

MANANTIALES BEHR WIND FARM

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Manantiales Behr (MB) wind farm project (hereinafter referred to as the Project) consists of the installation of a Greenfield wind power plant located in the department of Escalante, Province of Chubut, in the south of Argentina and connected to the Argentine Interconnection System (hereinafter referred to as the SADI, from the Spanish “Sistema Argentino de Interconexión”).

Despite Argentina’s great wind potential, wind power generation projects such as the MB wind farm so far only represent a small share of the country’s electricity matrix. According to Wholesale Electricity Market Administration Company (hereinafter referred to as CAMMESA, from the Spanish “), wind power plants represented by the end of 2016 only 1% (187 MW) of the country’s installed capacity¹. Given this context, projects like MB wind farm represent an important renewable and clean non-conventional alternative for electricity generation and a valuable contribution to the diversification of the Argentine energy matrix.

The Project consists in two phases of 49.5 MW each one - that are expected to start operation in August and December 2018, respectively - totalizing 99 MW.

The Project net electricity generation is projected to be 502,900 MWh/year on a P50 basis. This electricity delivered by the project activity to the grid would otherwise be generated by the operation of grid-connected power plants and by the addition of new generation sources. Thus, the project will generate greenhouse gases (GHG) emission reductions by displacing electricity that in the baseline would be produced by fossil fuel based power plants connected to the SADI.

The estimated annual average emissions reductions generated by the project during the 10 years crediting period are 251,000 tCO₂e/year.

The project will contribute to the sustainable development of Argentina by, among others:

- Reducing GHG and local air pollutants (SO₂, NO_x and PM) emissions from the country’s energy matrix;
- Improving energy supply security and grid stability by increasing diversification of power generation sources in terms of technologies and geographic location.
- Stimulating the regional economy by increasing job opportunities for local workers and service suppliers.
- Improving the local infrastructure (roads, electricity lines, etc.)

1.2 Sectoral Scope and Project Type

Sectoral scope: 01; Energy industries (renewable - / non-renewable sources)

The Project is not a grouped GHG project.

¹ Yearly Report 2016; CAMMESA; 20/10/2017; Available at:
<http://portalweb.cammesa.com/memnet1/Pages/descargas.aspx>

1.3 Project Proponent

Organization name	YPF Energía Eléctrica S.A. (YPF LUZ)
Contact person	Santiago Sajaroff
Title	Chief Operation Officer
Address	Macacha Güemes 515, Buenos Aires
Telephone	+54 11 54413985
Email	santiago.sajaroff@ypf.com

1.4 Other Entities Involved in the Project

Organization name	Not applicable
Role in the project	Not applicable
Contact person	Not applicable
Title	Not applicable
Address	Not applicable
Telephone	Not applicable
Email	Not applicable

1.5 Project Start Date

1st August 2018.

Is the commercial operation date (COD) of the project's phase 1 (49.5 MW) when it officially started to dispatch electricity to the Argentinean electricity system, as allowed by CAMMESA's authorization dated on 31/07/2018.

The commercial operation of the second phase (49.5 MW) was completed on 22nd December, 2018 according to CAMMESA's authorization dated on 21/12/2018..

1.6 Project Crediting Period

Project crediting period: 10 years, extendable twice for another 10 years each time.

Start date: 01/08/2018

End date: 31/07/2028

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 2018 (from 01/08/2018)	57,545
Year 2019	255,976
Year 2020	255,976
Year 2021	255,976
Year 2022	255,976
Year 2023	255,976
Year 2024	255,976
Year 2025	255,976
Year 2026	255,976
Year 2027	255,976
Year 2028 (Until 31/07/2028)	148,677
Total estimated ERs	2,510,006
Total number of crediting years	10
Average annual ERs	251,000

1.8 Description of the Project activity

The Manantiales Behr Project is a Greenfield wind farm to be connected to the SADI.

It consists of the installation of 30 aero-generators Vestas, model V-112 3.3 MW IEC IB Class, of 3.3 MW each, totalizing 99 MW of installed capacity, with a hub height of 84 meters and a sweep area of 112 meters.

The main technical parameters of the MB wind farm are illustrated in the table below:

Technical Parameter	Unit	Phase I	Phase II	MB wind farm	Reference
Installed capacity	MW	49,5	49,5	99,0	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 8; August 2016
Plant load factor (%) – P50	%	58.4%	57.5%	58.0%	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 11 (PAE with exceedances levels (20 years)); August 2016
Project net electricity generation – P50	MWh/yr	253,400	249,500	502,900	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 11 (PAE with exceedances levels (20 years));

					August 2016
Project technical lifetime	Years	20	20	20	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 9; August 2016

As stated in the table above, the wind farm load factors have been determined by a third party specialized company (EAPCSUR Wind Energy) based on 3 years historical data². The load factor is estimated based on the long-term average electricity generation with 50% probability of occurrence in any given year (P50).

The energy generated by the complex is transmitted to a new substation constructed and owned by YPFEE (SE Manantiales Behr) which is connected to the SADI through a 21 km high tension transmission line that connects YPEE's substation to the substation SE Escalante where the electricity billing meter (the main meter) is located

As this is a greenfield project, there are no facilities, systems and equipment in operation under the existing scenario prior to the implementation of this project.

1.9 Project Location

The Project is located in the San Jorge Gulf basin within the Manantiales Behr reservoir operated by YPF S.A., in Escalante Department, province of Chubut, approximately 40 km north-west from Comodoro Rivadavia city, Argentina.

The geographic coordinates of the project are:

Latitude: 45° 40' 12" S

Longitude: 67° 46' 48" W



² Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 10; August 2016.

1.10 Conditions Prior to Project Initiation

As above mentioned, this is a Greenfield project, there are no facilities, systems and equipment in operation under the existing scenario prior to the implementation of this project.

According to the methodology ACM0002 Version 19.0: "if the project activity is the installation of a Greenfield power plant, the baseline scenario is the 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".

The baseline scenario is the same as the conditions existing prior to the project initiation. Refer to Section 2.4 (Baseline Scenario) for the description of the scenario.

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The following list summarizes the applicable regulatory framework met by the project:

National level

- National Constitution
- Law N° 24,065 "Electric Energy Regime" and its Decree N°1,398/92
- Law N°25,675 "General Environment Law"
- Law N°25,019 "National Regime of Solar and Wind Energy" and its Decrees N°1,220/98 and N°1,597/99.
- Law N°26,190 "Renewable Sources of Energy Promotion Regime"

Chubut Province

- Chubut Province Constitution
- Law XI N°35 "Chubut Province Environmental Code"
- Law N°4,389 "Wind Activity Regulation" and its regulatory Decree N°235/99
- Decree N°185/09 (provides guidelines on how to submit the Environmental Impact Assessment)

The Project complies with all national law and regulations applicable since the Environmental Impact Assessments (EIA) of the wind power plant and the transmission line between the project and the substation were approved by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016 (Disposición N°155/16-SGAyDS) and 12/08/2016 (Disposición N°137/16-SGAyDS), respectively.

Additionally, in the context of the Argentinean electricity market, all new agents (generators, self-generators, cogenerators or transmission agent) that aim to participate in the Wholesale Electricity Market (MEM, due to its name in Spanish) have to present the request to be a MEM agent in conjunction with the Environmental Impact Assessment to the Argentinean Ministry of Energy³.

The Project is in compliance with this requirement given that it obtained the authorization to be a MEM agent by Resolution E 468/2016 of the Secretariat of Electric Energy of the Argentinean Government.⁴

³ Available at: <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=3433>. Accessed on: 26/06/2018

⁴ Available at: <http://servicios.infoleg.gob.ar/infolegInternet/verNorma.do?id=269266>. Accessed on: 26/06/2018

1.12 Ownership and Other Programs

1.12.1 Project Ownership

The following documents (provided to the VVB at validation) prove YPFEE ownership of MB wind farm:

- Legal title to the project's land from 23/09/2005;
- Project ownership arising under Resolution E 468/2016 (15/12/2016) of the Secretariat of Electric Energy of the Argentinean Government, which authorize YPFEE S.A. to act as Wholesale Electricity Market (MEM) Agent for its project Manantiales Behr wind farm.

1.12.2 Emissions Trading Programs and Other Binding Limits

GHG removals generated by the project will not be used for compliance with binding limits to GHG emissions since Argentina does not have GHG emission compliance nor trading programs in place.

1.12.3 Other Forms of Environmental Credit

Manantiales Behr Wind Farm Project is a Greenfield and is not registered in any other GHG program.

1.12.4 Participation under Other GHG Programs

The project neither has been registered nor is seeking for registration under any other GHG programs.

1.12.5 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The Manantiales Behr project is not a grouped project.

Leakage Management

According to the applicable methodology ACM0002 Version 19.0 no leakage emissions are considered for a Greenfield wind power project. Thus, neither a leakage management plan nor leakage mitigation measures are required.

Commercially Sensitive Information

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

Sustainable Development

Argentina is among the 150 countries that adopted the 2030 Agenda for Sustainable Development, including the Sustainable Development Goals (SDGs) at the United Nations Sustainable Development Summit on 25 September 2015.

In July 2017, the National Council for the Coordination of Social Policies (CNCPS) Argentinean President was appointed – through the Decree 499/2017⁵ - as the responsible body for the coordination of the necessary actions for the effective implementation of the 2030 Agenda for Sustainable Development.

Furthermore, Argentina has prioritized its targets based on the SDG 1: End poverty in all its forms everywhere.⁶

In this regard, MB project will contribute to the achievement of the country's sustainable development targets by:

- Stimulating the regional economy by, increasing tax revenues for the local government and job opportunities for local workers and service suppliers. The resulting economic stimulus will improve capital stock and availability in the region, which in turn will allow investment in the improvement of general infrastructure, productive capacity and consequently the satisfaction of the population's basic needs, thus promoting a virtuous cycle in the local economy;
- Stimulating the development of a proficient services sector in the region where the project will be located to be able to satisfy its need of skilled operators and maintenance staff and therefore creating opportunities for education, professionalization and employment.
- Inducing the development of national technology and improving the domestic know-how. By promoting the establishment and growth of the necessary industry equipment and services, the project will contribute to increase availability of NCRE technologies, which will, consequently, reduce maintenance costs and risks of the technologies in the country;
- Improving energy security and grid stability by increasing diversification of power generation sources in terms of technologies and geographic location;
- Improving the local infrastructure such as roads and electricity transmission systems; and
- Reducing GHGs and local air pollutants (SO₂, NO_x and PM) emissions from the Argentinean energy matrix.

Further Information

No further information is included.

⁵ Available at: <https://www.boletinoficial.gob.ar/#!DetalleNormaBusquedaAvanzada/166424/20170713>

⁶ National Voluntary Report, Argentina; July 2017;
http://www.odsargentina.gob.ar/public/documentos/seccion_publicaciones/ods/informe_voluntario_para_web_.pdf

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

- ACM0002 “Grid-connected electricity generation from renewable sources” (version 19.0)⁷;
- Tool for the demonstration and assessment of additionality (version 07.0.0)⁸;
- Methodological Tool: Investment Analysis (version 09.0)⁹;
- Tool to calculate the emission factor for an electricity system (version 07.0)¹⁰;
- Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0).

2.2 Applicability of Methodology

The table below demonstrates how the applicability conditions of the selected methodology and tools are met by the project activity and explains the documentation that has been used to prove it:

ACM0002 (version 19.0) applicability criteria	ACM0002 (version 19.0) applicability to the project activity	Documentation that has been used as a basis of justification
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: a) Install a Greenfield power plant; b) Involve a capacity addition to (an) existing plant(s); c) Involve a retrofit of (an) existing operating plants/units; d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or e) Involve a replacement of (an) existing plant(s)/unit(s).	The project activity consists in a grid-connected wind energy power generation project activity that installs a Greenfield power plant (option a).	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.
2. The methodology is applicable under the following conditions: a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the	a) The project activity includes a wind power plant. b) Not applicable. The project activity consists of a Greenfield project.	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.

⁷ Available at: <https://cdm.unfccc.int/methodologies/DB/5725LCHYPYM4I1V8OD9SFYVAMFFWNP>

⁸ Available at: <http://cdm.unfccc.int/Reference/tools/index.html>.

⁹ Available at: <http://cdm.unfccc.int/Reference/tools/index.html>.

¹⁰ Available at: <http://cdm.unfccc.int/Reference/tools/index.html>.

ACM0002 (version 19.0) applicability criteria	ACM0002 (version 19.0) applicability to the project activity	Documentation that has been used as a basis of justification
existing plant/unit 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, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.		
3. In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density calculated using equation (3), is greater than 4 W/m²; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (3), is greater than 4 W/m²; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (3), is lower than or equal to 4 W/m², all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (4), is greater than 4 W/m²; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m² shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the	Not applicable. The project activity consists of a grid-connected wind power plant.	Not applicable.

ACM0002 (version 19.0) applicability criteria	ACM0002 (version 19.0) applicability to the project activity	Documentation that has been used as a basis of justification
total installed capacity of integrated hydro power project.		
4. In the case of integrated hydro power projects, project proponent shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum five years prior to implementation of CDM project activity.	Not applicable. The project activity consists of a grid-connected wind power plant.	Not applicable.
5. The methodology is not applicable to: a) 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; b) Biomass fired power plants/units.	The project activity does not consist of: a) 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; or b) Biomass fired power plants/units.	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.
6. In the case of retrofits, rehabilitations, 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	Not applicable. The project activity consists of a Greenfield grid-connected wind	EIA and its approval by the Ministry of Environment and Sustainable

ACM0002 (version 19.0) applicability criteria	ACM0002 (version 19.0) applicability to the project activity	Documentation that has been used as a basis of justification
"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".	energy power plant.	Development Control of Chubut on 22/07/2016.
7. In addition, the applicability conditions included in the tools referred in the methodology.	The project activity meets the applicability conditions included in the tools referred in the methodology.	See table below.

Tool for the demonstration and assessment of additionality (version 07.0.0) applicability criteria	Additionality tool applicability to the project activity	Documentation that has been used as a basis of justification
The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool.	Not applicable. The project activity applies to the approved methodology ACM0002 (version 19.0).	This project activity PD.
Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The project activity will demonstrate and assess additionality using this tool and the provisions contained in ACM0002 (version 19.0).	This project activity PD.

Tool to calculate the emission factor for an electricity system (version 07.0) applicability criteria	Grid emission factor tool applicability to the project activity	Documentation that has been used as a basis of justification
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 activity substitutes grid electricity by supplying clean and renewable electricity to the Argentinean Electricity System (SADI).	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an	The emission factor for the project activity electricity system is calculated for	Argentinean Ministry of Energy grid

Tool to calculate the emission factor for an electricity system (version 07.0) applicability criteria	Grid emission factor tool applicability to the project activity	Documentation that has been used as a basis of justification
option, can include off-grid power plants.	grid power plants only.	emission factor calculations ¹¹ .
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 activity electricity system (SADI) is located exclusively in Argentina.	Argentinean Ministry of Energy grid emission factor calculations
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	A value of zero will be applied to the CO ₂ emission factor of biofuels power plants if connected to SADI.	Argentinean Ministry of Energy grid emission factor calculations

Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0) applicability criteria	Methodological tool applicability to the project activity	Documentation that has been used as a basis of justification
If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity	Scenario A applies to the source of electricity consumption by the project activity since it will consume electricity from the grid and is purchased only from the SADI. No captive power plant(s) are installed at the site of electricity consumption.	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016

¹¹ <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311>.

consumer can be provided with electricity from the captive power plant(s) and the grid.		
This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	Scenario I applies to the recipient of the electricity generated by the project activity since it dispatches electricity to the Argentinean Electricity System (SADI).	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.
This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emissions.	The project activity is not a captive renewable power plant. It is connected to the Argentinean Electricity System (SADI).	EIA and its approval by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016.

2.3 Project Boundary

According to ACM0002 Version 19.0, MB wind power plant boundary includes the project power plant and all power plants/units connected physically to the electricity system that the VCS project power plant is connected to; i.e.: the SADI.

The project activity consists of a Greenfield power plant. Thus, according to ACM0002 Version 19.0: *“the baseline scenario is 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.*

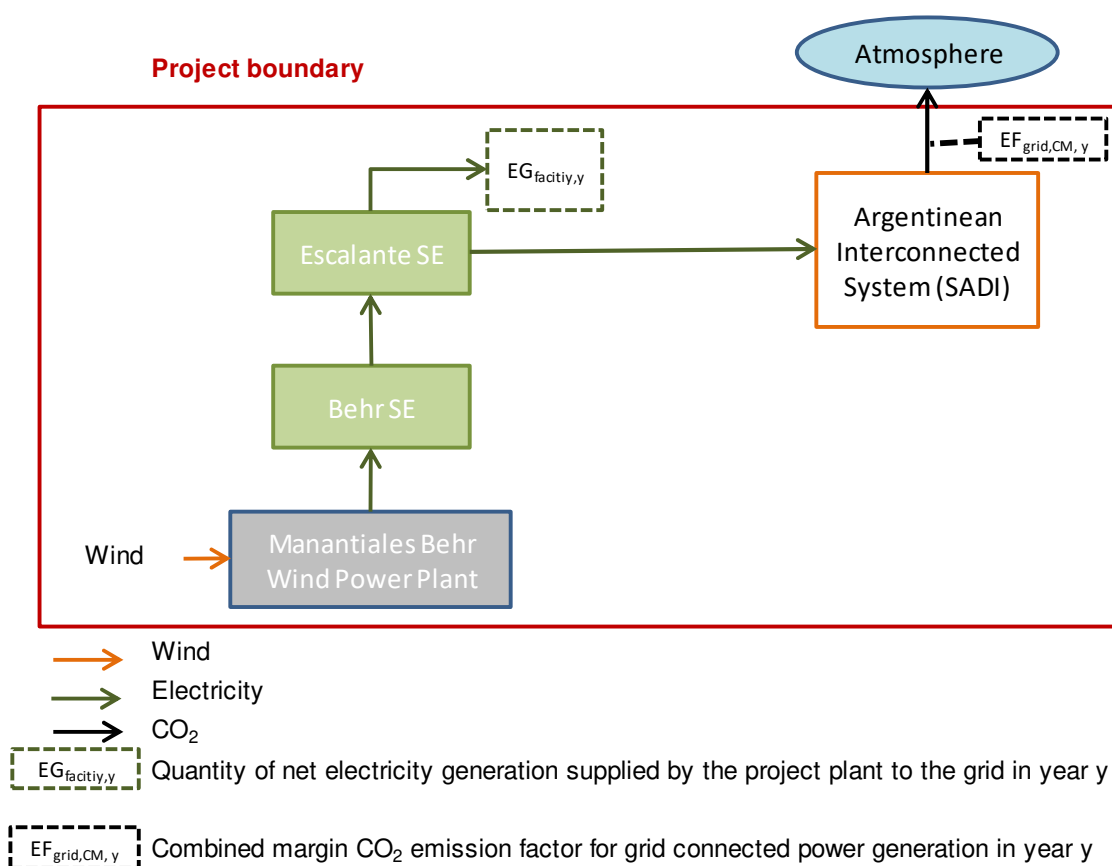
The project activity is a wind power plant and do not use fossil fuel. Thus, no project emissions are expected to happen.

Based on the above explanations, the greenhouse gases and emission sources included in or excluded from the project boundary are described in the table below.

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 ₂ O	No	Minor emission source
Project activity	For dry or flash steam geothermal power plants, emissions of CH ₄ and CO ₂ from non-condensable gases contained in geothermal steam	CO ₂	No	Not applicable. The project consists of a wind power plant.
		CH ₄	No	Not applicable. The project consists of a wind power plant.
		N ₂ O	No	Not applicable. The project consists of a wind power plant.
	For binary 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 consists of a wind power plant.
		CH ₄	No	Not applicable. The project consists of a wind power plant.
		N ₂ O	No	Not applicable. The project consists of a wind power plant.
	For binary geothermal power plants, fugitive emissions of hydrocarbons such as n-butane and isopentane (working fluid) contained in the heat exchangers	Low GWP hydrocarbon/refrigerant	No	Not applicable. The project consists of a wind power plant.
	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 consists of a wind power plant.
		CH ₄	No	Not applicable. The project consists of a wind power plant.
		N ₂ O	No	Not applicable. The project consists of a wind power plant.
	For hydro power plants, emissions of CH ₄ from the reservoir	CO ₂	No	Not applicable. The project consists of a wind power plant.
		CH ₄	No	Not applicable. The project consists of a wind power plant.

Source	Gas	Included	Justification/explanation
	N ₂ O	No	Not applicable. The project consists of a wind power plant.

The flow diagram provided below illustrates the equipment, systems and flows of mass and energy including the emissions sources and GHGs included in the project boundary.



2.4 Baseline Scenario

According to the applicable methodology [ACM0002 \(version 19.0\)](#): "If the project activity is the installation of a Greenfield power plant, the baseline scenario is the 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."

2.5 Additionality

The additionality of the project activity is demonstrated by conducting an additionality assessment according to the [Tool for the demonstration and assessment of additionality \(version 07.0.0\)](#).

The tool provides a step-wise approach to demonstrate and assess additionality. These steps include:

- (a) Step 0: Demonstration whether the proposed project activity is the first-of-its-kind;
- (b) Step 1: Identification of alternatives to the project activity;
- (c) Step 2: Investment analysis;
- (d) Step 3: Barriers analysis;
- (e) Step 4: Common practice analysis.

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

Outcome of Step 0: The project activity is not first-of-its-kind. Thus, step 1 is applied.

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

- Sub-step 1a: Define alternative scenarios to the project activity

Given that, the proposed project activity is the installation of a Greenfield power plant, two realistic and credible alternatives that provide comparable outputs or services have been identified:

- a) The proposed project activity undertaken without being registered as a VCS project;
- b) Continuation of the current situation, i.e. no project activity undertaken. This would imply, as per the provisions contained in the methodology ACM0002 (version 19.0) that “*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”.*”

Outcome of Step 1a: As presented above, the identified realistic and credible alternative scenario(s) to the project activity are: a) The proposed project activity undertaken without being registered as a VCS project; and b) Continuation of the current situation, i.e. no project activity undertaken.

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

Outcome of Step 1b: The identified alternative scenarios comply with all applicable mandatory legal and regulatory requirements of Argentina on national and/or sectoral policies and regulations.

Step 2: Investment analysis

The purpose of this step is to determine that the proposed project activity is not the most economically or financially attractive alternative or not economically or financially feasible, without the revenue from the sales of carbon credits.

- Sub-step 2a. Determine appropriate analysis method

The project activity generates financial and economic benefits other than carbon credits related income, so a simple cost analysis (Option I) cannot be applied.

The available alternatives are investment comparison analysis (Option II) and benchmark analysis (Option III).

Given that the project developer does not have alternative and comparable investment choices (to continue the current trend is the only option apart from executing the proposed project activity without registration as a VCS project), benchmark analysis (Option III) is considered appropriate.

- Sub-step 2b. Option III. Benchmark analysis

According to the Investment Analysis methodological tool (version 09.0) section 6, paragraphs 15 and 17, respectively: "...Local commercial lending rates or WACC are appropriate benchmarks for a project IRR..." and "In the 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."

Given that the project IRR (after taxes in real terms) has been selected as the financial indicator for the investment analysis and that the project could have been developed by an entity other than the project participant, the WACC based on parameters that are standard in the market has been selected as the appropriate benchmark.

Cost of equity

Sub-section 6.1 of the additionality tool states that: "If the benchmark is based on parameters that are standard in the market, the cost of equity should be determined either by: (a) selecting the values provided in the Appendix; or by (b) calculating the cost of equity using CAPM."

Based on this provision, the present project activity utilizes the default value for the **expected return on equity after taxes, expressed in real terms, for Argentinean energy industry projects** provided in the Appendix of the investment analysis tool, version 09.0: **13.94%**.

Cost of debt

The cost of debt (k_d) was selected according to paragraph 24 of the investment analysis tool, version 09.0: "If the benchmark is based on parameters that are standard in the market, the cost of debt should be calculated as the cost of financing in the capital markets (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on documented evidence from financial institutions with regard to the cost of debt financing of comparable projects. In cases where this data is not available, use the commercial lending rate in the host country to calculate the cost of debt."

Given that there is no documented evidence from financial institutions with regard to the cost of debt of financing comparable projects, the World Bank¹² commercial lending interest rate in Argentina in 2015 (latest data available by the time of the investment decision taken by the project participant: 31st August 2016) has been utilized to determine the cost of debt. Based on the World Bank statistics, **the pre-tax cost of debt (k_d) in nominal terms is 24,92%**.

The k_d is in nominal terms and the project investment analysis is carried out in real terms. Thus, the cost of debt in real terms, has been calculated, as per the Fisher equation and utilizing the average forecasted inflation rate for the host country published by the International Monetary Fund World Economic Outlook

¹² ; World Bank Indicators;

<https://data.worldbank.org/indicator/FR.INR.LEND?end=2016&locations=AR&start=1960&view=chart>;
(Original source: IMF)

(IMF WEO) in April 2016¹³ for the next five years after the start of the project activity (i.e.: at the time of the investment decision taken by the project participant) following the instructions of paragraph 16 of the CDM investment analysis tool Version 09.0.

Inflation rate	
2017	20,0%
2018	15,0%
2019	10,0%
2020	5,0%
2021	5,0%
Average	11,0%

As a result, the pre-tax cost of debt in real terms is 15.01%.

To transform the pre-tax rate in a post-tax rate, a conversion based on best practices is utilized:

$$K_{\text{post-tax}} = K_{\text{pre-tax}} * (1 - \text{tax})$$

The Argentinean income tax rate is 35%.¹⁴

The result is a **post-tax cost of debt in real terms of 9.75%**.

WACC

According to the investment analysis tool version 09.0, paragraph 26: *"If the benchmark is based on parameters that are standard in the market, then the typical debt/equity finance structure observed in the sector of the country should be used. If such information is not readily available, 50 per cent debt and 50 per cent equity financing may be assumed as a default."*

By the time the investment decision in the present project activity was taken by the project developer the total installed capacity of wind and solar power plants in Argentina, were 215 MW and 8.8 MW, (0,64% and 0,03% of the country' total installed capacity) respectively.¹⁵ Most of these power plants have an installed capacity bellow 1 MW. Only 6 wind power plants had an installed capacity higher than 10 MW and only 1 of them has an installed capacity similar to the project activity: Loma Blanca IV (50 MW) which has been registered as a CDM project activity¹⁶. For further information refer to the common practice analysis below.

No information about the debt/equity finance structure of these projects, particularly the 2 wind power plants with the highest installed capacity that could be comparable to the project activity, was found. Thus, the debt/equity finance structure of 50/50 has been assumed as a default.

¹³ International Monetary Fund, World Economic Outlook 2016; Apr 2016; Argentina; Inflation; <http://www.imf.org/external/pubs/ft/weo/2016/01/weodata/weorept.aspx?sy=2017&ey=2021&scsm=1&ssd=1&sort=country&ds=.&br=1&pr1.x=69&pr1.y=7&c=213&s=PCPI%2CPCPIPCH%2CPCPIE%2CPCPIEPCH&grp=0&a=>

¹⁴ Law N° 20.628 y Decree N° 649/97; http://www.wipo.int/wipolex/es/text.jsp?file_id=287573

¹⁵ Electricity Sector Statistic Report 2016; Complementary files/Power plants per owner type – Public Services (xls file); Ministry of Energy and Mining of Argentina. Available at: <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=4232>. Accessed on: 11/05/2018

¹⁶ CDM Project 9002; Available at: <https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1356066427.65/view>; Accessed on: 11/05/2018.

The result is a **post-tax WACC in real terms of 11.85%**, which is the benchmark for investment analysis of the project activity.

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

The Internal Rate of Return (IRR) in real terms of the proposed project activity was calculated based on inputs values valid and applicable at the time of the investment decision taken by the project participant.

The investment analysis tool, version 09.0, paragraph 10 states: *“Input values used in all investment analysis shall be valid and applicable at the time of the investment decision taken by the project participant.”*

Furthermore, according to the CDM definitions, the *“start date” of a project activity is: “the date on which the project participants commit to making expenditures for the construction or modification of the main equipment or facility (e.g. a wind turbine), or for the provision or modification of a service (e.g. distribution of energy-efficient light bulbs, change of transport management system), for the CDM project activity or CPA. Where a contract is signed for such expenditures (e.g. for procurement of a wind turbine), it is the date on which the contract is signed. In other cases, it is the date on which such expenditures are incurred. If the CDM project activity or CPA involves more than one of such contracts or incurred expenditures, it is the first of the respective dates. Activities incurring minor pre-project expenses (e.g. feasibility studies, preliminary surveys) are not considered in the determination of the start date.”*

Based on the above provisions, the start date (according to the CDM glossary) of MB project activity has been defined as the date when the first purchase order or the wind turbines for the project was issued (31/08/2016), since this was the first project expense and the one that triggered the commitment between YPF EE S.A. and Vestas Argentina S.A., thus, the project point of no return.

Following this rule, the table below presents the input parameters and supporting documentation utilized.

Parameter	Units		Value	Reference
Date of the investment decision taken by the project participant (point of no return)	-		31/08/2016	1st purchase order of wind turbines for the project from YPF EE S.A. to Vestas Argentina S.A.
Project Technical Lifetime	years		20	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 9; August 2016
Depreciation	years		20	Linear depreciation conservatively considered based on 20 years project lifetime.
Income tax rate	%		35%	'Law N° 20.628 y Decree N° 649/97; http://www.wipo.int/wipolex/es/text.jsp?file_id=287573
Amount of Wind Turbine Generators (WTG)	-		30	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 8; August 2016
WTG capacity	MW		3,3	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 8; August 2016
Electricity tariff	USD/MWh		70.70	Average monomic spot price 2015; CAMMESA Annual report 2015; Page 55; 02/06/2016; http://portalweb.cammesa.com/memnet1/Pages/descargas.aspx
CAPEX	USD		205,600,000	YPF EE S.A. Board meetings 23/10/2015 and 10/05/2016
	USD/MW		2,076,768	Calculated

Parameter	Units		Value	Reference
OPEX				
O&M Vestas	USD/WTG .year	Years 1, 2	79,700	O&M contract; YPF EE S.A. - Vestas; 28/07/2016
		Years 3 to 5	92,500	
		Years 6 to 20	113,000	
O&M Fixed	USD/year		825,531	Estimated based on O&M costs of "Complejo de Generación Tucumán" (property of YPF EE S.A.) as provided in the income statement of 2015; "Balance Subsidiaria Anual (Completo) de YPF ENERGIA ELECTRICA S.A. al 31 Dic 2015"; PDF page 28 (Annex II, Income Statement 2015); 02/03/2016; Available at: http://www.cnv.gov.ar/InfoFinan/Zips.asp?CodiSoc=218&DescriSoc=YPF%20S.A.&TipoDocum=1&TipoArchivo=1&TipoBalance=1&Lang=0
Insurance cost	USD/year		173,467	Estimated based on insurance cost of "Complejo de Generación Tucumán" (property of YPF EE S.A.) as provided in the income statement of 2015; "Balance Subsidiaria Anual (Completo) de YPF ENERGIA ELECTRICA S.A. al 31 Dic 2015"; PDF page 28 (Annex II, Income Statement 2015); 02/03/2016; Available at: http://www.cnv.gov.ar/InfoFinan/Zips.asp?CodiSoc=218&DescriSoc=YPF%20S.A.&TipoDocum=1&TipoArchivo=1&TipoBalance=1&Lang=0
Taxes				
Gross income tax	%		3.50%	Law XXIV N°71, Legislatura de Chubut; Folio 11; http://www.dgrchubut.gov.ar/wp-content/uploads/2017/01/XXIV-71.pdf
Income Tax rate	%		35%	Law N° 20.628 y Decree N° 649/97; http://www.wipo.int/wipolex/es/text.jsp?file_id=287573
Credits/Debits tax	%		0.60%	The tax system in Argentina; Argentine Agency of Investment and International Trade; Page 5; http://www.inversionycomercio.org.ar/docs/pdf/El_Sistema_Tributario_en_la_Argentina.pdf

Based on the parameters mentioned above, the project Internal Rate of Return (IRR) of Manantiales Behnr wind power plant in the absence of carbon credits revenues is:

MB wind power plant project IRR	Benchmark
9.37%	11.85%

In conclusion, the project IRR is lower than the benchmark, indicating that the investment on it, without any incentives from carbon credits revenues is not attractive for a rational investor.

- Sub-step 2d. Sensitivity analysis

A sensitivity analysis is conducted by altering the following parameters in order to show that the conclusion of the investment analysis is robust to reasonable variations in the critical assumptions:

- CAPEX decrease;
- Electricity tariff increase;
- Net electricity generation increase (plant load factor);
- Operation & Maintenance (Opex or O&M costs) reduction.

As per the Investment Analysis tool Version 09.0 these parameters were selected as they constitute more than 20% of either total project costs or total project revenues, are the most likely to fluctuate over time and can significantly affect the financial attractiveness of the project.

The sensitivity analysis was performed by altering these parameters +/- 10% and by calculating the variation necessary to reach benchmark.

The tables below summarize the results of the sensitivity analysis.

Parameter	Variation	Project IRR
Investment (Capex)	-10%	10.69%
Electricity tariff	+10%	10.72%
Net electricity generation (Capacity Factor)	+10%	10.72%
Opex	-10%	9.61%

Parameter	Variation to benchmark	Values of parameters to achieve benchmark	
Investment (Capex)	-17.42%	To achieve benchmark, the Capex should be (kUSD/MW):	1,714,964
Electricity tariff	18.60%	To achieve benchmark, the electricity tariff should be (USD/MWh):	83.85
Net electricity generation (Load Factor)	18.60%	To achieve benchmark, the load factor should be:	68.78%
Opex	No solution	Even with zero Opex costs the project IRR is:	11.68%

The likelihood of the variations for each parameter is discussed below based on the market projections, articles and/or technical data:

1. **Investment (Capex):** The project CAPEX is based on proposals from the project providers and best estimations made by the project developer by the time the investment decision was taken on 31/08/2016.
The CAPEX of the project, which includes the grid-connection investment costs, is around 205.6 million USD, equivalent to 2,077kUSD/MW.
A reduction of 17.42% equivalent to a CAPEX of 1,715 kUSD/MW to achieve benchmark is unrealistic since, according to the International Renewable Energy Agency (IRENA), the weighted average total installed costs for onshore wind power plants in Asia (excluding China and India), Oceania, Central America and the Caribbean and South America (excluding Brazil) are the most were between USD 1,884 and USD 2,256 kUSD/MW in 2016¹⁷.
Thus, the project IRR is unlikely to reach the benchmark.
2. **Electricity tariff:** to reach the benchmark the electricity tariff should increase by 18.60% equivalent to 83.85 USD/MWh.
By the time the project developer took the investment decision (31/08/2016) the yearly average monomonic spot price was 70.7 USD/MWh (based on 2015 data from CAMMESA).

¹⁷ Renewable Power Generation Costs in 2017; Page 96; IRENA;
<http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017>

Furthermore, the average monomic spot price of the first half of 2016, which includes the months with the highest prices of the year (May, June and July) was 74.33 USD/MWh.

Therefore, an increase of 18.60% to reach a yearly average monomic spot price of 83.85 USD/MWh is extremely unlikely to occur.

3. **Net electricity generation (load Factor):** the net electricity generation would need to increase 18.60%, equivalent to a project load factor of 68.78% to reach the benchmark.

As stated in section 1.8 above, the project load factor P50 is 58.0% as determined by EAPCSUR Wind Energy, an independent and competent third party, based on three years of historic wind data.

According to IRENA in 2017, the global weighted average capacity factor for onshore wind was 29%.

Furthermore, even when there is no specific data for Argentina, in a sample of 12 countries, the highest capacity factor was reached in Brazil and was below 50%.¹⁸

Therefore, the load factor of Manantiales Behr is already a high value compared with other countries statistical data and a further increase of 18.60% resulting in a PLF of 68.78% is unlikely to occur.

4. **Opex:** the operating and maintenance cost of MB wind farm, which includes Vestas' O&M cost plus the power plant O&M own personnel, is in average 40.64 USD/kW/year per year along the project lifetime.

According to IRENA, full-service renewal contracts cost in 2017 was USD 44/kW/year.¹⁹ Therefore, MB Opex is a realistic value.

Furthermore, even assuming the project will incur no Opex, the project IRR remains below the benchmark (11.68%).

The above illustrated results prove that only with highly unrealistic and very favourable circumstances the project IRR could reach the benchmark.

Therefore, the present project is not financially attractive, without the revenue from the sale of carbon credits.

Outcome of Step 2: After the sensitivity analysis, it is concluded that the proposed component project activity is unlikely to be financially/economically attractive. Thus, step 4 is applied.

Step 3: Barrier Analysis

The project developer has opted to use the investment analysis to demonstrate the additionality of this project. Therefore, the barrier analysis is not addressed.

Outcome of Step 3: As Step 3 (Barrier Analysis) is not being used, then proceed to Step 4 (Common practice analysis).

Step 4: Common practice analysis

The proposed VCS project activity applies measures that are listed in the definitions' section of the [Tool for the demonstration and assessment of additionality](#) ~~Tool for the demonstration and assessment of additionality (version 07.0.0)~~ (version 07.0.0). Therefore, the analysis should refer to the latest version of the "Methodological tool: Common practice" (version 03.1).

According to the Tool, the applicable geographical area should be the entire host country by default. Therefore, the geographical area of the common practice analysis is limited to Argentina.

¹⁸ Renewable Power Generation Costs in 2017; Pages 102 and 103; IRENA;
<http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017>

¹⁹ Renewable Power Generation Costs in 2017; Page 105; IRENA;
<http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017>

The tool provides the following stepwise approach for common practice:

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

The Manantiales Behr Wind Farm installed capacity is 99 MW, hence, the applicable capacity range is: **49.5 MW – 148.5 MW.**

- *Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:*
 - (a) *The projects are located in the applicable geographical area;*
 - (b) *The projects apply the same measure as the proposed project activity;*
 - (c) *The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;*
 - (d) *The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;*
 - (e) *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;*
 - (f) *The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.*

As above explained, the start date (according to CDM glossary) of MB project activity has been defined as 31/08/2016. Thus, according to item (f) similar projects should be identified until this date. The common practice analysis has been conducted based on data from the Electricity Sector Statistic Report 2016 from the Ministry of Energy and Mining of Argentina²⁰ which contains information of power plants that started to operate until the end of 2016 and there is no specific data about the operation start date of each power plant. Nevertheless, according to the Electricity Sector Statistic Report 2016, from August 2016 until December 2016 no new power plants stated to operate and only one thermal power plant (Guillermo Brown) increased its capacity in October.²¹

The table below summarizes the results obtained:

Type	Quantity of operational power plants within the +/- 50% capacity range	CDM plants	Nall
Fossil	26	1	25
Hydro	14	2	12
Wind	1	1	0
Total	41	4	37

- *Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.*

²⁰ Electricity Sector Statistic Report 2016; Complementary files/Power plants per owner type – Public Services (xls file); Ministry of Energy and Mining of Argentina. Available at: <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=4232>. Accessed on: 11/05/2018.

²¹ Electricity Sector Statistic Report 2016; Page 8; Ministry of Energy and Mining of Argentina. Available at: <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=4232>. Accessed on: 11/05/2018

Based on the information provided in the UNFCCC website, 4 projects identified in step 2, have been registered as CDM project activities. Therefore,

$$N_{all} = 37$$

- Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff} .

All the projects identified in Step 3 apply technologies that are different to the technology applied in the proposed project activity. Thus,

$$N_{diff} = 37$$

Step 5: calculate factor $F = 1 - N_{diff} / N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$$F = 1 - 37 / 37 = 0.00$$

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.

As the factor F is not greater than 0.2 and $N_{all} - N_{diff}$ is equal to zero, the proposed project activity is not a common practice.

As a result of applying the “Tool for demonstration and assessment of additionality” it is concluded that based on conservative approaches and assumptions, the proposed project activity fulfills all the additionality requirements demonstrating that it is additional.

Outcome of Step 4: As the outcome of Step 4 is that the proposed project activity is not regarded as “common practice”, as demonstrated above, then, the proposed project activity is additional.

2.6 Methodology Deviations

The present project activity does not incur in any deviation from the applicable methodology.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

According to ACM0002 Version 19.0 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 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:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

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

$EF_{grid,CM,y}$ = grid as a result of the implementation of the project activity in year y (MWh/yr)
 = Combined margin CO₂ 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” (tCO₂/MWh)

Calculation of $EG_{PJ,y}$

As the project activity is the installation of a Greenfield power plant, then:

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

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 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 the combined margin CO₂ emission factor for grid connected power generation in year y ($EF_{grid,CM,y}$)

According to the Tool to calculate the emission factor for an electricity system, version 07.0 the combined margin is calculated as a weighted average as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)

$EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

For wind power projects the weighting OM and BM factors are:

Weighting factor	Wind power generation projects
w_{OM}	0.75
w_{BM}	0.25

The Ministry of Energy and Mining of Argentina that calculates the Combined Margin (CM) emission factor of the Argentinean Interconnection System (SADI) according to the different methods provided in the “Tool to calculate the emission factor for an electricity system” and makes it available to the public.²²

Therefore, the $EF_{grid,CM,y}$ for the present project activity is obtained from the Ministry of Energy and Mining (MEM) of Argentina.

According to the MEM 2015 EF_{grid} calculator, which is the latest version available at the time of submission of the project to validation, low-cost/must-run contributes to less than 50% of total grid

²² Available at: <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311>; Accessed on: 11/05/2018.

generation and, therefore, simple OM method (option a) of the tool based on ex-ante data vintage (2013, 2014 and 2015) is used for the present project activity.

For calculating the Build Margin (BM) emission factor, the option 1 (ex-ante) of the tool has been chosen. Thus, the Build Margin emission factor for 2015, as published by the Ministry of Energy and Mining of Argentina, is utilized and fixed ex-ante for the crediting period.

3.2 Project Emissions

According to the methodology project emissions (PE_y) for wind projects that do not use fossil fuels for electricity generation are zero.

Therefore:

$$PE_y = 0$$

3.3 Leakage

According to the methodology ACM0002 (version 19.0), the following is stated:

"No leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport) are neglected".

Therefore,

$$L_y = 0$$

3.4 Net GHG Emission Reductions and Removals

According to ACM0002 Version 19.0 the quantification of net GHG emission reductions is as follow:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (tCO₂e/yr);

BE_y = Baseline emissions in year y (tCO₂e/yr);

PE_y = Project emissions in year y (tCO₂e/yr).

As no project emissions (PE_y) were identified for Manantiales Behr Wind Farm project, $ER_y = BE_y$.

Therefore,

$$ER_y = EG_{facility,y} \times EF_{grid,CM,y}$$

The ex-ante calculation of emission reductions is calculated based on the above formulae and based on the data parameters illustrated in the table below.

Variable	Value	Data Source
Operating Margin Emissions Factor ($EF_{grid,OM,y}$ in tCO_2/MWh)	0.532	Simple OM ex ante (2013, 2014, 2015), Argentinean Grid CO_2 EF calculation 2015; Ministry of Energy and Mining; Argentinean National Government; http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311
Build Margin Emissions Factor ($EF_{grid,BM,y}$ in tCO_2/MWh)	0.440	Ex ante BM 2015; Argentinean Grid CO_2 EF calculation 2015; Ministry of Energy and Mining; Argentinean National Government; http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311
Weighting of operating margin emission factor (w_{OM})	0.75	Tool to calculate the emission factor for an electricity system, v07.0, wind project
Weighting of building margin emission factor (w_{BM})	0.25	Tool to calculate the emission factor for an electricity system, v07.0, wind project
Combined Margin Emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh)	0.509	Calculated
Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y ($EG_{facility,y}$ in MWh/yr)	502,900	Certificate of the resource and annual energy production (PAE) – Wind Power Project Manantiales Behr; EAPCSUR Wind Energy; page 11 (PAE with exceedances levels (20 years)); August 2016

Therefore, annual emission reductions are:

$$ER_y = 255,976 \text{ tCO}_2\text{e/year}$$

Year	Estimated baseline emissions or removals ($tCO_2\text{e}$)	Estimated project emissions or removals ($tCO_2\text{e}$)	Estimated leakage emissions ($tCO_2\text{e}$)	Estimated net GHG emission reductions or removals ($tCO_2\text{e}$)
Year 2018 (from 01/08/2018 ²³)	57,545	0	0	57,545
Year 2019	255,976	0	0	255,976
Year 2020	255,976	0	0	255,976
Year 2021	255,976	0	0	255,976
Year 2022	255,976	0	0	255,976
Year 2023	255,976	0	0	255,976
Year 2024	255,976	0	0	255,976
Year 2025	255,976	0	0	255,976
Year 2026	255,976	0	0	255,976
Year 2027	255,976	0	0	255,976
Year 2028	148,677	0	0	148,677

²³ Commercial operation date of the project's phase 1 (49.5 MW). The commercial operation of the second phase (49.5 MW) was completed on 22nd December, 2018.

(until 31/07/2028)				
Total	2,510,006	0	0	2,510,006

4 MONITORING

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin Emissions factor
Source of data	Argentinean Grid CO ₂ EF calculation 2015; Ministry of Energy and Mining; Argentinean National Government; http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311
Value applied	0.532
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to the Tool to calculate the emission factor for an electricity system.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build Margin Emissions factor
Source of data	Argentinean Grid CO ₂ EF calculation 2015; Ministry of Energy and Mining; Argentinean National Government; http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311
Value applied	0.440
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to the Tool to calculate the emission factor for an electricity system.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh

Description	Combined Margin Emissions factor
Source of data	Argentinean Grid CO ₂ EF calculation 2015; Ministry of Energy and Mining; Argentinean National Government; http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=2311
Value applied	0.509
Justification of choice of data or description of measurement methods and procedures applied	Calculated according to the Tool to calculate the emission factor for an electricity system.
Purpose of Data	Calculation of baseline emissions
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$ (or $EG_{PJ,y}$)
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	This parameter will be monitored using bi-directional energy meter Class 0.2S
Frequency of monitoring/recording	Continuous measurements and monthly recorded.
Value applied	502,900
Monitoring equipment	Energy meter Class 0.2S ²⁴
QA/QC procedures to be applied	The main meter is the billing meter which is located at SE Escalante. A “control” meter is also available at the SE in line with CAMMESA’s Electric-Commercial Metering System (Sistema de Medición Eléctrico Comercial – SMEC) requirements ²⁵ . Meters will be calibrated according to CAMMESA procedures. ²⁶ In case of failures CAMMESA procedure will be followed. ²⁷

²⁴ CAMMESA Procedures Version XXVI, Anexo 24 (Sistema de operación y despacho (SOD)); 1.2.1. (Características de equipos y clase de medición); Meters of power utilities with installed capacity equal or greater than 20 MW; <http://portalweb.cammesa.com/Pages/Institucional/Empresa/procedimientos.aspx>

²⁵ <http://portalweb.cammesa.com/pages/smec.aspx>

²⁶ The verification (calibration) frequency is currently no longer than once per year according to CAMMESA, Technical Procedure PT-14 (Auditoría Externa de SMEC); <http://portalweb.cammesa.com/Pages/Institucional/Empresa/procedimientos.aspx>

	The electricity generation will be cross-checked with records of electricity sale (e.g. sales receipt). All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period.
Purpose of data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	-

4.3 Monitoring Plan

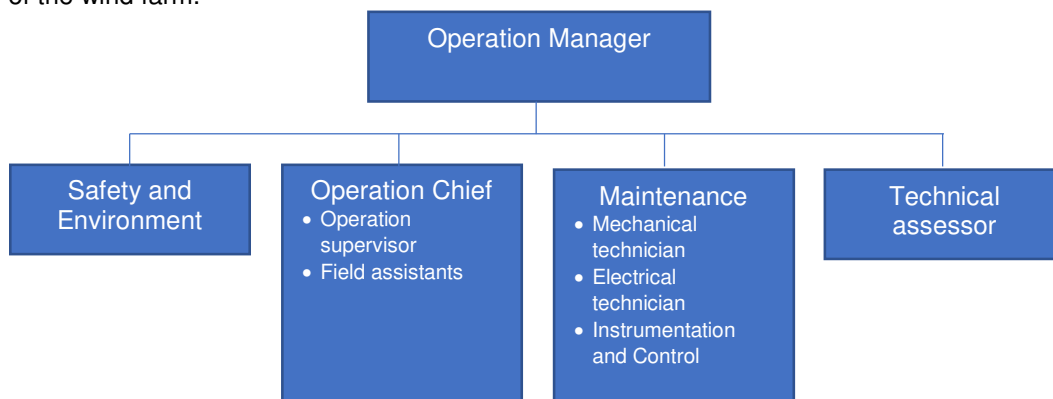
Methods for measuring, recording, storing, aggregating, collating and reporting data and parameters

The project electricity generation will be dispatched to the Wholesale Electricity Market ("MEM" from the Spanish Mercado Eléctrico Mayorista). Therefore, measuring, recording, storing, aggregating, collating and reporting data and parameters must follow the Wholesale Electricity Market Administrator Company (CAMMESA) technical procedures regarding the Commercial Measurement System ("SMEC" from the Spanish Sistema de Medición Comercial) and the Real Time Operation System ("SOTR" from the Spanish Sistema de Operación en Tiempo Real).²⁸

Data will be kept until two years after the end of the crediting period or the last issuance of CERs whichever occurs later.

Organizational structure, responsibilities and competencies of the monitoring personnel

The organizational structure of the project for the operation, maintenance, safety and environment task is illustrated in the diagram below. The operation supervision and field assistants will have permanent presence in the control room of the wind farm.



²⁷ CAMMESA Technical Procedure N°3, Technical Procedure PT-N°3; Commercial Measurement System (SMEC) Procedure of data collection in emergency;
http://portalweb.cammesa.com/Biblioteca%20de%20Documentos/P_3_.pdf

²⁸ CAMMESA Procedures Version XXVI, Anexo 24 (Sistema de operación y despacho (SOD));
<http://portalweb.cammesa.com/Pages/Institucional/Empresa/procedimientos.aspx>

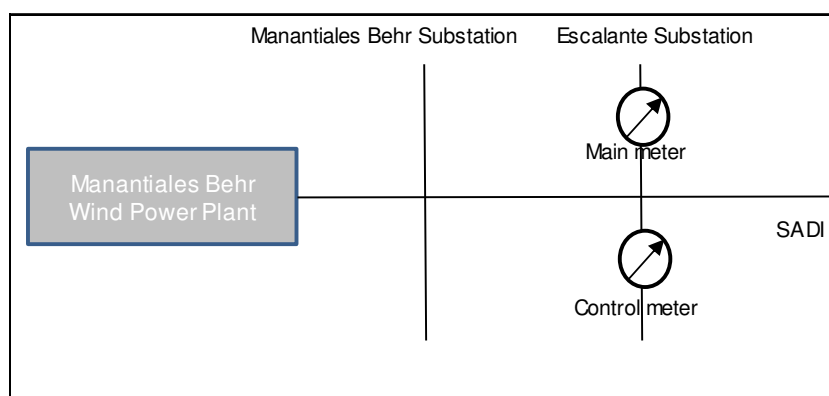
Detailed roles and responsibilities of the relevant staff involved in VCS monitoring will be in place at the starting date of the crediting period. Furthermore, this staff will receive relevant training, if required, to ensure that monitoring duties will be performed by trained staff.

Quality Assurance and Quality Control

As mentioned above, the meter used for determining the electricity supplied to the grid is a high accuracy measurement device/s and meets all relevant metrological requirements prescribed by CAMMESA.

Procedures for maintenance of the monitoring equipment are conducted in accordance with national procedures and standards.

The line diagram below illustrates the measurement arrangements:



All data collected as part of monitoring will be archived electronically and be kept at least for 2 years after the end of the last crediting period.

5 SAFEGUARDS

5.1 No Net Harm

The Manantiales Behr wind farm project potential environmental and socio-economic impacts and the steps to mitigate them have been identified in the EIA approved by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016 (Disposición N°155/16-SGAYDS).

The conclusion of the EIA is that the project activity does not generate significant negative impacts. Most of the impacts correspond to the categories moderate and low.

The most affected factor is the economic activity, meanwhile the less affected factor is the operators. Both impacts are positive.

The negative aspects considered during the operation of the wind farm are the impacts on birds life and the generation of noise and visual impact, although the latter are low impacts given that the project is located in an area of hydrocarbon exploitation, not an urban settlement.

It also highlighted as positive the fact that in the abandonment stage the negative impacts are considered reversible in the short term achieving the restoration of environmental conditions prior to the project.²⁹

To mitigate the negative impacts of the project, an Environmental Management Plan (PGA due to its name in Spanish “Plan de Gestión Ambiental”) has been designed³⁰. The main objectives of the PGA are:

- To preserve the environmental quality by minimizing the negative impacts caused in the area of direct influence of the project.
- To encourage the execution of activities planned for the project that cause positive impacts on environmental factors.
- To guarantee the execution of the project in an environmentally responsible manner, controlling the human activities derived from the different stages of the project in a way that they are developed in an appropriate manner.
- To foresee and execute direct and specific actions to prevent or correct the environmental impacts indicated in the environmental report.
- To generate environmental awareness and to promote a responsible attitude that contribute to preserves the environment.

The PGA is divided in general actions and actions to mitigate the impacts of the Project, among others:

- With regards to the birds impact, there will be a sustained monitoring during at least one year after the operation start of the wind farm to evaluate the real impact of the structures in operation, considering raptors, migratory birds and endemic birds.
- Regarding flora and fauna life, hunting of wildlife will be strictly prohibited, as well as harvest of wild plants or the introduction of non-native or not adapted species.
- The noise will be controlled according to not surpass the limits established by the National Commission of Communications.

The detailed list of actions and the impact they mitigate and/or correct are described in the EIA.

5.2 Environmental Impact

The environmental matters in Argentina are jurisdiction of the Provincial Governments. In this regard, the Government of Chubut sanctioned the Law XI N° 35 (former Law N° 5,439) “Chubut Province Environmental Code” (from the Spanish “Código Ambiental de la Provincia del Chubut”)³¹ and the Decree N° 185/09 “Environmental Impact Evaluation” (from the Spanish “Evaluación de Impacto Ambiental”)³².

According to Annex V of the Decree N° 185/09 power plants with a required installation area above 0.5 ha - including offshore and onshore wind projects - have to prepare and present the Environmental Impact Assessment (EIA).

The Manantiales Behr wind farm EIA was elaborated by “Confluencia, Ambiente y Seguridad” and approved by the Ministry of Environment and Sustainable Development Control of Chubut on 22/07/2016 (Disposición N°137/16-SGAyDS).

²⁹ Manantiales Behr wind farm EIA; Pages 167-168; May 2016.

³⁰ Manantiales Behr wind farm EIA; Pages 169-181; May 2016.

³¹ Available at: <http://www.legischubut2.gov.ar/digesto/lx/XI-35.html>. Accessed on: 12/05/2018.

³² Available at: <http://www.chubut.gov.ar/portal/wp-organismos/ambiente/wp-content/uploads/sites/8/2014/05/Decreto-185.pdf>. Accessed on: 12/05/2018

Regarding, the transmission line between Manantiales Behr and Escalante substations, it was not required to elaborate and EIA but an Environmental Report of the Project (from the Spanish “Informe Ambiental del Proyecto”, IAP), which was also elaborated by “Confluencia, Ambiente y Seguridad” and approved by the Ministry of Environment and Sustainable Development Control of Chubut on 12/08/2016 (Disposición N°155/16-SGAyDS).

Additionally, in the context of the Argentinean electricity market, all new agents (generators, self-generators, cogenerators or transmission agent) that aim to participate in the MEM have to present together with the request to be a MEM agent, the EIA to the Argentinean Ministry of Energy³³.

The Project is in compliance with this requirement given that it obtained the authorization to be a MEM agent by Resolution E 468/2016 of the Secretariat of Electric Energy of the Argentinean Government.

Details related to the impacts and the actions proposed to mitigate them are described in section 5.1 above.

5.3 Local Stakeholder Consultation

According to the Decree N° 185/09 the Manantiales Behr wind farm EIA and the transmission line IAP were submitted to public consultation.

The Manantiales Behr wind farm EIA was subject of a public audience on 29/06/2016 according to Art. 21 of Annex I of the Decree N° 185/09, as stated in the resolution that approved it (“Disposición N°155/16-SGAyDS”).

Meanwhile, the transmission line IAP was subject of a public consultation from 05/02/2016 until 19/02/2016, as stated in the resolution that approved it (“Disposición N°137/16-SGAyDS”).

According to the Decree N° 185/09 the methods used for engaging local stakeholders in each process (public audience and public consultation), as well as the procedures for documenting the outcomes of the local stakeholder consultation and how due account of the inputs received during the consultation were taken into account were as follows:

- *Public audience of the MB wind farm EIA:* the invitation was published in two newspapers with the highest circulation within the Province, in the newspaper with the highest circulation within the area affected by the project activity, in the official newspaper of the province and in the official webpage of the applicable authority. The EIA was available for the stakeholders consultation. During the public audience the stakeholders made their observations and the project developer answered them, as established in the Decree N° 185/09. The audience was recorded and included to the EIA approval file.
- *Public consultation of the transmission line IAP:* the invitation was published in the newspaper with the highest circulation within the area affected by the activity and in the Official newspaper of the province. The applicable authority made available an e-mail address to receive observations from the stakeholders, that also can send their comments through postal mail or made them in person. The observations were included in the IAP approval file and communicated to the project developer.

³³ <http://www.energia.gob.ar/contenidos/verpagina.php?idpagina=3433>

The invitations to the stakeholders to make comments, as well as the MB wind power plant EIA and the transmission line IAP, were also available in the website of the Ministry of Environment and Sustainable Control of the Government of Chubut, where they remain available^{34,35}.

Regarding the mechanism for on-going communication with local stakeholders YPF Luz has in place a website (<http://www.ypfluz.com>) that contains information about:

- The company strategic plan: to achieve 5,000 MW of efficient thermal and renewable power generation capacity by 2023,
- Its assets (operational and under construction), including Manantiales Behr wind farm,
- Its quality, health and safety and environmental management systems, in compliance with ISO standards,
- Its code of ethic and conduct,
- News about the company,
- Etc.

The website invites stakeholders to send their comments and suggestions to the e-mail address: sugerenciasypfluz@ypf.com

5.4 Public Comments

As above stated, the public audience of MB wind farm project took place on 29/06/2016. According to the list of participants, 94 persons participated of the public audience. Furthermore, as stated in the public audience act (elaborated by the Ministry of Environment and Sustainable Control of the Government of Chubut) 12 stakeholders made comments about the project and after that, in accordance with Art. 35 of the Annex I of the Decree 185/09, the project developer answered them.

According to the records, the comments were related to the following aspects:

- Environmental: impacts on the birds, soil movements, environmental management in the construction and operation phases and residues management.
- Technical: aerogenerators characteristics, providers and the transmission line.
- Human resources: generation of work
- Corporate social responsibility: socialization of the Project and training.

The Project proponent answered all the questions. The registry is available to the VVB at validation.

Therefore, due account of the comments received during the public comment period was taken by the project proponent. However, is important to mention that, as can be verified in the

³⁴ Invitation to MB wind power plant EIA public audience; 05/05/2016; <http://www.chubut.gov.ar/portal/wp-organismos/ambiente/2016/05/05/convocatoria-a-audiencia-publica-del-proyecto-parque-eolico-mananhttpwww-chubut-gov-arportalwp-organismosambientewp-contentuploadssites8201605p-e-mb-ypf-ee-232x300-pngtiales-behr-ypf/>. Accessed on: 12/05/2018.

³⁵ Invitation to MB transmission line IAP public consultation; 26/01/2016; <http://www.chubut.gov.ar/portal/wp-organismos/ambiente/2016/01/26/convocatoria-a-consulta-publica-del-proyectolinea-aerea-de-transmision-de-132-kv-entre-set-manantiales-behr-y-set-escalante/>. Accessed on: 12/05/2018.

registries, all comments were related to ask for additional information about the project but not to ask for changes or modifications. This is evidenced by the fact that the authority (Ministry of Environment and Sustainable Control of the Government of Chubut) did not ask for changes to the project based on the public audience. Therefore, the project design did not suffered any update due to the stakeholders comments.

Regarding the public consultation of the transmission line IAP, no public comments were received.