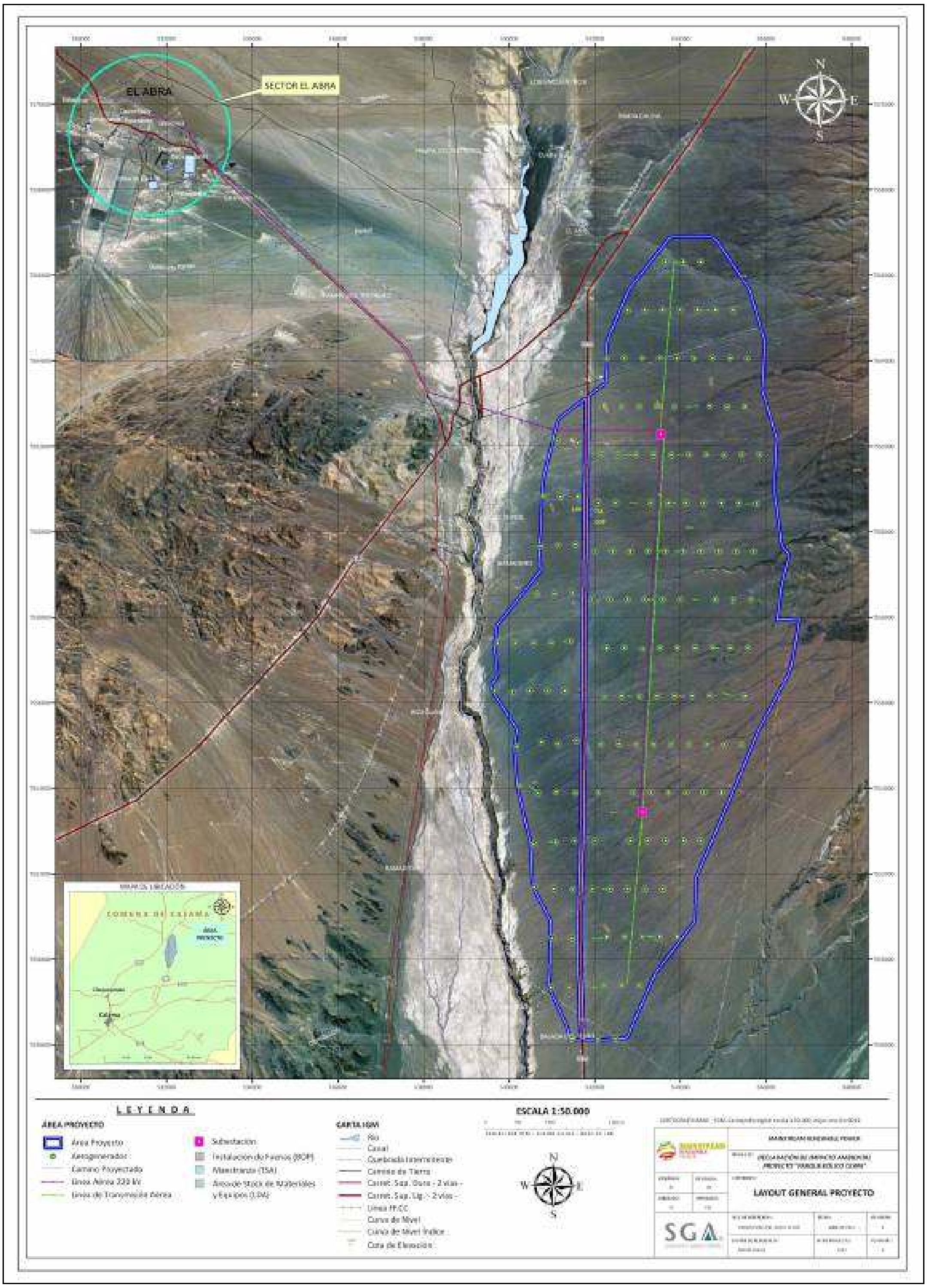

Figure 2. Project Layout
Source: DIA, 2011, page 10.

A.4.2. Category(ies) of project activity:

>>
This project is considered as Sectoral Scope 1, Energy Industries (renewable/non renewable).

A.4.3. Technology to be employed by the project activity:

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Ckani Wind Farm Project is a wind-sourced electricity generation power plant project activity that will supply energy to the grid. The project is a Greenfield project, thus the scenario prior to the implementation of the project is the energy generation by the SING grid. The baseline scenario is the electricity delivered to the SING grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. The implementation of the project considers a set of 160 wind turbines which sum 240 MW of installed capacity in three construction phases. The implementation of Ckani Wind Farm Project will displace the dispatch of thermoelectric power plants currently operating in the system and will contribute with the GHG emission reductions. The implementation of this project will allow to supply clean energy to the system, diversifying the energy pool through the implementation of NCRE sources and to assist the assurance of the electricity supply.

The scope of the project activity is the implementation of a new grid-connected wind farm. The main characteristics of Ckani Wind Farm project are summarized in the following information:

- Turbine Manufacturer: Goldwind
- Installed Capacity per turbine: 1.5 MW
- Total Number of wind turbines: 160
- Hub Height: 75 meters
- Rotor Diameter: 87 meters
- Design lifetime: 20 years
- Plant load factor: 32.7%[2]

Other components included in the project activity, related to energy generation are:

- Electricity transmission lines
- Electric towers
- O&M Building
- Other civil works (foundations, crane pads, etc.)
- Access roads

According to the methodology, for most renewable power generation project activities, there are no emission sources and greenhouse gases involved, except for geothermal, solar thermal and some hydro power projects. Since Ckani Wind Farm project is a wind-based electricity generation power plant, project activity's GHG emissions are equal to zero.

The energy generated by this project activity, is going to be monitored by a class 0.2 bidirectional meter located at the substation in the project site. In addition the project considers a SCADA system; this will be used as an internal monitoring and control system for each turbine.

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[2] "Assessment of the energy production of the proposed Ckani wind farm in Chile", page 17, by Garrad Hassan

The energy is going to be produced from an environmentally safe and sound technology of wind electricity generation equipment designed, engineered and manufactured by Goldwind (www.goldwindglobal.com) which is an international respected supplier.

Goldwind is going to transfer to the Host Party its know-how by means of training the power plant staff during the construction, commissioning and operation of the project activity.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

>>

Table 3. Emission Reductions

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
2013*	143,092
2014**	286,185
2015***	487,123
2016	487,123
2017	487,123
2018	487,123
2019	487,123
Total estimated reductions (tonnes of CO_2e)	2,864,892
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	409,270

(*) Considering 47 turbines operating
(**) Considering an addition of 47 turbines and a total of 94 turbines operating
(***) Considering an addition of 66 turbines and a total of 160 turbines operating

A.4.5. Public funding of the project activity:

>>
Ckani Wind Farm Project does not consider public funding.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

>>
For this project activity applies the Approved consolidated baseline and monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 12.2.0, Sectoral Scope 01; in effect as of EB 65.
http://cdm.unfccc.int/filestorage/Z/5/C/Z5CN1XU07YRQ9JDBH4SGO2WA8M3TKP/eb65_repan16.pdf?t=NUt8bTRmdGYzfDAUGrdNDQakBWUTJAgR-eUC

This methodology also refers to:

The "Tool to calculate the emission factor of an electricity system", version 02.2.1; in effect as of EB 63.
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

The "Tool for demonstration and assessment of additionality", version 06.0.0, in effect as of EB 65.
http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

More information about approved methodologies can be obtained at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

>>

Project participants choose Approved Consolidated Methodology ACM0002 version 12.2.0 to develop the project activity design document due to the fact that this methodology is applicable to grid-connected renewable power generation project activities that involve the installation of a new power plant at a site where no renewable power plant was operated prior to the implementation of the project, which is the case of the proposed project activity.

The project activity fulfils the following applicability conditions:

Table 4. Applicability conditions

Applicability condition	Fulfilment of applicability conditions
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 activity considers the installation of a Greenfield wind power plant.
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 11 to calculate the parameter $EG_{PJ,y}$): 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;	This condition does not apply to the project activity since is not a capacity addition, retrofit or replacement project.
In case of hydro power plants: • One of the following conditions must apply: - The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or - The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m^2; or - The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the	These conditions do not apply since the project considers the installation of a wind power plant.

Applicability condition	Fulfilment of applicability conditions
Project Emissions section, is greater than 4 W/m^2.	
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 $W/^{m2}$ all the following conditions must apply: -The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; - Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project1 that collectively constitute the generation capacity of the combined power plant; - Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; - Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15MW; - Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	These conditions do not apply since the project considers the installation of a wind power plant.
The methodology is not applicable to the following: - Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants; - Hydro power plant that result in new single reservoir or in the increase in existing single reservoir where the power density of the power plant is less than 4 W/m^2.	The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity, uses biomass nor result in a new reservoir with less than 4 W/m^2.
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, i.e. 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.	This condition does not apply to the project activity since the project activity doesn't consider a retrofit, replacement or capacity addition.

Therefore, all methodological applicability conditions are met by Ckani Wind Farm project activity.

B.3. Description of the sources and gases included in the project boundary:

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Table 5. Emissions sources included in or excluded from the project boundary

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 activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non condensable gases contained in geothermal steam.	CO_2	No	Not applicable. The project activity is a wind farm
		CH_4	No	
		N_2O	No	
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable. The project activity is a wind farm
		CH_4	No	
		N_2O	No	
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Not applicable. The project activity is a wind farm
		CH_4	No	
		N_2O	No	

The greenhouse gases emissions within the project activity boundaries are associated to the baseline, produced from electricity generation in fossil fuel-fired power plants connected to the SING electric grid.

The project activity will supply zero-emissions electricity to the grid, thus avoiding greenhouse gases emission by displacing the dispatch of thermoelectric power plants. As it is shown in Figure 3 there are no greenhouse gases emissions associated to the project activity.

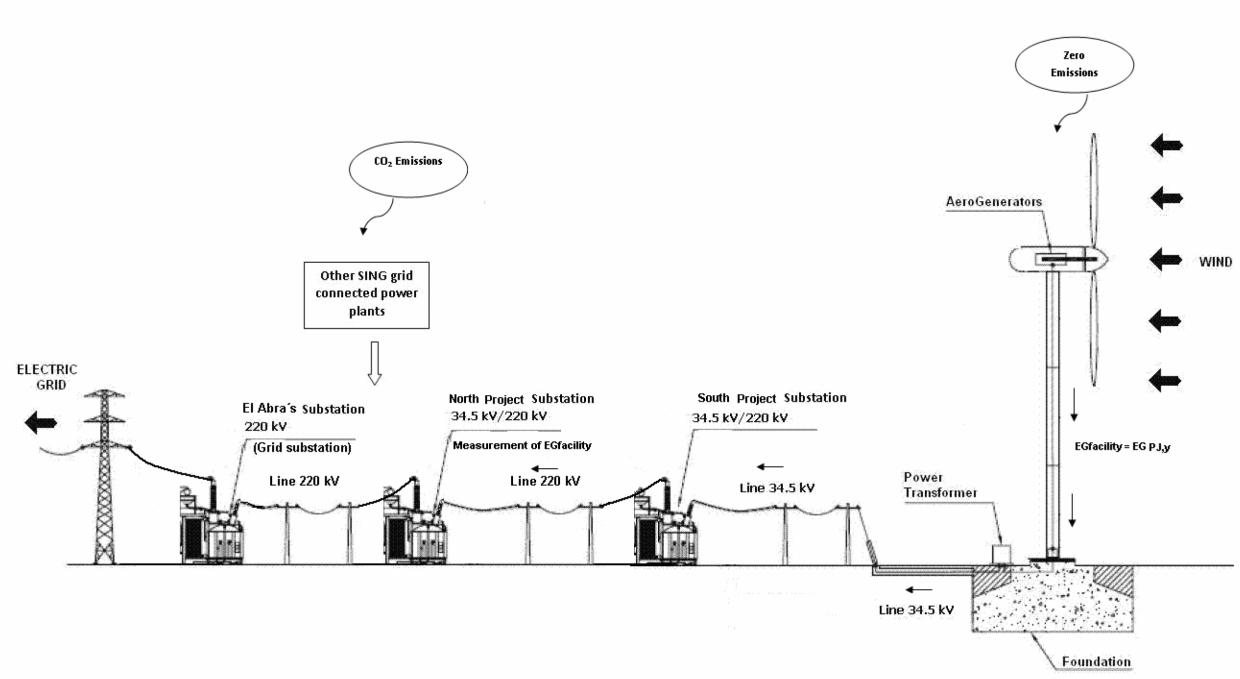

Figure 3. Flow diagram of the project activity

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

>>
According to ACM0002 v. 12.2.0, the baseline scenario of the proposed project activity is defined as the electricity delivered to the grid (SING) by the project that would have otherwise been generated by the operation of grid-connected power plants and by the addition of the new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system v.02.2.1”.

Due to Chile’s geography, its electric infrastructure is divided into five separate systems that are not connected between them: Great North Interconnected Grid (SING by its Spanish abbreviation), Central Interconnected Grid (SIC by its Spanish abbreviation), Aysén, Magallanes and Easter Island Systems. The Figure below illustrates the five different systems allocation.

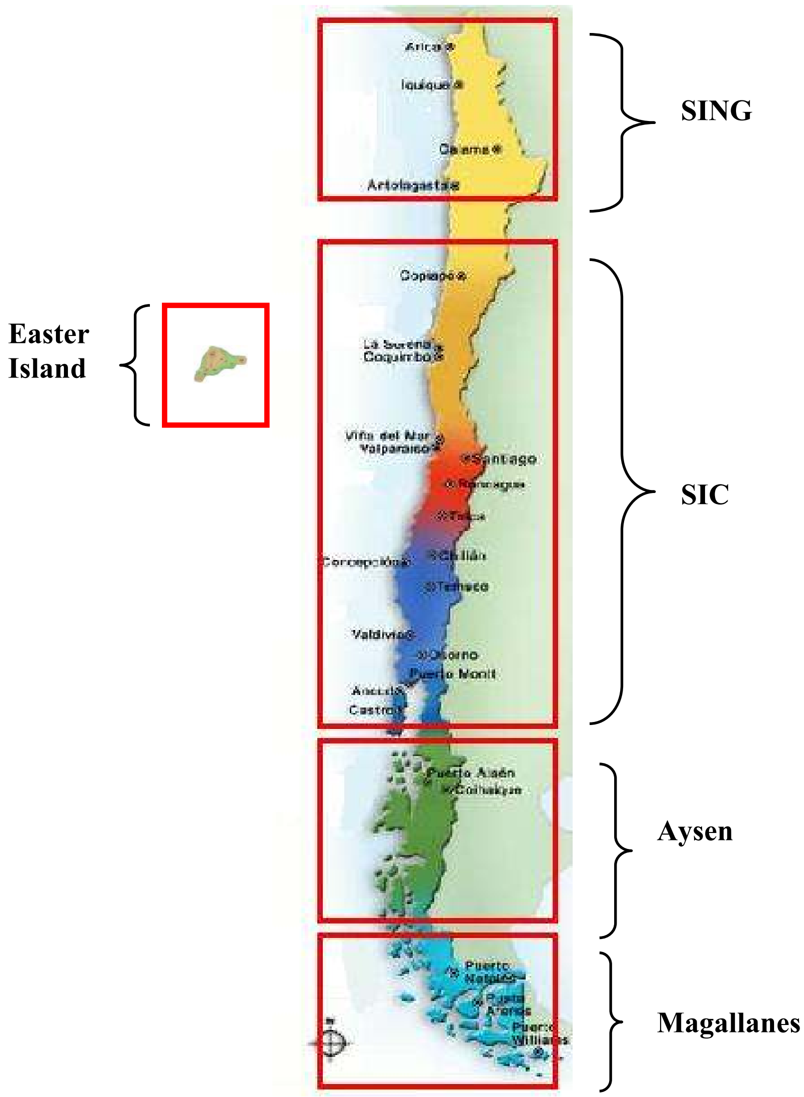

Figure 4. Chilean Electric System

Considering that the project activity is located in the Calama Commune, in the Region of Antofagasta (II Region), the renewable electricity generation is going to be delivered to the Great North Interconnected Grid (SING), which is dominated by electricity generating sources that use coal, diesel, natural gas and fuel oil (see Table 6 below). The actual fuel mix is expected to persist during the crediting period.[3]

The characteristics of the SING can be found at the CDEC-SING web page (http://www.cdec-sing.cl).

The following figure displays a simplified map of the SING grid.

[3] According to SING system pricing and planning study "Final Report, 2008 October", page 9, the 95% of recommended plants by 2019 will use fossil fuel to generate energy un the system.

Figure 5. The Great North Interconnected Grid (SING)
Source: CDEC-SING, 2011.

For the Great North Interconnected Grid (SING), the total electricity generated and the energy allocation by fuel for years 2008, 2009 and 2010 are shown in the table below.

Table 6. SING Energy production by fuel category

Source	2008[6]	2009[4]	2010[5]
Hydro	0.4%	0.3%	0.4%
Coal	33.8%	32.9%	32.9%
Diesel	3.5%	3.6%	3.6%
Fuel Oil	3.6%	6.1%	6.1%
Natural Gas	58.8%	57.1%	57.1%
TOTAL	**3,593 MW**	**3,699 MW**	**3,701 MW**

Ckani Wind farm is a Non-Conventional Renewable Energy (NCRE) project and it will be connected to the SING, allowing diversify the system by the incorporation of clean energy that does not depend on fuel supply constraints.

Furthermore, the activity has a key role towards reducing emissions of greenhouse gases, since in the absence of the project activity; the equivalent amount of electricity would have been generated by the operation of the grid connected power plants that use coal, diesel, fuel Oil or natural gas

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

>>

Prior Consideration of the CDM

According to "Guidelines on the demonstration and assessment of prior consideration of the CDM" version 4, EB 62, the Executive Board *takes notes that the issue of prior consideration of the CDM as a major element in assessing that CDM benefits were considered necessary in the decision to undertake the project as CDM project activity*.

The 29th of December of 2011, the project participant informed to Environmental Ministry of Chile (designated national authority-DNA) and the UNFCCC secretariat of their intention to seek CDM status according the "Guidelines on the demonstration and assessment of prior consideration of the CDM" version 4, EB 62

Therefore, the CDM component was seriously considered before the implementation of the project.

Additionality

According the methodology ACM0002 version 12.2.0, the additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality v.6.0.0".

This tool considers the following steps to demonstrate and assess additionality:

[4] CDEC-SING Operation Statistics, 2000/2009, page 31. Available in: http://www.cdec-sing.cl/html_docs/anuario2009/PDF/cdec-sing%202009%20ing.pdf

[5] 2010 Annual Report Statistics and Operation, page 40. Available in: http://www.cdec-sing.cl/html_docs/anuario2010/pdf/SING2010EN.pdf

Step1: Identification of alternatives to the project activity;
Step2: Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;
Step3: Barriers analysis; and
Step4: common practice analysis.

STEP 1. ***Identification of alternatives to the project activity consistent with current laws and regulations***

Sub-step 1a Identification of alternatives to the project activity consistent with current laws and regulations:

Under this analysis there are defined realistic and credible alternatives to the project activity.

Sub-step 1a. Define alternatives to the project activity:
The alternative scenarios to the proposed project activity are the following:

(a) The proposed project activity undertaken without being registered as a CDM project activity;
(b) The continuation of the current situation (no project activity or other alternatives undertaken).

Sub-step 1b. Consistency with mandatory laws and regulations:
The electricity generation through any of the previously identified alternatives represents a realistic and credible alternative scenario to the project activity, and are in compliance with Chilean mandatory legislation and regulations taking into account the enforcement in the country and EB decisions on national and/or sector policies and regulations

STEP 2. ***Investment analysis***

This analysis aims to demonstrate that the proposed project activity can't be considered to be economically attractive, without the revenue from the sale of CERs.

To conduct the investment analysis the "Guidelines on the Assessment of Investment Analysis v.05" will be taken into account and the following sub-steps will be completed:

Sub-step 2a: Determine appropriate analysis method:
The CDM project activity will generate financial or economic benefits other than the CDM related income, so simple cost analysis cannot be used (option I). Under this situation, investment comparison analysis (option II) or benchmark analysis (option III) applies.

According the "Guidelines on the Assessment of Investment Analysis v.05" (paragraph 19) the benchmark analysis is appropriate if the alternative to the project activity is the supply of electricity from a grid. Then, the benchmark approach (option III) is selected for the investment analysis as it is suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest.

Sub-step 2b. – Option III Benchmark analysis

For the investment analysis the financial indicator is project IRR (considering 100% equity) and it was compared against a benchmark.

According the "Guidelines on the Assessment of Investment Analysis v.05", for the selection of appropriate benchmarks, in cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market. For the proposed project activity cost of equity will be determined by selecting the values provided in Appendix A of the referred guidelines.

Benchmark determination:

For the proposed project, the category according to the sectored scopes used under the CDM is Group I: Energy Industry in Chile, therefore the default value for the expected return on equity calculated after taxes is 10.3%. This value is expressed in percentages in real terms, as the project IRR (considering 100% equity) which was also carried out in real terms.

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

The project evaluation considers the following items:

Table 7. General parameters

General Parameters	Unit	Value
Installed Capacity year 1	MW	70.5
Installed Capacity year 2	MW	141
Installed Capacity year 3 and ahead	MW	240
Plant load factor[6]	%	32.7

- **Investment:** The following table details the values of the items considered in the investment.

Table 8. Investment parameters

Investment	Unit	Value	Sources[7]
Civil Works	MMUS$	114.02	Project Quotations and studies
Electrical Items	MMUS$	16.60	Project Quotations and studies
Turbines	MMUS$	218.61	Turbine supply agreement
Substation Items	MMUS$	20.95	Project quotations and studies
Grid Items	MMUS$	5.08	Project study
Total	MMUS$	375.26	

[6] "Assessment of the energy production of the proposed Ckani wind farm in Chile", page 17, by Garrad Hassan
[7] For further information, please refer to the Financial evaluation spreadsheet.

- **Operational costs:** The economic evaluation considers a constant expense during the project lifetime associated to operational costs that are necessary for the central operation. The following table details each value.

Table 9. Operational cost

Operational costs	Unit	Value	Source[8]
Transmission fee	MMUS$/year	0.500	Transnet proposal
O&M	MMUS$/year	4.896	Turbine supply agreement
Others[9]	MMUS$/year	7.953	The Economics of Wind Power Part III.[10]

- **Incomes:** The project incomes are associated to the energy sales. These incomes consider the estimated dispatch of energy under spot sales and firm capacity sales based in the firm capacity[11] of the project which corresponds to 16.0%.

Table 10. Incomes

Income parameters	Unit	Value	Source[12]
Energy price, spot	US$/MWh	69.77	Node Price Report – October 2011 Public information from the Energy National Commission (CNE)
Firm Capacity price, spot	US$/MW-year	110,439.6	

- **Tax:** The economic evaluation considers the tax that the company must pay every year during the project lifetime. This corresponds to 17% of the income before taxes[13], calculated as: total benefits minus total expenses associated to each year of the project activity (total expense considers the operational costs and the annual depreciation of the investment).

- **Depreciation:** The depreciation for each tangible asset was obtained from the values fixed by the national Internal Revenue Service (SII) stated in the Fixed assets Lifetime Table[14]. The depreciation years for the turbines corresponds to the useful lifetime[15] determined by the turbine supplier. These values are presented in Table 11.

[8] For further information, please refer to the Financial evaluation spreadsheet.
[9] Includes the costs of insurance, land rent, administration, power from the grid and miscellaneous
[10] Information available at http://www.wind-energy-the-facts.org/
[11] In the Article Nº259 of the Supreme decree Nº327 which corresponds to the "Regulation of the General Law of Electric Services", it is defined the firm capacity as the *maximum power that a generator can inject and transmit to the transmission systems in the peak hours of the system, considering its probable unavailability.*
[12] For further information, please refer to the Financial evaluation spreadsheet.
[13] Available at the National Internal Revenue Service ("Sistema de Impuestos Internos, SII") Web page: http://www.sii.cl/aprenda_sobre_impuestos/impuestos/imp_directos.htm
[14] Available in the SII Web page: http://www.sii.cl/pagina/valores/bienes/tabla_vida_enero.htm
[15] According to the International Financial Reporting Standards (IFRS) the depreciation of an asset is the systematic allocation of the depreciable amount of an asset over its useful life.

Table 11. Depreciation for tangible assets

Depreciation	Years
Turbine Foundation	20
Site access roads	20
Public road upgrades	20
Met masts	10
O&M building	20
34.5kV Collector Underground Cable	20
34.5kV Collector Single Circuit Overhead Line	20
690V - 34.5kV unit transformers	10
Turbines	20
Substation 220kV Extension	20
Substation 34.5kV- 220kV	20
220kV Transmission Line	20

The period of the financial analysis is 20 years.

Considering the data presented above, the result of the financial parameter project IRR (100% equity), in real terms, is: 6.47%

Therefore, the project IRR (100% equity) does not reach the benchmark minimum (10.3%).

Sub-step 2d: Sensitivity analysis

According to the "Guidelines on the Assessment of Investment Analysis ver. 05", only variables (including the initial investment cost) that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (at least a range of +10% and –10%, is recommended by this guidance).

According to the economic evaluation of the project, the following parameters are included in the sensitivity analysis:

a) Energy price
b) Energy generation
c) Firm capacity
d) Firm capacity price
e) Operational costs
f) Project Investment

The project IRR (100% equity) is analyzed for a fluctuation of +10% for energy price, energy generation, firm capacity and firm capacity price; and -10% for operational costs and investment; the six parameters are analyzed independently and the results are shown in the following table:

Table 12. Sensibility analysis results

Parameter	Fluctuation (%)	IRR (%)
a) Energy price	+10%	7.86
b) Energy generation	+10%	7.86
c) Firm capacity	+10%	6.59
d) Firm capacity price	+10%	6.59
e) Project costs	-10%	6.86
f) Project Investment	-10%	7.84

Therefore, the conclusion that CDM project activity is not the most economically attractive alternative is robust to reasonable variations in the critical assumptions

STEP3. *Barriers analysis*

The Project activity doesn't consider a barrier analysis to demonstrate additionality

STEP4. *Common Practice analysis*

The "Tool for demonstration and assessment of additionality" v. 06.0.0 (EB 65) suggests on this step that the above generic additionality tests shall be complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and region. This test is a credibility check to complement the investment analysis (Step 2) or barrier analysis (Step 3). The Step 4 requires to (a) Analyze other activities similar to the proposed project activity, and, if so, to (b) Discuss any similar Options that are occurring.

This step considers to provide an analysis of any other activities that are operational and that are similar to the proposed project activity, considering similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis.

In this CDM project, the applicable geographical area by default is Chile and it includes all the national electricity grids: SIC, SING[16], Magallanes, Aysén and Easter Island Electricity Systems.

According to paragraph 43 of the "Tool for demonstration and assessment of additionality" v. 6.0.0 if a CDM project corresponds to one of the measures listed in paragraph 6, the Common Practice analysis should be according to paragraph 47 and not by following Sub-step 4a and Sub-step 4b detailed in paragraph 44 to 46. Thus, the measure of Ckani Project activity must be analyzed through paragraph 6.

[16] SIC: Central Interconnected Grid (Sistema Interconectado Central in Spanish); SING: Great North Interconnected Grid (Sistema Interconectado del Norte Grande in Spanish).

In paragraph 6 of this tool it is defined that the *measure* (for emission reduction activities) *is a broad class of greenhouse gas emission reductions activities possessing common features*. In this framework there are four measures considered:

(a) Fuel and feedstock switch;
(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);
(c) Methane destruction;
(d) Methane formation avoidance.

Considering these definitions, the current CDM project corresponds to the measure (b) Switch of technology with change of energy source since it is an ENRC Greenfield power plant activity that will deliver energy to the grid that would otherwise been generated by grid connected fuel based power plants.

According to paragraph 47 of the "Tool for demonstration and assessment of additionality v.06.0.0" four steps must be analyzed to determine common practice for projects listed in paragraph 6. The analysis of these steps for the Ckani Wind Farm Power Project are submitted below and detailed in the Common Practice Spreadsheet.

Step 1: Calculation of the applicable output range (installed capacity).

The output range is calculated based in the CDM project design capacity of 240 MW, then the calculated applicable output range of installed capacity is:

-50%: 120 MW
+50%: 360 MW

Step 2: Calculation of N_{all}

In the Common Practice Spreadsheet are identified all plants that deliver the same capacity within the applicable output range calculated in Step 1 (120 – 360 MW), as the proposed project activity and have started commercial operation before the start date of the project. Then, the calculated number N_{all} is 29.

The following table details the information of each N_{all} plant considered for this analysis.

Table 13. List of all plants that are within the output range calculated based on the design capacity

System	Power Plant	Registered CDM Projects/Under validation	Energy source / fuel	Capacity (MW)
SIC	Alfalfal	No	Hydro	178.0000
SIC	Canutillar	No	Hydro	172.0000
SIC	Rucúe	No	Hydro	178.0000
SIC	Antuco	No	Hydro	324.0000

System	Power Plant	Registered CDM Projects/Under validation	Energy source / fuel	Capacity (MW)
SIC	Abanico	No	Hydro	129.0000
SIC	Ventanas 2	No	Coal	218.5000
SIC	Los Vientos	No	Diesel	125.0000
SIC	Santa Lidia	No	Diesel	132.0000
SIC	Candelaria	No	Natural Gas	272.0000
SIC	Nueva Ventanas	No	Coal	267.0000
SIC	Bocamina	No	Coal	127.0000
SIC	Taltal 1	No	Natural Gas	120.0000
SIC	Taltal 2	No	Natural Gas	120.0000
SIC	Quintero	No	Diesel	289.7800
SIC	Cardones	No	Diesel	153.0400
SIC	Los Espinos	No	Diesel	136.9600
SING	TERMOLÉCTRICA ANDINA - CTA	No	Coal	168.8000
SING	TERMOELÉCTRICA ANGAMOS - ANG1	No	Coal	272.3570
SING	TERMOELÉCTRICA ANGAMOS - ANG2	No	Coal	272.5960
SING	TERMOELÉCTRICA TARAPACÁ - CTTAR	No	Coal	158.0000
SING	TERMOELÉCTRICA MEJILLONES - CTM1	No	Coal + Petcoke	165.9000
SING	TERMOELÉCTRICA MEJILLONES - CTM2	No	Coal + Petcoke	175.0000
SING	TERMOELÉCTRICA MEJILLONES - CTM3	No	Natural Gas	250.7500
SING	TERMOELÉCTRICA TOCOPILLA - U14	No	Coal	136.4000
SING	TERMOELÉCTRICA TOCOPILLA - U15	No	Coal	130.3000
SING	TERMOELÉCTRICA HORNITOS - CTH	No	Coal	170.1000
SING	TERMOELÉCTRICA NORGENER - NTO1	No	Coal + Petcoke	136.3000
SING	TERMOELÉCTRICA NORGENER - NTO2	No	Coal + Petcoke	141.0400
SING	SALTA - CC SALTA	No	Natural Gas	229.0000

Step 3: Calculation of N_{diff}

In this step, from the plants identified in step 2, there should be identified all the plants that use a different technology than the technology applied in the proposed project activity (N_{diff}).

According to the definition of different technologies stated in paragraph 9 of the "Tool for demonstration and assessment of additionality v.06.0.0, in the context of the current CDM project activity, would be plants that deliver the same output and that differ by:

a) Energy source.

The project activity uses wind power as energy source, therefore projects that use geothermal, hydro, biomass, diesel, gas, coal or other energy source are considered as different technologies.

Then, as it's shown in the table above, the calculated number N_{diff} is 29

Step 4: Calculation of factor F.

The calculated factor F is 0 (=1- 29/29), which means that 0% of the operating technologies in Chile are similar as the used in the proposed project.

Finally, the Step 4 states that a 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, from which it may be concluded that the proposed project activity is not a "common practice" in Chile, because it does not comply with neither of both condition. This means that, in the country there are no similar technologies as applied in the proposed project that deliver energy to the national electric systems, including SIC, SING, Magallanes, Aysén and Easter Island.

As a result of the previous analysis, the Ckani Wind Farm Project has proved not to be a "common practice".

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the ACM0002 version 12.2.0 methodology applicable to the project activity, the baseline scenario is the electricity delivered to the grid by the project activity that 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 v.02.2.1".

The emission reductions are calculated as the difference between the emission of the baseline scenario and the emissions due to the Project activity and the associated leakage.

Project emissions

For most renewable power generation project activities, there are no emission sources and greenhouse gases involved, except for geothermal, solar thermal and some hydro power projects. Since Ckani Wind Farm project is wind electricity generation power plant, the project activity's greenhouse gases emissions are equal to zero ($PE_y = 0$).

Baseline emissions

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

Equation 1: Baseline emissions

$$BE_y = EG_{PJ,y} \bullet EF_{gridCM,y}$$

Where:

BE_y : Baseline emissions in year *y* (tCO_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" version 02.2.1 (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) Greenfield plants, (b) retrofits and replacements, and (c) capacity additions. Since the project activity is a Greenfield renewable energy power plant because of the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

Equation 2: Project activity electricity generation

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{PJ,y}$: 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)

$EG_{facility,y}$: : Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

Calculation of $EF_{grid\ CM,,y}$

The Combined margin emission factor ($EF_{grid,CM,y}$) is determined in accordance with the "Tool to calculate the emission factor of an electricity system" version 02.2.1, which includes six steps to be applied:

STEP 1. Identify the relevant electricity systems.

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

The steps and formulae used to estimate baseline emissions and project emissions of the proposed project activity are described below:

STEP 1. ***Identify the relevant electric systems***

There are five connected electricity systems in Chile; SING, SIC, Aysen, Magallanes and Easter Island systems which cover different geographical locations along the country. All of them operate independently and do not transfer electricity to each other, so neither imports nor exports are observed in any of the mentioned systems.

Due to the location of the project activity, it is connected to the SING electricity system so it has been identified as the project electricity system and all the necessary information of the power plants within the SING, will be considered to calculate the build margin and the operating margin emission factor

STEP 2. ***Choose whether to include off-grid power plants in the project electricity system***

Option I is selected: Only grid power plants connected to the SING are included in the calculation.

STEP 3. ***Select a method to determine the operating margin (OM).***

The selected OM emission factor method from the "Tool to calculate the emission factor of an electricity system" version 02.2.1 is Option (d) Average OM. In this method the emission factor is calculated as the average emission rate of the all power plants serving the grid, including the low-cost/must-run power plants.

The data vintage chosen for the calculation of the OM emission factor is the ex-ante option, where calculations are based on a 3-year generation-weighted average and the most recent data (2010, 2009, and 2008) available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emission factor during the crediting period.

STEP 4. ***Calculate the operating margin emission factor according to the selected method.***

The average OM is calculated based on data of the net electricity generation and CO_2 emission factor of each power unit (option A). Since at the moment of submission of the PDD information regarding electricity consumption was available only at company level, not by power unit, all calculations were performed using data of fuel consumption and net electricity generation by company.

The operating margin emission factor for the year y is calculated using the next equation.

Equation 3: Operating Margin emission factor for year y

$$EF_{grid,OMAve,y} = \frac{\sum_{m} EG_{m,y} \bullet EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMAve,y,}$	: Average operating margin CO_2 emission factor in year *y* (tCO_2/MWh).
$EG_{m,y}$	: Net quantity of electricity generated and delivered to the grid by power plant / unit *m* in year *y* (MWh).
$EF_{EL,m,y}$	: CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m	: All power units serving the grid in year *y* .
y	: The three most recent years for which data is available at the time of submission of the CDM PDD to de DOE for validation (ex-ante option).

The CO_2 emission factor of each power unit is determined using options A1 or A2, as indicated in the "Tool to calculate the emission factor of an electricity system" version 02.2.1, using the most recent historical year (2010, 2009 and 2008) for which power generation data is available.
For power plants where data on fuel consumption and electricity generation is available, the emission factor should be determined using Option A1 as follows:

Equation 4: CO_2 emission factor of power units. Option A1

$$EF_{EL,m,y} = \frac{\sum_{i} FC_{i,m,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{EL,m,y}$	: CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$	: Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (mass or volume unit)
$NCV_{i,y}$	: Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	: CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	: Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m	: All power units serving the grid in year *y*.
i	: All fossil fuel types combusted in power unit *m* in year *y*
y	: The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option).

When using option A1, data on fuel consumption of a particular power plant/unit ($FC_{i,m,y}$) can be obtained from the total amount of fuel in mass units (kg or m^3), from CDEC-SING;

In cases where power units haven't got available data of fuel consumption, the emission factor for those power plants was determined using option A2 and the following equation:

Equation 5: CO_2 emission factor of power units. Option A2

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:

$EF_{EL,m,y}$	: CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,i,y}$	:Average CO_2 emission factor of fuel type *i* used in power unit m in year y (tCO_2/GJ)
$\eta_{m,y}$	: Average net energy conversion efficiency of power unit *m* in year *y* (ratio)
m	: All power units serving the grid in year *y*.
i	:All fossil fuel types combusted in power unit *m* in year *y*
y	: The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option).

STEP 5. *Calculate the build margin (BM) emission factor.*

The BM emission factor is determined in accordance to Option 1 of the "Tool to calculate the emission factor of an electricity system" version 02.2.1, where for the first crediting period the build margin emission factor is calculated ex-ante based on the most recent information available (2010) on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the BM emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the BM emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

The sample group of power units *m* used to calculate the build margin is determined as per the following procedure provided in the "Tool to calculate the emission factor for an electricity system v.02.2.1":

(a) Identify the set of five power units, excluding units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET5\text{-units}}$ in MWh);

(b) Determine the annual electricity generation of the project activity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation, $AEG_{SET \geq 20\%}$ in MWh).

(c) From SET $AEG_{SET5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid.

If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

The $SET_{\geq 20\%}$ was selected as the SET_{sample} because it is the set of power units that comprises the larger annual generation (compared to $SET_{5\text{-units}}$).

The $SET_{\geq 20\%}$ consists in the power units (excluding CDM project activities) that started to supply electricity to the system most recently and that comprises the 20 % of the annual total electricity generation in the system excluding electricity generated by CDM project activities.

Considering that the SET_{sample} include power units that started to supply electricity to the SING grid more than 10 years ago (year 2000 is included in the analysis); options d), e) and f) of the "Tool to calculate the emission factor for an electricity system v.02.2.1" were analyzed. At the time of the PDD submission there is no power plant registered as CDM project activity in the SING, therefore the option (f) of the "Tool to calculate the emission factor for an electricity system v.02.2.1" is considered and the sample group SET_{sample} include power units older than 10 years until the set comprises 20% of generation.

The build margin emission factor is the generation-weighted average emission factor (tCO_2/GWh) of all power units *m* during the most recent year *y* (2010) for which power generation data is available, calculated as follows:

Equation 6: Build Margin emission factor

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \bullet EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	: Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	: Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$	: CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m	: Power units included in the build margin
y	: Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) is determined using option A1 (represented by Equation 4) and A2 (represented by Equation 5), using for *y* the most recent historical year (2010) for which power generation data is available, and using for *m* the power units included in the build margin.

STEP 6. ***Calculate the combined margin (CM) emissions factor.***

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on method (a) Weighted average CM as follows:

Equation 7: Combined Margin emission factor

$$EF_{grid,CM} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

$EF_{grid,CM,}$:Combined margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$:Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$:Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} :Weighting of operating margin emissions factor (%)
w_{BM} :Weighting of build margin emissions factor (%)

The default values per Wind generation project activities established by the "Tool to calculate the emission factor for an electricity system v.02.2.1" are 75% for W_{OM} and 25%W_{BM}.

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

Equation 8: Emission Reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y : Emission reductions for the year y (tCO_2/y).
BE_y : Baseline emissions for the year y (tCO_2/y).
PE_y : Project emissions for the year y (tCO_2/y).
LE_y : Leakage emissions for the year y (tCO_2/y).

Since there isn't any project emission because the electricity is generated by a renewable source and there is no leakage emission, the emission reductions will be the baseline emission. Baseline emissions are estimated multiplying the combined margin by the electricity generation.

B.6.2. Data and parameters that are available at validation:

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Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh/y
Description:	Net electricity generated and delivered to the grid by power plant/unit m in year y.
Source of data to be used:	CDEC-SING Annual Report
Value applied	Refer to Annex 3, Table 16
Justification of the choice of data or description of	Available in CDEC-SING Web site: http://cdec2.cdec-sing.cl/portal/page?_pageid=33,44050&_dad=portal&_schema=PORTAL. "Energy generation/ monthly detail of energy generation"

measurement methods and procedures actually applied:	
Any comment:	Data from CDEC-SING represents the most recent and reliable information available.

Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	For Diesel and Coal: kg/year, for Natural Gas: m^3/year
Description:	Amount of fossil fuel type *i* consumed by power plant/unit *m* in year y
Source of data to be used:	CDEC-SING Annual report
Value applied	Refer to Annex 3, Table 17
Justification of the choice of data or description of measurement methods and procedures actually applied:	Available in CDEC-SING Web site: http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_inf_anuario_pub.sp_consu_central_anual. Official Annual Report 2010. Energy generation by power plant 1996-2011, "conscomb" sheet.
Any comment:	Data from CDEC-SING represents the most recent and reliable information available.

Data / Parameter:	**$NVC_{i,v}$**
Data unit:	For Diesel and Coal: [GJ/kg] and For Natural Gas: [GJ/m^3]
Description:	Net calorific value (energy content) of fossil fuel type *i* in year y
Source of data to be used:	Energy National Balance 2010, Energy National Commission (CNE) Revised 1996 IPCC Guidelines, page 1.4.
Value of data	Refer to Annex 3, Table 19
Description of measurement methods and procedures to be applied:	Gross calorific value of CNE (available at http://www.cne.cl/cnewww/export/sites/default/06_Estadisticas/Documentos/BNE2008.xls) multiplied by: 0.9 for gas and 0.95 for liquid and solid fuels from IPCC 2006. Volume 2. Energy. Chapter 1. Section 1.4.1.2. Units conversion from Kcal to TJ (available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html)
Any comment:	

Data / Parameter:	**$EFco_{2i,v}$ and $EF_{CO2,m,i,y}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i used in power unit *m* in year y
Source of data to be used:	IPCC revised guidelines (2006).
Value of data	Refer to Annex 3, Table 19
Description of measurement methods and procedures to be applied:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 2.4 of Chapter 1, Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories. Available at Web Page: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html
Any comment:	

Data / Parameter:	η_m
Data unit:	%
Description:	Efficiency of power plant *m*
Source of data used:	Defaults values from "Tool to calculate the emission factor for an electricity system v.02.2.1" page 27 Available in Web Page: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
Value applied	Defaults values from "Tool to calculate the emission factor for an electricity system v.02.2.1" page 27
Justification of the choice of data or description of measurement methods and procedures actually applied:	This data is used to calculate the emission factor of a plant m (as per option A2 of the tool to calculate the emission factor of an electricity system) in case that there is no fuel consumption data available from public national sources like CDEC-SING (fossil fuel consumption) and CNE (specific fossil fuel consumption).
Any comment:	This parameter is only used if no fuel consumption data is available.

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for SING grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system v.02.2.1”
Source of data used:	Calculated as per the “Tool to calculate the emission factor for an electricity system” version 02.2.1; based on: - CDEC-SING Annual Report - Energy National Balance 2010, Energy National Commission (CNE) - Revised 1996 IPCC Guidelines Defaults values from "Tool to calculate the emission factor for an electricity system v.02.2.1" page 27
Value applied	0.708
Justification of the choice of data or description of measurement methods and procedures actually applied:	This data is used to calculate the combined emission factor of SING grid. All data is available from public national sources like CDEC-SING (fossil fuel consumption) and CNE (specific fossil fuel consumption) or international available data like IPCC Guideline.
Any comment:	The $EF_{grid,CM,y}$ value will be fixed ex- ante

B.6.3. Ex-ante calculation of emission reductions:

>>

The general equations and assumptions are already explained in Chapter B.6.1 and all data used to estimate ex-ante emission reductions can be found in Annex 3. The ex-ante calculations of emission reductions for the project are detailed below.

Baseline Emissions

The estimated energy generation of the project activity for year 1 is approximately 202,201.87 MWh, for year 2 is approximately 404,403.74 MWh and for year 3 and the rest of the crediting period is approximately 688,346.78MWh

The CO_2 emission factor of the grid ($EF_{CO2grid,y}$= 0.708 tCO_2/MWh) was calculated in a transparent and conservative manner as a combined margin consisting in a combination of operating margin (OM) and a build margin (BM) according procedures prescribed in the “Tool to calculate the Emission Factor for an electricity system” version 02.2.1 as follows.

Operating Margin (OM) Emission Factor

A transparent ex-ante calculation of the OM emission factor is presented below, applying all relevant equations presented in section B.6.1 above, provided in the “Tool to calculate the emission factor for an electricity system” version 02.2.1 and using the data presented in Annex 3.

The values used for estimating the emission factor for each power plant included in the OM are exposed in the tables presented in Annex 3 and depending on annual fuel consumption or specific fuel consumption data availability options A1 and A2 are applied, using Equation 4 and Equation 5, respectively. The OM emission factor is calculated using Equation 3**.**

The operating margin emission factors for 2008, 2009 and 2010 are calculated below:

$$EF_{OM,2008} = \frac{11,430,580}{13,697,694} = 0.834 tCO_2 / MWh$$

$$EF_{OM,2009} = \frac{11,030,289}{14,114,369} = 0.781 tCO_2 / MWh$$

$$EF_{OM,2010} = \frac{11,229,929}{14,267,131} = 0.787 tCO_2 / MWh$$

The full generation-weighted average operating margin emission factor for the most recent 3 years is 0.801 tCO_2/MWh

Build margin (BM) emission factor

A transparent ex-ante calculation of the BM emission factor is presented below, applying all relevant equations presented in section B.6.1 above, provided in the “Tool to calculate the emission factor for an electricity system” version 02.2.1 and using the data presented in Annex 3.

The values used for estimating the emission factor for each power unit included in the BM are exposed in Table 18 presented in Annex 3 and depending on annual fuel consumption or specific fuel consumption

data availability options A1 and A2 were applied, using Equation 4 and Equation 5, respectively. The BM emission factor is calculated for year 2010 using Equation 6.

The option selected to calculate the build margin was option (b) of the tool. The option was selected since power plant capacity additions in the electricity system that include the 20% of the system net generation and have been built most recently comprises a larger annual generation than the five power units that have been built most recently as it can be seen in the Table 18 in Annex 3.

Using the values presented in Annex 3 the following value for the BM emission factor is calculated:

$$EF_{BM} = \frac{1,258,118}{2,934,539} = 0.429 tCO_2 / MWh$$

Finally the Build Margin Emission factor of the grid is 0.429 tCO_2/MWh

Combined margin (CM) emission factor

Using the $EF_{grid,OM}$ value, the $EF_{grid,BM}$ value and the weighting values of the OM (w_{OM} = 75%) and the BM (w_{BM} = 25%), the CM emission factor estimation is calculated as follows:

$$EF_{CM} = 0.75 \times 0.801\ tCO_2/MWh + 0.25 \times 0.429\ tCO_2/MWh = 0.708\ tCO_2/MWh$$

Finally, the baseline emission factor of the grid is 0.708 tCO_2/MWh

Project Activity Emissions
For this wind project, $PE_y = 0$.

Leakage
There is no energy generating equipment being transferred from another activity, therefore leakage is not considered in this project activity (LE_y=0).

Table 14 summarizes the results for OM emission factor of 0.801 tCO_2/MWh and BM emission factor of 0.429 tCO_2/MWh. These values are used to obtain an estimation of the CM emission factor of 0.708 tCO_2/MWh.

Table 14. Emissions Reduction Estimation Data

Variable	Unit	Value
OM Emissions Factor ($EF_{grid,OM-ave,y}$)	tonnes CO_2e/MWh	0.801
BM Emissions Factor ($EF_{grid,BM,y}$)	tonnes CO_2e/MWh	0.429
CM Emissions Factor ($EF_{grid,CM,y}$)	tonnes CO_2e/MWh	0.708

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>
The following table represents the emission reduction results of the project activity for the crediting period:

Table 15. Summary of the ex-ante emission reductions

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
2013*	0	143,092	0	143,092
2014**	0	286,185	0	286,185
2015***	0	487,123	0	487,123
2016	0	487,123	0	487,123
2017	0	487,123	0	487,123
2018	0	487,123	0	487,123
2019	0	487,123	0	487,123
Total (tonnes of CO_2 e)	0	2,864,892	0	2,864,892

(*) Considering 47 turbines operating
(**) Considering an addition of 47 turbines and a total of 94 turbines operating
(***) Considering an addition of 66 turbines and a total of 160 turbines

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

>>

Given that the emission factor is calculated ex-ante and according to the "Tool to calculate the emission factor of an electricity system v. 02.2.1", the only data to be monitored is the electricity supplied to the grid.

Data / Parameter:	$EG_{PJ,y} = EG_{Facility}$
Data unit:	[MWh/y]
Description:	Quantity of net electricity generation supplied by Ckani to the SING grid in year y
Source of data to be used:	Measured by a bi-directional meter located at the project site substation that connects the project to the SING grid.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Year 1: 202,201.87 MWh/y Year 2: 404,403.74 MWh/y Year 3 and ahead: 688,346. 78 MWh/y
Description of measurement methods and procedures to be applied:	The electricity exported by the project activity and imported from the grid will be continuously measured by a bi-directional meter and recorded monthly. The electricity meter should have a maximum error of 0.2% according with Chilean regulations "Manual de procedimientos Nº 13. Instalación, lectura,

	sincronización y mantenimiento de equipos de medida utilizados en la valorización de transferencias entre integrantes del CDEC-SING [17]" which is based in the international norm IEC (Internacional Electrotechnical Comission). The meter will be calibrated according to local grid standards.
QA/QC procedures to be applied:	The measurements will be crosschecked with the records for sold electricity and the smaller value of the two will be considered in a conservative manner.
Any comment:	The data will be archived electronically and kept until two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.2. Description of the monitoring plan:

>>

1. Monitoring organization

The project activity contemplates the designation of a proper staff to perform all the CDM monitoring tasks and AM Eolica Alto Loa SpA. will manage all the activities involved in the monitoring procedures which comprises an on site operator, which will be in charge of downloading the data from the main meter every month, a project supervisor, which will be in charge of gathering the data and sending it to the CDM manager.

The CDM manager will be in charge of archiving and processing all the data collected and also will be in charge of crosschecking the information with the project sales receipts.

The CDM manager will be in charge of coordinating the performances of the calibrations and reporting any special events (i.e. meter errors, stoppages, etc.).

The CDM manager is also responsible of ensuring that the operating staff members are properly trained.

2. Monitoring equipment and installation

The main electricity meter for the measurement of the electricity supplied to the grid will be installed at the project substation which connects the project to the grid.

This meter will have a maximum error of 0.2% according with Chilean regulations and will be calibrated according to local grid standards.

The measurements will be crosschecked with the records for sold electricity and the smaller value of the two will be considered in a conservative manner.

3. Data recording procedure

a) Metering Electricity Delivered to the Grid

[17] Document available at CDEC-SING Web site: http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_web_cdec_pages.pagina?p_id=3009

- Electricity generation data will be downloaded from the meter every one month and kept for CDM verification and cross-check invoicing purposes.
- The data will be archived until two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later

b) Main meter failure

In case the main meter is found to be beyond the permissible error then the error encountered will be discounted to all meter readings since the last calibration was performed as a conservative approach. However, the meter will be calibrated as soon as possible once the error is detected.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

>>
06/01/2012

POCH AMBIENTAL S.A.
Ignacio Rebolledo, Carolina Urmeneta and Fiona Bello
Renato Sánchez 3838, Las Condes, Santiago, Chile
Telephone number: (56 - 2) 207 0154
ignacio.rebolledo@poch.cl, carolina.urmeneta@poch.cl, fiona.bello@poch.cl.

The entity is not a project participant

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
17/01/2012. The starting date of the project activity will be the date the agreement for turbines supply is signed, between the project participant and the equipment supplier

C.1.2. Expected operational lifetime of the project activity:

>>
20 years, 0 months.

The lifetime is defined by the turbine supplier (Goldwind).

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

>>
01/01/2013 or the registration date (whatever occurs later)

C.2.1.2. Length of the first crediting period:

>>
7 years, 0 month (renewable)

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
The Environment Evaluation Service (SEA[18]) is in charge of the Environmental Impact Assessment System (SEIA[19]), instrument that serves to analyze the environmental impact of different project initiatives and prevent the deterioration of the national environment. The SEIA relies on defined and specific criteria, as stated on the National Law Nº20417/2010[20] and the SEIA Regulation DS Nº95/2001[21] in order to determine whether a project requires to be subject matter to the system or not. If the project activity requires to be submitted to the SEIA and it results to be authorized, the proper authorities will make public their response through an authorization document (RCA[22]) published on the SEA Web page[23], and if the project activity does not require to be subject matter to the SEIA, a written letter expressing this matter is elaborated and presented to the project activity developer.

AM Eolica Alto Loa SpA submitted on the 04/05/2011 to the national authorities all required evidence related to Ckani Wind Farm project activity in an Environmental Impact Statement (DIA) and got his approval on the 14th of December, 2011 (RCA Nº0221).

All mitigation and management measures regarding the emissions, residues sources and project effects are considered by the Environmental Impact Statement.

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

[18] Spanish acronym for "Servicio de Evaluación Ambiental"
[19] Spanish acronym for "Sistema de Evaluación Ambiental"
[20] http://www.leychile.cl/Navegar?idNorma=1010459
[21] http://www.sinia.cl/1292/articles-37936_pdf_reglamento_seia.pdf
[22] RCA stands in Spanish for "Resolución de Calificación Ambiental" (Environmental Qualification Resolution)
[23] www.sea.gob.cl

>>
As mentioned in section D.1, the different stages of Ckani Wind Farm project fulfil the applicable national environmental regulations and requirements. The project does not generate environmental impacts considered significant and all necessary mitigation measures are considered in order to meet the environmental regulation. Measures are to be executed at its respective time in accordance with the approved environmental management assessment.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>
AM Eolica Alto Loa SpA performed two meetings with the local Stakeholder´s, specifically with the indigenous communities of "Estación San Pedro", "Conchi Viejo" and "Lasana".

The representatives of the first two communities attended the meeting on the 21st of November of 2011 at the Hotel "Diego de Almagro" located in the city of Calama. The second meeting was conducted on the 22nd of November of 2011 in the office of the indigenous community of "Lasana" in the locality of Lasana.

AM Eolica Alto Loa SpA invited the local stakeholders to the meetings through the presidents of each community to which their sent invitations. The presidents of each community informed the activity to their neighbor's trough different medias: telephone calls, trough their local meetings and in person. Some of the assistants also knew about the meeting through other neighbors that where contacted.

The meeting performed on the 21st of November was attended by 17 participants, including members of the directive board of the indigenous community of "Estación San Pedro" and other members of the community, the president of the community of "Conchi Viejo", among others

The meeting performed on the 22nd of November was attended by 16 participants, including representatives from the indigenous community of "Lasana", from the organization of rural clean water and neighbors of the community.

For both meetings the agenda considered the following topics:

- Project presentation
- Video of the project
- Climate change, Kyoto protocol, CDM project, emission reductions and contribution to the sustainable development
- Questions session[24]

Some of the pictures from the stakeholders meetings are presented in the followings figures:

[24] If any questions were made during the presentation, these were answered immediately.

Figure 6. 21st of November Stakeholders meeting

Figure 7. 22nd of November Stakeholders meeting

E.2. Summary of the comments received:

>>

Participating stakeholders where very interested in the project. Questions where made by the local neighbors and the representatives of the directive board of the communities that were present.

The main questions where related to:

- The layout of the project. It was explained and shown in a digital map where was the project located in relation to the lands of the neighbor indigenous communities.
- The stage of the project in the environmental evaluation process. It was explained that the project presented an Environmental Assessment Statement to the SEA on the 4th of May of 2011 and that there were presented two ADENDAS where there were explained some observations requested by the regional authorities and that it was expected to receive soon the approval RCA.
- Layout of the project and how does it operate. It was explained that the project considers the installation of 160 turbines and that the first stage considers construction 47 and that the planned distance between the wind turbines is 400m to side of each turbine and 900m from behind approximately. Finally it was explained that the wind farm doesn't use any fossil fuel to operate, just wind and that it delivers zero GHG.
- Where does the energy going to be delivered. It was explained that the generated energy will be delivered to the grid, specifically to the SING and that from there it was going to be delivered to the houses. Also it was explained that there wasn't any possibilities to deliver the energy directly to the houses because it is a Generation project and the technology doesn't permit the distribution of energy to the house.

E.3. Report on how due account was taken of any comments received:

>>

The questions were immediately answered at the meetings by the project developer.

There where some encouraging comments to the project and there was a lot of interest in the performance of more meetings to promote the project, to which the project developer answered that they where already considering it.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AM Eolica Alto Loa SpA
Street/P.O.Box:	Alonso de Córdova 5151, of. 1003, Las Condes
Building:	
City:	Santiago
State/Region:	Región Metropolitana
Postcode/ZIP:	
Country:	Chile
Telephone:	56 (2) 592 3100
FAX:	56 (2) 592 3101
E-Mail:	
URL:	
Represented by:	José Ignacio Escobar Troncoso
Title:	Legal representative
Salutation:	Mr.
Last name:	Escobar
Middle name:	Ignacio
First name:	José
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	jose.escobar@mainstreamrp.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Ckani Wind Farm project does not consider public funding.

Annex 3

BASELINE INFORMATION

Table 16. Net electricity generation and delivered to the grid by source, 2008-2010

Net Electricity generation MWh/year			
Company	**2008**	**2009**	**2010**
Celta	918,260.2	989,762.1	999,870.0
Electroandina	3,530,907.3	3,764,150.3	4,544,500.5
E-CL	3,234,542.0	3,044,967.7	2,682,154.7
AES Gener	1,132,140.9	1,340,181.0	953,078.9
GasAtacama	2,897,796.1	3,115,475.5	2,887,730.4
Norgener	1,955,378.5	1,826,321.6	2,120,336.5
Cavancha	15,168.8	14,671.8	14,203.6
Enernuevas	0.0	0.0	2,779.0
Enorchile	13,500.6	6,143.5	17,463.2
Inacal	0.0	12,695.5	44,123.2
Angamos	0.0	0.0	250.0
Andina	0.0	0.0	641.2
TOTAL	**13,697,694.4**	**14,114,368.9**	**14,267,131.1**

Table 17. Fuel Consumption per fuel in the SING

Fuel	**Fuel Consumption kg or m^3 (gas)/year**		
	2008	**2009**	**2010**
Coal	3,385,858,792.9	3,537,790,000.00	3,537,790,000.00
Natural gas	237,347,905.49	626,400,000.00	626,400,000.00
Diesel	762,685,776.54	367,966,490.00	367,966,490.00
Fuel oil Nº 6	109,929,156.75	100,053,192.99	87,371,480.00
TOTAL	**4,495,821,631.63**	**4,418,648,999.42**	**4,619,527,970.00**

Table 18. Build Margin Calculation Data

Company	**Power Plant**	**Unit**	**Sub Unit**	**Fuel Type**	**Starting Year**	**Gross Generation 2010 (GWh) Total**	**Unit Electricity consumption (GWh/y)**	**Power plant Net generation (GWh/y)**	**Emissions tCO_2/year**
ANDINA	Andina	CTA	CTA1	Coal	2010	0.64	0.00	0.64	12,184
ANGAMOS	Angamos	ANG1	ANG1	Coal	2010	0.25	0.00	0.25	203
ENERNUEVAS		MHAH	MHAH	Hydro	2010	1.28	0.00	1.28	0
ENERNUEVAS		MHT2	MHT2	Hydro	2010	1.50	0.00	1.50	
ENORCHILE	Estandartes	ZOFRI_7_1-12	ZOFRI_7	Diesel	2009	10.62	0.00	10.62	7,434
INACAL	INACAL	INACA	INACA	Fuel	2009	44.12	0.00	44.12	30,603

Company	Power Plant	Unit	Sub Unit	Fuel Type	Starting Year	Gross Generation 2010 (GWh) Total	Unit Electricity consumption (GWh/y)	Power plant Net generation (GWh/y)	Emissions tCO_2/year
		L	L 1	Oil Nro. 6					
ELECTROANDINA	Diesel Tamaya	SUTA	SUTA1d	Diesel	2009	0.00	0.00	0.00	125,462
ELECTROANDINA	Diesel Tamaya	SUTA	SUTA1	Fuel Oil Nro. 6	2009	187.14	11.35	175.79	
ENORCHILE	Diesel Zofri	ZOFRI_1-6	ZOFRI_1	Diesel	2007	1.14	0.00	1.14	4,258.32
ENORCHILE		ZOFRI_2-5	ZOFRI_2	Diesel	2007	5.70	0.00	5.70	
ELECTROANDINA	Termoelectrica Tocopilla	U16	U16-TGd	Diesel	2001	0.00	0.00	0.00	564,240
ELECTROANDINA	Termoelectrica Tocopilla		U16-TG	Natural Gas	2001	1,070.71	64.96	1,005.76	
ELECTROANDINA	Termoelectrica Tocopilla		U16-TVd	Diesel	2001	0.00	0.00	0.00	
ELECTROANDINA	Termoelectrica Tocopilla		U16-TV	Natural Gas	2001	456.12	27.67	428.45	
AES GENER	Salta	CC SALTA	TV10d	Diesel	2000	0.00	0.00	0.00	299,736
AES GENER	Salta		TV10	Natural Gas	2000	924.83	4.83	919.99	
E-CL	Termoelectrica Mejillones	CTM3	CTM3-TGd	Diesel	2000	142.19	10.64	131.55	213,997
E-CL	Termoelectrica Mejillones		CTM3-TG	Natural Gas	2000	81.98	6.14	75.85	
E-CL	Termoelectrica Mejillones		CTM3-TVd	Diesel	2000	95.41	7.14	88.26	
E-CL	Termoelectrica Mejillones		CTM3-TV	Natural Gas	2000	47.16	3.53	43.63	
TOTAL								**2,934.5**	**1,258,118**

Table 19. Fossil Fuel Data

Fuel type *i*	CO_2 Emission Factor $EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$ [tCO_2/GJ]	Gross calorific Value $GCV_{i,y}$ [Kcal/Kg; Kcal/m^3 (gas)]	GCV to NCV Conversion factor according to IPCC guidelines	Net Calorific Value $NCV_{i,y}$ [GJ/kg; GJ/m^3 (gas)]
Coal	0.0895	7,000	0.95	0.028
Diesel	0.0726	10,900	0.95	0.043
Natural Gas	0.0543	9,341	0.90	0.035
Fuel Oil Nº6	0.0755	10,500	0.95	0.042

Annex 4

MONITORING INFORMATION

All the monitoring information is presented in the PDD.