



**Verified Carbon
Standard**

Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility Monitoring Report (01/11/2017 – 31/12/2020)



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Project Title	Longyuan Mulilo De Aar Maanhaarberg Wind Energy Facility
Version	02
Report ID	1949-MR-1-2021
Date of Issue	30-March-2021
Project ID	1949
Monitoring Period	Monitoring Period 1: 1-November-2017 to 30-November-2017 Monitoring Period 2: 1-December-2017 to 31-December-2017 Monitoring Period 3: 1-January-2018 to 31-January-2018 Monitoring Period 4: 1-February-2018 to 28-February-2018 Monitoring Period 5: 1-March-2018 to 31-March-2018 Monitoring Period 6: 1-April-2018 to 30-April-2018 Monitoring Period 7: 1-May-2018 to 31-May-2018

Monitoring Period 8: 1-June-2018 to 30-June-2018

Monitoring Period 9: 1-July-2018 to 31-July-2018

Monitoring Period 10: 1-August-2018 to 31-August-2018

Monitoring Period 11: 1-September-2018 to 30-September-2018

Monitoring Period 12: 1-October-2018 to 31-October-2018

Monitoring Period 13: 1-November-2018 to 30- November-2018

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Monitoring Period 15: 1-January-2019 to 31-January-2019

Monitoring Period 16: 1-February-2019 to 28-February-2019

Monitoring Period 17: 1-March-2019 to 31-March-2019

Monitoring Period 18: 1-April-2019 to 30-April-2019

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Monitoring Period 23: 1-September-2019 to 30-September-2019

Monitoring Period 24: 1-October-2019 to 31-October-2019

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Monitoring Period 26: 1-December-2019 to 31-December-2019

Monitoring Period 27: 1-January-2020 to 31-January-2020

Monitoring Period 28: 1-February-2020 to 29-February-2020

Monitoring Period 29: 1-March-2020 to 31-March-2020

Monitoring Period 30: 1-April-2020 to 30-April-2020

Monitoring Period 31: 1-May-2020 to 31-May-2020

Monitoring Period 32: 1-June-2020 to 30-June-2020

Monitoring Period 33: 1-July-2020 to 31-July-2020

Monitoring Period 34: 1-August-2020 to 31-August-2020

Monitoring Period 35: 1-September-2020 to 30-September-2020

Monitoring Period 36: 1-October-2020 to 31-October-2020

	Monitoring Period 37: 1-November-2020 to 30- November-2020 Monitoring Period 38: 1-December-2020 to 31-December-2020
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project comprises only one activity – a single wind farm with the total installed capacity of 100.5 MW, which was implemented close to the town of De Aar in the Northern Cape Province of the Republic of South Africa (RSA). 67 UP86 turbines, supplied by United Power, are employed by the project.

The EPC contract was signed on 06/02/2015. The wind farm started commercial operation on 31/10/2017 and continues operating. The project lifetime is 20 years.¹

The total GHG emission reductions covered in this monitoring report are 906,090 tCO₂e.

1.2 Sectoral Scope and Project Type

This project falls under sectorial scope: Energy (renewable/non-renewable).

Project type is Renewable energy. Displacement of electricity that would be provided to the grid by more-GHG-intensive means.

This is not a grouped project.

1.3 Project Proponent

Organization name	Blue World Carbon Asset Management (Pty) Ltd (Primary project Proponent)
Contact person	Ilya Goryashin
Title	General Manager
Address	http://www.blueworldcarbon.com
Telephone	+27790908139
Email	Ilya.goryashin@blueworldcarbon.com

¹ Please refer to the Project Description (version 02.1, 20/11/2019) for the references to the information provided in Section 1 of this Monitoring Report

Organization name	Longyuan Mulilo De Aar Wind Power (RF) (Pty) Ltd
Contact person	Bertus van Niekerk
Title	Project Manager
Address	1 st Floor, Mazars house, Rialto road, Grand Moorings Precinct, Century City, 7441
Telephone	+27715705168
Email	bertus@mulilo.com

1.4 Other Entities Involved in the Project

Longyuan Mulilo De Aar Wind Power (RF) (Pty) Ltd (Longyuan Mulilo) is the wind farm developer. Blue World Carbon Asset Management (Pty) Ltd (BWC) is a carbon consultant employed to develop all necessary VCS documentation, facilitate VCS registration, monitor the present project (monitoring plan), facilitate verification and request of VCU's issuance from VERRA. BWC receives a fee for its services.

Organization name	Longyuan Mulilo De Aar Wind Power (RF) (Pty) Ltd (Longyuan Mulilo)
Role in the Project	The project owner and the wind farm developer
Contact person	Bertus van Niekerk
Title	Project Manager
Address	1 st Floor, Mazars house, Rialto road, Grand Moorings Precinct, Century City, 7441
Telephone	+27715705168
Email	bertus@mulilo.com

1.5 Project Start Date

31/10/2017, the day when the wind farm started commercial operation.

1.6 Project Crediting Period

31 October 2017 (00:00) – 30 October 2027 (24:00); 10-year total period.

1.7 Project Location

The project is located on Farm Re/130 and 2/131 outside of the town of De Aar. Total area of the site is approximately 350 hectares. De Aar is the main town of the Emthanjeni Local Municipality located in the Northern Cape Province of the RSA (Figure 1.7-1 and Figure 1.7-2).

Geographical latitude: - 30.7278. Geographical longitude: 23.8831. Time zone: UTC+2.



Figure 1.7-1: Location of De Aar in the Republic of South Africa



Figure 1.7-2: The wind farm site

The GPS coordinates of wind turbines is specified in Table below:

Item	As Built (Latitude & Longitude)	Item	As Built (Latitude & Longitude)	Item	As Built (Latitude & Longitude)
1	S30°43'2.46" E23°56'50.52"	24	S30°43'54.3" E23°53'27.36"	47	S30°44'36.9" E23°51'26.16"
2	S30°42'56.7" E23°57'0.96"	25	S30°43'35.04" E23°53'24.3"	48	S30°45'4.92" E23°52'24.24"
3	S30°43'20.76" E23°52'35.22"	26	S30°43'19.8" E23°53'8.34"	49	S30°44'42.24" E23°52'0.24"
4	S30°42'41.64" E23°57'32.4"	27	S30°44'50.46" E23°51'8.58"	50	S30°44'56.88" E23°51'59.88"
5	S30°42'49.56" E23°57'24.9"	28	S30°43'53.04" E23°52'58.38"	51	S30°46'22.32" E23°51'5.82"
6	S30°42'55.98" E23°57'16.62"	29	S30°44'22.86" E23°52'18"	52	S30°31'53.76" E24°17'31.44"
7	S30°42'56.1" E23°56'31.98"	30	S30°43'36.96" E23°52'33"	53	S30°45'44.28" E23°49'53.94"
8	S30°42'59.16" E23°56'21.3"	31	S30°43'24.36" E23°52'20.4"	54	S30°44'36.9" E23°50'14.22"
9	S30°43'4.32" E23°56'8.76"	32	S30°42'58.14" E23°52'11.34"	55	S30°45'37.74" E23°50'3.24"
10	S30°43'8.76" E23°51'48.48"	33	S30°43'5.4" E23°52'1.02"	56	S30°45'32.64" E23°50'56.52"
11	S30°43'21.66" E23°51'50.88"	34	S30°43'29.4" E23°52'5.46"	57	S30°45'58.62" E23°49'58.98"
12	S30°42'56.34" E23°55'11.4"	35	S30°44'51.24" E23°52'50.7"	58	S30°46'10.2" E23°51'16.26"
13	S30°43'43.02" E23°51'51.6"	36	S30°43'6.24" E23°51'16.92"	59	S30°45'57.36" E23°50'52.56"
14	S30°43'6.06" E23°55'1.32"	37	S30°43'22.26" E23°51'20.4"	60	S30°45'51.54" E23°51'30.54"
15	S30°44'9.6" E23°53'3.18"	38	S30°43'42.24" E23°51'2.7"	61	S30°45'39.2" E23°51'52.38"
16	S30°43'51.18" E23°53'54.84"	39	S30°43'56.34" E23°50'56.28"	62	S30°45'17.4" E23°51'57.9"
17	S30°44'1.74" E23°53'47.94"	40	S30°43'31.74" E23°50'8.94"	63	S30°46'29.7" E23°51'22.56"
18	S30°44'14.52" E23°53'44.82"	41	S30°43'42.9" E23°50'1.86"	64	S30°45'33.48" E23°51'20.88"
19	S30°44'24.48" E23°53'2.46"	42	S30°43'58.86" E23°50'9.78"	65	S30°45'41.52" E23°50'23.4"
20	S30°45'19.26" E23°51'7.92"	43	S30°44'27.3" E23°50'7.98"	66	S30°45'38.7" E23°52'12.42"
21	S30°44'45.84" E23°53'3.12"	44	S30°44'43.2" E23°50'30.42"	67	S30°45'28.74" E23°52'21.9"
22	S30°44'27.36" E23°52'43.2"	45	S30°44'57.6" E23°52'39.66"		
23	S30°44'11.22" E23°50'21.48"	46	S30°45'58.86" E23°50'24.36"		

1.8 Title and Reference of Methodology

ACM0002: "Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources" (Version 19.0)²

TOOL01: "Methodological tool: Tool for the demonstration and assessment of additionality" (Version 07.0.0)³

TOOL05: "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)⁴

TOOL24: "Methodological tool: Common practice" (Version 03.1)⁵

TOOL27: "Methodological tool: Investment analysis" (Version 09.0)⁶

1.9 Participation under other GHG Programs

The project was seeking registration under the CDM programme, but it has never been registered.

1.10 Other Forms of Credit

The project has never been included in an emissions trading program or any other Binding Limits.

The project has neither sought or received other Forms of Environmental Credit.

The project is eligible under the CDM and might seek CDM registration after the end of GHG Accounting Period with VCS programme.

1.11 Sustainable Development

This project satisfies all sustainable development goals of Host Party (DNA). The main benefits of the implementation of the present project are:

1. Social and economic: Promotion and development of wind power technology in the RSA which in turn will lead to the creation of new job opportunities both during the

² <https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD>
(this version of the methodology will be applied throughout the whole document)

³ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-01-v7.0.0.pdf>
(this version of the tool will be applied throughout the whole document)

⁴ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-05-v3.0.pdf>
(this version of the tool will be applied throughout the whole document)

⁵ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-24-v1.pdf>
(this version of the tool will be applied throughout the whole document)

⁶ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-27-v9.0.pdf>
(this version of the tool will be applied throughout the whole document)

construction and operation phases and to growth in tax revenues. The project implementation led to creation of 7,961.7 person-month during the construction phase and 11,316 person-month during the operation phase. Sales of carbon credits generated by the project will result in increased foreign direct investment;

2. Environmental: Mitigation of the negative environmental impact. Combustion of fossil fuels (mostly coal) at Eskom's power plants and hereby emissions of the harmful substances into the atmosphere, such as flue gas, coal ash, oxides of sulphur and nitrogen will be reduced due to the implementation of the project; and
3. Other: Contribution to achievement of the national Government goal to generate 10,000 GWh of electricity from renewable energy by 2013 and the objective to reduce RSA's GHG emissions by approximately 34.00% below the current emissions baseline by 2020.

Reports on Enterprise and Social Economic Developments are quarterly submitted to the Department of Mineral Resources and Energy.

2 SAFEGUARDS

2.1 No Net Harm

Based on the findings of all credible specialists who undertook their respective specialist studies, it is concluded that the overall impact of this development is low as the negative impacts can be mitigated. This development has been reviewed by using the triple bottom line approach, which clearly shows that this is a sustainable development with a balance between the biodiversity, social and economic elements.

Possible negative impacts are discussed in the ensuing paragraphs below:

1) Impact on biodiversity and ecosystems

Reptiles may be forced out of their underground shelters during the construction phase. Birds and bats may be impacted through collision with the blades of the wind turbines as well as collision with the associated power line during the operational phase.

Proposed mitigation measures: Length of road and cable trenches shall be reduced; relocation of facility to a lower sensitivity area, where applicable, it is recommended that all turbines and the substation be located at least 30m from any mapped High sensitivity area; adjusting the schedule of operational turbines according to the results of ongoing monitoring of the bird and bat numbers and movement in the area; minimising the length of any new power lines.

2) Noise impact

The noise from construction machines has some impact on the surrounding area during the construction phase, which will only have a localized effect and is not expected to increase the ambient noise levels in nearest towns.

Proposed mitigation measures: all equipment should be maintained regularly and have appropriately filled silencers; personal should be specially trained. Blasting should not take place more than once a day and should only permitted between the hours of 9:00 to 17:00.

During the operation phase the cumulative contribution of the wind turbines and the transformer substation on the noise environment at the communities around the site will be within acceptable levels.

Proposed mitigation measures: Monitoring of the noise level.

3) Impact on natural resources

The impact on the natural resources is the loss of arable land due to the construction of the turbines and associated infrastructure. However, most of the current cultivation or grazing practices will still be possible between the structures.

Proposed mitigation measures: Length of road and cable trenches shall be reduced.

4) Impact on the atmosphere

The main impact is related to formation of dust during the construction period from land excavation and transportation vehicles. It should be mentioned that combustion of fossil fuels (mostly coal) at the Eskom power stations and hereby emissions of the harmful substances into the atmosphere, such as flue ash, oxides of sulphur and nitrogen will be reduced due to the project implementation.

Proposed mitigation measures: Blasting should not take place more than once a day and should only permitted between the hours of 9:00 to 17:00.

2.2 Local Stakeholder Consultation

The project owner appointed DJ Environmental Consultants to undertake the Scoping and Environmental Impact Assessment and associated Public Participation Process (PPP) in terms of the NEMA EIA Regulations and VCS requirement.

The activities undertaken to canvass public opinion regarding the proposed project activity are summarised in Table below.

An advertisement announcing the EIA Process and inviting Interested and Affected Parties (I&APs) to register on the project database was placed in The Echo and Die Volksblad.

All I&APs who registered were sent a copy of the Background Information Document.

Two notices were placed on site (Afrikaans and English) advertising the proposed development and inviting I&APs to register on the project database.

The Scoping Report was placed for public review and comment at the De Aar Public Library and Damfontein Farm. E-mails (preferred means of communication) were also sent to all registered I&APs informing them of the release of the Scoping Report for public review and comment.

The Environmental Impact Report was released in the public domain for review and comment in October 2010. Announcement on the release of the report for review and comment were placed in the local newspaper. Copies of the EIA Report were placed at the De Aar Public Library and at Damfontein Farm. The EIA Report was available for public review and comment for 40 days from 8 October 2010 until 16 November 2010.

In addition, letters were also sent out to all registered I&AP, notifying them on the availability of the EIA Report for review and comment.

I&APs were afforded an opportunity to raise their issues and concerns regarding the proposed development during the consultation process. All comment and response were compiled.

Table 5-1: Summary of activities undertaken and proposed during public consultation

Activity	Date
Phase 1: Project initiation	
Submission of Application to Department of Environmental Affairs (DEA)	Application submitted to DEA on 28 August 2009
DEA Acknowledgement of Application	31 August 2009
Identification of I&APs	October 2009
Advertisement of the process	The application was advertised in The Echo and Die Volksblad on 8 October 2009
Placement of posters on site	Posters indicating the proposed project were placed on the site on 02 October 2009
Phase 2: Initial public consultation process	
Circulation of Background Information Document to I&APs	From 23 November 2009
End of comment period on BID and registration for I&AP	17 December 2009
Phase 3: Scoping	
Circulation of Scoping Report to registered I&APs for comments	The release of the Scoping Report for public review on 08 October 2009
End of period for comment on Draft Scoping Report	02 July 2010
Collation of comments and submission of Scoping Report to DEA	05 July 2010

Activity	Date
Phase 4: EIA	
DEA reviewed Scoping Report and Plan of Study for EIA and issued a letter of acceptance and to proceed with the EIA phase	25 August 2010
Appointment of Specialists to undertake studies according to the approved terms of reference	From October 2009
EIA Report drafted and released in public domain for review and comment	8 October 2010 to 16 November 2010
Collation of comments and submission of EIA Report and draft EMP to DEA	22 November 2010
DEA review and issue a decision	60 days from submission to the Department

I&APs were afforded an opportunity to raise their issues and concerns regarding the proposed development during the public consultation process of the Scoping Phase. To date, no comments were received from the registered I&AP's. The Organs of State did not provide any comments during the provided comment period.

Longyuan Mulilo De Aar Wind Power (RF) (Pty) Ltd has a Grievance Procedure in place, which explains how stakeholders can lodge or raise an issue, concern, problem, or claim that an individual or group wants the company, wind farm operator or contractor on site to address and resolve, which is directly and indirectly related to the company's business activities.

Longyuan Mulilo De Aar Wind Power (RF) (Pty) Ltd also has a community Trust where community needs are raised and discussed.

No issues, concerns, problems, or claims have been lodged or raised through the Grievance Procedure.

2.3 AFOLU-Specific Safeguards

Not applicable, this is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The wind farm started commercial operation on 31/10/2017 and has been operating without events that could impact the GHG emission reductions or removals and monitoring.

3.2 Deviations

2.3.1 Methodology Deviations

Not applicable, there are no methodology deviations applied during these monitoring periods.

2.3.2 Project Description Deviations

Not applicable, there are no project description deviations applied during these monitoring periods. There were no project description deviations applied in previous monitoring reports (this is the first monitoring report).

3.3 Grouped Projects

Not applicable, this is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for grid connected power generation calculated ex ante
Source of data	ASB0040-2018, Table 1, page 5
Value applied	0.9871
Justification of choice of data or description of measurement methods and procedures applied	Standardized baseline ASB0040-2018 is selected for the project. Table 1 of this standardized baseline provides the value of the combined margin CO ₂ emission factor for the project electricity system applicable to wind and solar power generation for the determination of baseline emissions of 0.9871 t CO ₂ /MWh
Purpose of Data	Calculation of baseline emissions
Comments	This value was appointed as a constant for the whole crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$																				
Data unit	MWh																				
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project in year y																				
Source of data	On-site measurement by electricity meters, yielding the net electricity supplied to the grid of the RSA. There are two main meters installed in the Maanhaarberg IPP Substation on 132kV side. Each meter is accompanied with the check meter. Monthly reports with the records for delivered electricity to Phiri Eskom 132kV Switching Station are submitted by the Eskom to PP																				
Description of measurement methods and procedures to be applied	There are two main meters installed in Maanhaarberg IPP Substation on 132kV side. Each meter measures the grid electricity export and the import from grid. PP calculates the difference between the measured quantities of the grid electricity export and the import from grid. Each meter is accompanied with the check meter for the cross check. The exported and imported electricity is continuously measured and recorded. Data are digitally archived at least on a monthly basis. On the Phiri Eskom 132kV Switching Station measurement of the electricity supplied to the grid is also carried out by Eskom. Monthly reports with the records for delivered electricity to Phiri Eskom 132kV Switching Station are submitted by the Eskom to PP. PP compares and calculates the difference between two measurements. The lowest value shall be used for calculations of the baseline emissions. Longyuan Mulilo’s personal, including the plant manager, is responsible for implementation and overall control as well as collection of all data, and submits the data to BWC.																				
Frequency of monitoring/recording	Continuous measurement																				
Value monitored	Actual values for the purpose of calculation of GHG emission reductions archived: <table><tr><th>Monitoring Period</th><th>Month</th><th>Year</th><th>Value</th></tr><tr><td>1</td><td>11</td><td>2017</td><td>27,580.272000</td></tr><tr><td>2</td><td>12</td><td>2017</td><td>29,179.200005</td></tr><tr><td>3</td><td>1</td><td>2018</td><td>28,772.639990</td></tr><tr><td>4</td><td>2</td><td>2018</td><td>23,210.664000</td></tr></table>	Monitoring Period	Month	Year	Value	1	11	2017	27,580.272000	2	12	2017	29,179.200005	3	1	2018	28,772.639990	4	2	2018	23,210.664000
Monitoring Period	Month	Year	Value																		
1	11	2017	27,580.272000																		
2	12	2017	29,179.200005																		
3	1	2018	28,772.639990																		
4	2	2018	23,210.664000																		

	5	3	2018	24,668.087991
	6	4	2018	16,065.024000
	7	5	2018	18,426.887997
	8	6	2018	18,921.600000
	9	7	2018	23,024.663997
	10	8	2018	24,001.320000
	11	9	2018	20,991.360004
	12	10	2018	27,538.176011
	13	11	2018	28,971.095998
	14	12	2018	30,443.568000
	15	1	2019	32,371.560009
	16	2	2019	23,276.856010
	17	3	2019	25,907.831990
	18	4	2019	19,261.344000
	19	5	2019	17,073.839998
	20	6	2019	20,152.559990
	21	7	2019	25,277.496002
	22	8	2019	17,788.055998
	23	9	2019	23,958.048006
	24	10	2019	30,512.063996
	25	11	2019	29,149.487994
	26	12	2019	30,840.527990
	27	1	2020	29,457.311998
	28	2	2020	22,663.751995
	29	3	2020	18,532.247996
	30	4	2020	20,770.655999
	31	5	2020	12,972.527998
	32	6	2020	16,727.447998
	33	7	2020	21,138.335993
	34	8	2020	28,703.184021
	35	9	2020	22,613.280000
	36	10	2020	29,064.191998
	37	11	2020	28,356.263997
	38	12	2020	29,590.008000
Monitoring equipment	The meter class is 0.2S. Landis+Gyr E650 (or similar) electricity meters shall be used. Serial numbers of currently installed main meters are: 37108380 and 37108382. Meters are installed at the on-site substation.			

QA/QC procedures to be applied	Electricity meters are calibrated as per the requirements of the Power Purchase Agreement, clause 12.6.7, when the difference between measurements at the Phiri Eskom 132kV Switching Station and Maanhaarberg IPP Substation is more than 0.5%
Purpose of the data	Calculation of baseline emissions
Calculation method	PP compares and calculates the difference between measurements in the Maanhaarberg IPP Substation and measurements in the Eskom 132kV Switching Station. The lowest value shall be used for calculations of the baseline emissions.
Comments	-

4.3 Monitoring Plan

The following monitoring procedures are applied:

1. Monitoring period

This monitoring report covers the following monitoring periods:

- Monitoring Period 1: 1-November-2017 to 30-November-2017
- Monitoring Period 2: 1-December-2017 to 31-December-2017
- Monitoring Period 3: 1-January-2018 to 31-January-2018
- Monitoring Period 4: 1-February-2018 to 28-February-2018
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- Monitoring Period 24: 1-October-2019 to 31-October-2019
- Monitoring Period 25: 1-November-2019 to 30- November-2019
- Monitoring Period 26: 1-December-2019 to 31-December-2019
- Monitoring Period 27: 1-January-2020 to 31-January-2020
- Monitoring Period 28: 1-February-2020 to 29-February-2020
- Monitoring Period 29: 1-March-2020 to 31-March-2020
- Monitoring Period 30: 1-April-2020 to 30-April-2020
- Monitoring Period 31: 1-May-2020 to 31-May-2020
- Monitoring Period 32: 1-June-2020 to 30-June-2020
- Monitoring Period 33: 1-July-2020 to 31-July-2020
- Monitoring Period 34: 1-August-2020 to 31-August-2020
- Monitoring Period 35: 1-September-2020 to 30-September-2020
- Monitoring Period 36: 1-October-2020 to 31-October-2020
- Monitoring Period 37: 1-November-2020 to 30- November-2020
- Monitoring Period 38: 1-December-2020 to 31-December-2020

2. Data monitored and sources

The generated electricity is continuously measured and recorded at least on monthly basis by the wind farm personnel. The quantity of net electricity generation that is produced and fed into the grid in year y is determined on the basis of electricity meters. The metering instruments are installed in accordance with the requirements of the Grid and the Distribution Metering Codes at the point of supply which defines the commercial boundary between the wind farm owner and the grid. Readings of the electricity meters are cross-

checked with tax invoices and Eskom's monthly reports. Data on electricity supply are digitally archived and submitted to BWC.

The sources of data for calculation of GHG emission reductions in the course of monitoring are the records for delivered electricity to the RSA grid.

The emission reductions are calculated using the formulas in Section 3.2 of the VCS-PD.

3. The monitoring team

The wind farm underwent the necessary training related to operation and maintenance of the wind farm. The maintenance personnel of the wind farm are responsible for daily control over the monitoring plan implementation.

The Plant Manager of the wind farm is responsible for timely calibration of all instrumentation in accordance with the requirements of the power purchase agreement. Longyuan Mulilo's personal are responsible for implementation and overall control as well as collection and submission of all data to BWC.

Specialists of BWC calculate GHG emission reductions with data that are provided by Longyuan Mulilo.

In case of any doubts as to the accuracy of the data, the specialists of Longyuan Mulilo check and correct the data. The preliminary version of the monitoring report is submitted to the specialists of Longyuan Mulilo for review. In case any mistakes are found in the calculations of GHG emission reductions, the specialists of BWC correct these calculations accordingly.

4. Data storage

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

5. Instrumentation calibration

The instrumentation calibration and check-out are carried out in accordance with the requirements of the power purchase agreement. Longyuan Mulilo is responsible for the calibration or replacement of the meters.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are calculated as follows:

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

Where:

- BE_y = Baseline emissions in year y (tCO₂)
- $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project in year y (MWh)
- $EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y (tCO₂/MWh)

Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project

The following Tariff Meters are installed in the Maanhaarberg IPP Substation on 132kV side:

Tariff Meter	Serial Number
132/33KV TRFR1_(Main)	37108380
132/33KV TRFR1_(Check)	37108381
132/33KV TRFR2_(Main)	37108382
132/33KV TRFR2_(Check)	37108383

The tariff meters are equipped with the check meters.

The measured data from Tariff Meter 1 (main and check):

Monitoring Period	Month	Year	Net electricity generation from the on-site meters (kWh)		
			TRFR1 (main) (37108380)	TRFR1 (check) (37108381)	BWC's Check 1
1	11	2017	13,779,528	12,439,034	9.728%
2	12	2017	14,561,280	14,562,364	-0.007%
3	1	2018	14,358,768	14,360,683	-0.013%
4	2	2018	11,581,824	11,583,599	-0.015%
5	3	2018	12,363,408	12,365,539	-0.017%
6	4	2018	8,019,648	8,021,751	-0.026%
7	5	2018	9,193,608	9,195,227	-0.018%
8	6	2018	9,417,960	9,416,449	0.016%
9	7	2018	12,704,064	12,701,567	0.020%
10	8	2018	13,720,008	13,717,698	0.017%
11	9	2018	12,060,912	12,060,724	0.002%
12	10	2018	15,645,360	15,640,984	0.028%
13	11	2018	16,490,472	16 489 420	0.006%
14	12	2018	17,391,984	17,394,398	-0.014%

Monitoring Period	Month	Year	Net electricity generation from the on-site meters (kWh)		
			TRFR1 (main) (37108380)	TRFR1 (check) (37108381)	BWC's Check 1
15	1	2019	18,807,432	18,810,180	-0.015%
16	2	2019	13,629,888	13 633 245	-0.025%
17	3	2019	15,039,240	15,043,037	-0.025%
18	4	2019	11,183,712	11,186,603	-0.026%
19	5	2019	9,635,856	9,639,988	-0.043%
20	6	2019	11,047,488	11,051,439	-0.036%
21	7	2019	13,783,008	13,787,872	-0.035%
22	8	2019	9,947,112	9,950,972	-0.039%
23	9	2019	13,359,408	13,362,225	-0.021%
24	10	2019	17,496,768	17,499,025	-0.013%
25	11	2019	16,976,400	16,982,655	-0.037%
26	12	2019	17,776,848	17,780,521	-0.021%
27	1	2020	17,250,480	17,259,075	-0.050%
28	2	2020	12,820,344	12,823,803	-0.027%
29	3	2020	10,291,896	10,296,389	-0.044%
30	4	2020	11,570,448	11,574,337	-0.034%
31	5	2020	7,058,304	7,061,240	-0.042%
32	6	2020	9,255,024	9,257,191	-0.023%
33	7	2020	11,701,320	11,703,873	-0.022%
34	8	2020	16,311,672	16,312,585	-0.006%
35	9	2020	12,683,160	12,687,638	-0.035%
36	10	2020	16,387,488	16,386,012	0.009%
37	11	2020	16,093,392	16 097 755	-0.027%
38	12	2020	16,980,984	16 983 490	-0.015%

The difference in meter readings does not exceed 0.05%, except the readings for November 2017. This is due to the fact that the check meter only started to record as from 6/11/2017.

The measured data from Tariff Meter 2 (main and check):

Monitoring Period	Month	Year	Net electricity generation from the on-site meters (kWh)		
			TRFR2 (main) (37108382)	TRFR2 (check) (37108383)	BWC's Check 2
1	11	2017	13,800,744	12,455,691	9.746%
2	12	2017	14,621,352	14,624,764	-0.023%
3	1	2018	14,416,632	14,420,499	-0.027%
4	2	2018	11,628,840	11,632,139	-0.028%
5	3	2018	12,304,680	12,307,891	-0.026%
6	4	2018	8,045,376	8,047,903	-0.031%
7	5	2018	9,233,280	9,235,990	-0.029%
8	6	2018	9,506,832	9,511,086	-0.045%
9	7	2018	10,326,264	10,329,607	-0.032%
10	8	2018	10,281,312	10,285,169	-0.038%
11	9	2018	8,932,344	8,936,443	-0.046%
12	10	2018	11,895,768	11,897,764	-0.017%
13	11	2018	12,481,560	12 484 735	-0.025%
14	12	2018	13,051,584	13,054,117	-0.019%
15	1	2019	13,564,824	13,566,116	-0.010%
16	2	2019	9,647,352	9 648 090	-0.008%
17	3	2019	10,868,592	10,869,449	-0.008%
18	4	2019	8,077,632	8,079,022	-0.017%
19	5	2019	7,437,984	7,440,305	-0.031%
20	6	2019	9,109,752	9,112,818	-0.034%
21	7	2019	11,496,888	11,502,204	-0.046%
22	8	2019	7,844,472	7,848,706	-0.054%
23	9	2019	10,601,496	10,603,801	-0.022%
24	10	2019	13,018,344	13,025,871	-0.058%
25	11	2019	12,173,088	12,181,285	-0.067%
26	12	2019	13,064,496	13,068,528	-0.031%
27	1	2020	12,206,832	12,214,776	-0.065%
28	2	2020	9,843,408	9,848,450	-0.051%
29	3	2020	8,240,352	8,243,376	-0.037%
30	4	2020	9,200,208	9,200,745	-0.006%
31	5	2020	5,918,256	5,922,606	-0.073%
32	6	2020	7,478,880	7,482,519	-0.049%
33	7	2020	9,448,488	9,452,695	-0.045%

Monitoring Period	Month	Year	Net electricity generation from the on-site meters (kWh)		
			TRFR2 (main) (37108382)	TRFR2 (check) (37108383)	BWC's Check 2
34	8	2020	12,391,920	12,396,433	-0.036%
35	9	2020	9,930,120	9,935,727	-0.056%
36	10	2020	12,676,704	12,679,638	-0.023%
37	11	2020	12,263,016	12 267 920	-0.040%
38	12	2020	12,609,024	12 614 705	-0.045%

The difference in meter readings does not exceed 0.075%, except the readings for November 2017. This is due to the fact that the check meter only started to record as from 6/11/2017.

On the Phiri Eskom 132kV Switching Station measurement of the electricity supplied to the grid is also carried out by Eskom and captured on the Eskom's Payment Certificates:

Monitoring Period	Month	Year	Eskom Payment Certificates		BWC's Check 3
			Metered	Commercial Energy	
1	11	2017	27,580,272.002	27,580,272	0.000%
2	12	2017	29,179,200.005	29,179,200	0.000%
3	1	2018	28,772,639.990	28,772,640	0.000%
4	2	2018	23,210,664.015	23,210,664	0.000%
5	3	2018	24,668,087.991	24,668,088	0.000%
6	4	2018	16,065,024.010	16,065,024	0.000%
7	5	2018	18,426,887.997	18,426,888	0.000%
8	6	2018	18,921,600.000	18,921,600	0.000%
9	7	2018	23,024,663.997	23,024,664	0.000%
10	8	2018	24,001,320.004	24,001,320	0.000%
11	9	2018	20,991,360.004	20,991,360	0.000%
12	10	2018	27,538,176.011	27,538,176	0.000%
13	11	2018	28,971,095.998	28,971,096	0.000%
14	12	2018	30,443,568.002	30,443,568	0.000%
15	1	2019	32,371,560.009	32,371,560	0.000%
16	2	2019	23,276,856.010	23,276,856	0.000%
17	3	2019	25,907,831.990	25,907,832	0.000%
18	4	2019	19,261,344.012	19,261,344	0.000%
19	5	2019	17,073,839.998	17,073,840	0.000%

Monitoring Period	Month	Year	Eskom Payment Certificates		BWC's Check 3
			Metered	Commercial Energy	
20	6	2019	20,152,559.990	20,152,560	0.000%
21	7	2019	25,277,496.002	25,277,496	0.000%
22	8	2019	17,788,055.998	17,788,056	0.000%
23	9	2019	23,958,048.006	23,958,048	0.000%
24	10	2019	30,512,063.996	30,512,064	0.000%
25	11	2019	29,149,487.994	29,149,488	0.000%
26	12	2019	30,840,527.990	30,840,528	0.000%
27	1	2020	29,457,311.998	29,457,312	0.000%
28	2	2020	22,663,751.995	22,663,752	0.000%
29	3	2020	18,532,247.996	18,532,248	0.000%
30	4	2020	20,770,655.999	20,770,656	0.000%
31	5	2020	12,972,527.998	12,972,528	0.000%
32	6	2020	16,727,447.998	16,727,448	0.000%
33	7	2020	21,138,335.993	21,138,336	0.000%
34	8	2020	28,703,184.021	28,703,184	0.000%
35	9	2020	22,613,280.006	22,613,280	0.000%
36	10	2020	29,064,191.998	29,064,192	0.000%
37	11	2020	28,356,263.997	28,356,264	0.000%
38	12	2020	29,590,008.012	29,590,008	0.000%

The lowest values between the measured by Eskom and the on-site measured by Tariff Meters are used for the calculations of the baseline emissions:

Monitoring Period	Month	Year	KWh used to calculate the baseline emissions		
			Total TRFR1 (main) + TRFR2 (main)	Metered by Eskom	Minimum value
1	11	2017	27,580,272	27,580,272.002	27,580,272.000
2	12	2017	29,182,632	29,179,200.005	29,179,200.005
3	1	2018	28,775,400	28,772,639.990	28,772,639.990
4	2	2018	23,210,664	23,210,664.015	23,210,664.000
5	3	2018	24,668,088	24,668,087.991	24,668,087.991
6	4	2018	16,065,024	16,065,024.010	16,065,024.000
7	5	2018	18,426,888	18,426,887.997	18,426,887.997
8	6	2018	18,924,792	18,921,600.000	18,921,600.000

Monitoring Period	Month	Year	KWh used to calculate the baseline emissions		
			Total TRFR1 (main) + TRFR2 (main)	Metered by Eskom	Minimum value
9	7	2018	23,030,328	23,024,663.997	23,024,663.997
10	8	2018	24,001,320	24,001,320.004	24,001,320.000
11	9	2018	20,993,256	20,991,360.004	20,991,360.004
12	10	2018	27,541,128	27,538,176.011	27,538,176.011
13	11	2018	28,972,032	28,971,095.998	28,971,095.998
14	12	2018	30,443,568	30,443,568.002	30,443,568.000
15	1	2019	32,372,256	32,371,560.009	32,371,560.009
16	2	2019	23,277,240	23,276,856.010	23,276,856.010
17	3	2019	25,907,832	25,907,831.990	25,907,831.990
18	4	2019	19,261,344	19,261,344.012	19,261,344.000
19	5	2019	17,073,840	17,073,839.998	17,073,839.998
20	6	2019	20,157,240	20,152,559.990	20,152,559.990
21	7	2019	25,279,896	25,277,496.002	25,277,496.002
22	8	2019	17,791,584	17,788,055.998	17,788,055.998
23	9	2019	23,960,904	23,958,048.006	23,958,048.006
24	10	2019	30,515,112	30,512,063.996	30,512,063.996
25	11	2019	29,149,488	29,149,487.994	29,149,487.994
26	12	2019	30,841,344	30,840,527.990	30,840,527.990
27	1	2020	29,457,312	29,457,311.998	29,457,311.998
28	2	2020	22,663,752	22,663,751.995	22,663,751.995
29	3	2020	18,532,248	18,532,247.996	18,532,247.996
30	4	2020	20,770,656	20,770,655.999	20,770,655.999
31	5	2020	12,976,560	12,972,527.998	12,972,527.998
32	6	2020	16,733,904	16,727,447.998	16,727,447.998
33	7	2020	21,149,808	21,138,335.993	21,138,335.993
34	8	2020	28,703,592	28,703,184.021	28,703,184.021
35	9	2020	22,613,280	22,613,280.006	22,613,280.000
36	10	2020	29,064,192	29,064,191.998	29,064,191.998
37	11	2020	28,356,408	28,356,263.997	28,356,263.997
38	12	2020	29,590,008	29,590,008.012	29,590,008.000

Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project in year y (MWh):

Monitoring Period	Month	Year	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project in year y (MWh)
1	11	2017	27,580.272000
2	12	2017	29,179.200005
3	1	2018	28,772.639990
4	2	2018	23,210.664000
5	3	2018	24,668.087991
6	4	2018	16,065.024000
7	5	2018	18,426.887997
8	6	2018	18,921.600000
9	7	2018	23,024.663997
10	8	2018	24,001.320000
11	9	2018	20,991.360004
12	10	2018	27,538.176011
13	11	2018	28,971.095998
14	12	2018	30,443.568000
15	1	2019	32,371.560009
16	2	2019	23,276.856010
17	3	2019	25,907.831990
18	4	2019	19,261.344000
19	5	2019	17,073.839998
20	6	2019	20,152.559990
21	7	2019	25,277.496002
22	8	2019	17,788.055998
23	9	2019	23,958.048006
24	10	2019	30,512.063996
25	11	2019	29,149.487994
26	12	2019	30,840.527990
27	1	2020	29,457.311998
28	2	2020	22,663.751995
29	3	2020	18,532.247996
30	4	2020	20,770.655999
31	5	2020	12,972.527998
32	6	2020	16,727.447998

Monitoring Period	Month	Year	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project in year y (MWh)
33	7	2020	21,138.335993
34	8	2020	28,703.184021
35	9	2020	22,613.280000
36	10	2020	29,064.191998
37	11	2020	28,356.263997
38	12	2020	29,590.008000

Combined margin CO₂ emission factor for grid connected power generation

Standardized baseline ASB0040-2018 is selected for the project. The value of the combined margin CO₂ emission factor for the project electricity system applicable to wind and solar power generation for the determination of baseline emissions is 0.9871 t CO₂/MWh.

5.2 Project Emissions

Since the project activity uses wind energy to generate electricity the project emissions are equal to zero: PE_y = 0.

5.3 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: LE_y = 0.

5.4 Net GHG Emission Reductions and Removals

There are 38 vintages covered in this monitoring report.

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/11/2017 - 30/11/2017	27,224	0	0	27,224

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/12/2017 - 31/12/2017	28,802	0	0	28,802
01/01/2018 - 31/01/2018	28,401	0	0	28,401
01/02/2018 - 28/02/2018	22,911	0	0	22,911
01/03/2018 - 31/03/2018	24,349	0	0	24,349
01/04/2018 - 30/04/2018	15,857	0	0	15,857
01/05/2018 - 31/05/2018	18,189	0	0	18,189
01/06/2018 - 30/06/2018	18,677	0	0	18,677
01/07/2018 - 31/07/2018	22,727	0	0	22,727
01/08/2018 - 31/08/2018	23,691	0	0	23,691
01/09/2018 - 30/09/2018	20,720	0	0	20,720
01/10/2018 - 31/10/2018	27,182	0	0	27,182
01/11/2018 - 30/11/2018	28,597	0	0	28,597

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/12/2018 - 31/12/2018	30,050	0	0	30,050
01/01/2019 - 31/01/2019	31,953	0	0	31,953
01/02/2019 - 28/02/2019	22,976	0	0	22,976
01/03/2019 - 31/03/2019	25,573	0	0	25,573
01/04/2019 - 30/04/2019	19,012	0	0	19,012
01/05/2019 - 31/05/2019	16,853	0	0	16,853
01/06/2019 - 30/06/2019	19,892	0	0	19,892
01/07/2019 - 31/07/2019	24,951	0	0	24,951
01/08/2019 - 31/08/2019	17,558	0	0	17,558
01/09/2019 - 30/09/2019	23,648	0	0	23,648
01/10/2019 - 31/10/2019	30,118	0	0	30,118
01/11/2019 - 30/11/2019	28,773	0	0	28,773

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/12/2019 - 31/12/2019	30,442	0	0	30,442
01/01/2020 - 31/01/2020	29,077	0	0	29,077
01/02/2020 - 29/02/2020	22,371	0	0	22,371
01/03/2020 - 31/03/2020	18,293	0	0	18,293
01/04/2020 - 30/04/2020	20,502	0	0	20,502
01/05/2020 - 31/05/2020	12,805	0	0	12,805
01/06/2020 - 30/06/2020	16,511	0	0	16,511
01/07/2020 - 31/07/2020	20,865	0	0	20,865
01/08/2020 - 31/08/2020	28,332	0	0	28,332
01/09/2020 - 30/09/2020	22,321	0	0	22,321
01/10/2020 - 31/10/2020	28,689	0	0	28,689
01/11/2020 - 30/11/2020	27,990	0	0	27,990

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/12/2020 - 31/12/2020	29,208	0	0	29,208
Total	906,090	0	0	906,090