Gold Standard for the Global Goals

Climate Security & Sustainable Development

MONITORING REPORT

PUBLICATION DATE **14.10.2020**
VERSION **v. 1.1**
RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

Key Project Information
0 - Description of project
0 - Implementation of project
0 - Description of monitoring system applied by the project
0 - Data and parameters
0 - Calculation of SDG Impacts
0 - Safeguards Reporting
0 - Stakeholder inputs and legal disputes

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS11307
Title of the project (s) covered by monitoring report	Sapphire 49.5 MW Wind Farm Project
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	3.2
Version number of the monitoring report	1.6
Completion date of the monitoring report	28/03/2024
Date of project design certification	07/02/2022
Date of Last Annual Report	29/12/2022
Monitoring period number	2nd[1]
Duration of this monitoring period	01/01/2021 to 31/12/2022
Project Representative	Monsoon Carbon Pty Ltd.
Host Country	Islamic Republic of Pakistan
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	ACM0002: Grid-connected electricity generation from renewable sources (Version 20.0).
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

[1] This is the first monitoring period (1/1/2021-31/12/2022) under GS4GG. The previous period was monitored while the Project was registered on the Clean Development Mechanism and CERs were issued. These CERs were later labelled as Gold Standard CERs and then finally converted into GS VERs.

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 13 Climate Action	Emission Reductions	111,455	GS VER
SDG 7 Affordable and Clean Energy	Net amount of electricity supplied to grid	223,873	MWh
SDG 8 Decent work and Economic Growth	Number of jobs created	20	jobs

Table 2 – Product Vintages

		Amount Achieved		
Start Dates	End Dates	GS VERs	MWh	...
1/1/2021	31/12/2021	60,128	121,546	
1/1/2022	31/12/2022	51,327	102,328	

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

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The purpose of Sapphire 49.5MW Wind Farm Project (hereinafter the "project activity" or the "project" or the "wind farm") is to utilize wind resources for electricity generation through the construction of a wind farm with a total capacity of 52.8 MW and to deliver the electricity generated from the project to the *Water and Power Development Authority* (WAPDA) electricity grid, which is one of two national grids in Pakistan. By replacing the electricity supplied by the WAPDA grid, which is heavily dominated by fossil fuel fired power plants, with electricity generated from wind power the proposed project activity will achieve obvious greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions.

The project owner is Sapphire Wind Power Co. Ltd. The project activity involves the installation and operation of 33 wind turbines with unit capacity of 1,600kW, which will supply an average annual generation of 137,500 MWh to the WAPDA grid. The total installed capacity is actually 52.8 MW due to an increase in the rated capacity of the turbines from 1.5 MW to 1.6 MW.

The project started construction on 28/08/2014 and was in full commercial operation on 22/11/2015. Since then, the operation of the project has been continued in accordance with the project design as well as the description in the registered PDD. The CDM registration date was 14/11/2012, with UNFCCC Reference no 8163. The start date of the crediting period was changed to be 22/11/2015 (formerly 01/01/2014)[2]. Therefore, the crediting period is now 22/11/2015 – 21/11/2025 (Fixed) under CDM. The project was registered under GS4GG on 07/02/2022, the crediting period of the project under GS4GG is 22/11/2015 – 21/11/2025.

The total emission reductions achieved in this monitoring period (01/01/2021 – 31/12/2022) are 111,455 tCO_2e.

[2] https://cdm.unfccc.int/PRCContainer/DB/prcp771647029/view

A.2. Location of project

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The project is located in Pakistan, Sindh Province, northeast of Jhimpir City, within a narrow corridor, spanned by the following coordinates:

	Longitude	Latitude
1. 1.	67º51’48.33” E	25º07’18.40” N
2. 2.	67º51’48.03” E	25º07’10.59” N
3. 3.	67º54’40.46” E	25º06’20.95” N
4. 4.	67º56’01.05” E	25º05’35.46” N
5. 5.	67º57’53.13” E	25º05’03.55” N
6. 6.	67º58’08.95” E	25º05’28.90” N

The Geo-coordinate of each wind turbine (WTG) is listed as follows:

WTG	Longitude (E)	Latitude (N)	WTG	Longitude (E)	Latitude (N)
1	67° 53' 29.378"	25° 6' 47.937"	17	67° 55' 44.715"	25° 6' 9.012"
2	67° 53' 37.837"	25° 6' 45.497"	18	67° 55' 53.172"	25° 6' 6.57"
3	67° 53' 46.296"	25° 6' 43.057"	19	67° 56' 1.63"	25° 6' 4.128"
4	67° 53' 54.754"	25° 6' 40.649"	20	67° 56' 10.086"	25° 6' 1.718"
5	67° 54' 3.216"	25° 6' 38.209"	21	67° 56' 18.544"	25° 5' 59.275"
6	67° 54' 11.675"	25° 6' 35.768"	22	67° 56' 26.185"	25° 5' 57.054"
7	67° 54' 20.133"	25° 6' 33.328"	23	67° 56' 35.458"	25° 5' 54.39"
8	67° 54' 28.591"	25° 6' 30.92"	24	67° 56' 43.914"	25° 5' 51.979"
9	67° 54' 37.049"	25° 6' 28.479"	25	67° 56' 52.375"	25° 5' 49.536"
10	67° 54' 45.508"	25° 6' 26.038"	26	67° 57' 0.831"	25° 5' 47.093"
11	67° 54' 53.966"	25° 6' 23.597"	27	67° 57' 9.288"	25° 5' 44.65"
12	67° 55' 2.423"	25° 6' 21.188"	28	67° 57' 17.744"	25° 5' 42.239"
13	67° 55' 10.881"	25° 6' 18.746"	29	67° 57' 26.201"	25° 5' 39.795"
14	67° 55' 18.569"	25° 7' 44.07"	30	67° 57' 34.657"	25° 5' 37.351"
15	67° 55' 27.8"	25° 6' 13.863"	31	67° 57' 43.113"	25° 5' 34.908"
16	67° 55' 36.257"	25° 6' 11.454"	32	67° 57' 51.569"	25° 5' 32.496"
			33	67° 58' 0.025"	25° 5' 30.052"

The maps below illustrate the project location.

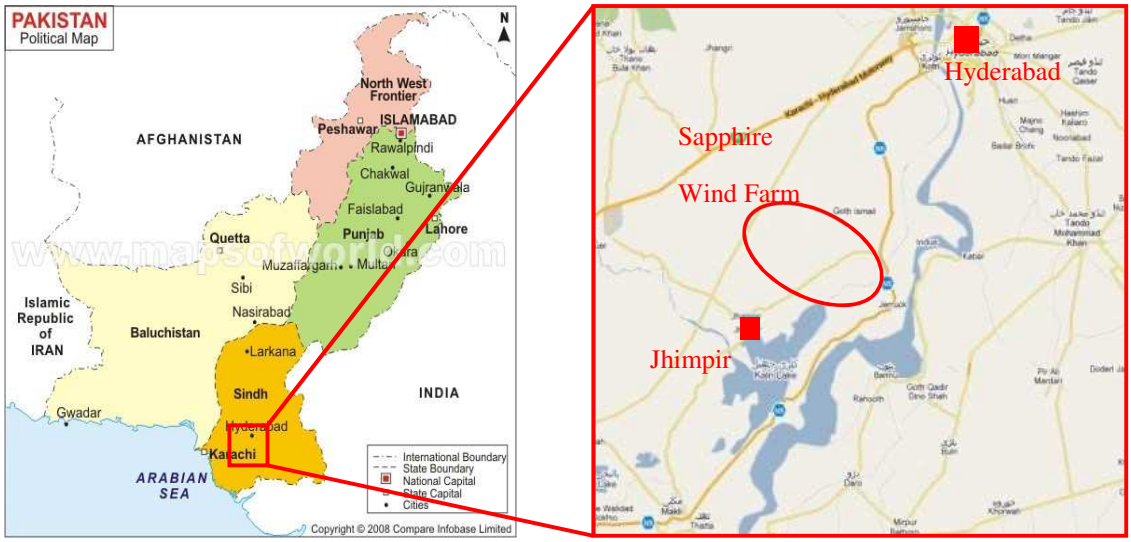

Figure 1: Map ofthe project location

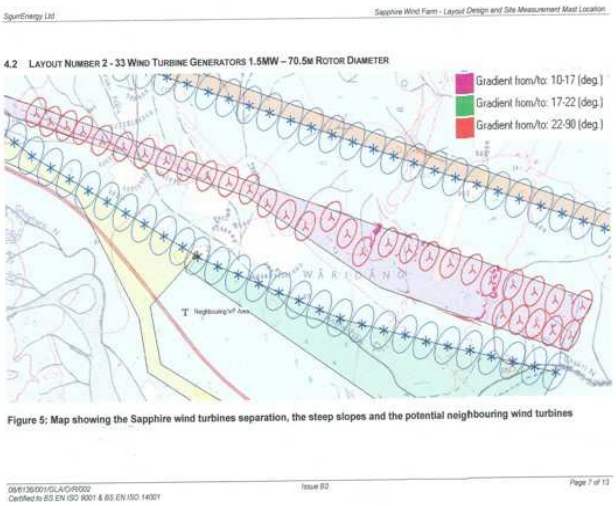

Figure 2: Map of the project location

A.3. Reference of applied methodology

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Title of the baseline methodology:

ACM0002: Grid-connected electricity generation from renewable sources (Version 20.0). [3]

Furthermore, the following Tool has been applied:

Version 07.0 of the Tool07: "Tool to calculate the emission factor for an electricity system" [4].

[3] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG
[4] https://cdm.unfccc.int/methodologies/Pamethodologies/tools/am-tool-07-v7.0.pdf

A.4. Crediting period of project

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22/11/2015 – 21/11/2025 (Fixed) under CDM;

22/11/2015 – 21/11/2025 under GS4GG.

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

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During the project implementation, 33 units of GE 1.6xle 50Hz wind turbine generators (WTG) were installed. The project has a total installed capacity of 52.8 MW and generates an annual estimated amount of electricity of 137,500 MWh at a plant load factor of 29.7%. Please see the technical parameters of the wind turbines as follows:

Table 1: Main technical parameters of the wind turbines

Parameter	Value
Rated power	1.6MW
Diameter of Rotor	82.5m
Number of blades	3
Swept area	5,346m^2
Rotor speed range	9 to 18 rpm
Rotational direction	Clockwise looking downwind
Maximum tip speed	77.2m/s
Orientation	Upwind
Speed regulation	Pitch control
Manufacturer	GE
Lifetime	20 years

The start date of the project (Finalization of EPC[5] contract) was 27/08/2011. The project started construction on 28/08/2014 and was in full commercial

[5] EPC (Engineering, Procurement and Construction)

operation on 22/11/2015. Since then, the operation of the project has been continued in accordance with the project design as well as the description in the registered PDD.

The normal implementation of the project has been maintained and no events or situations which may impact the applicability of the methodology have been observed during this monitoring period.

The technical and monitoring diagram is as follows:

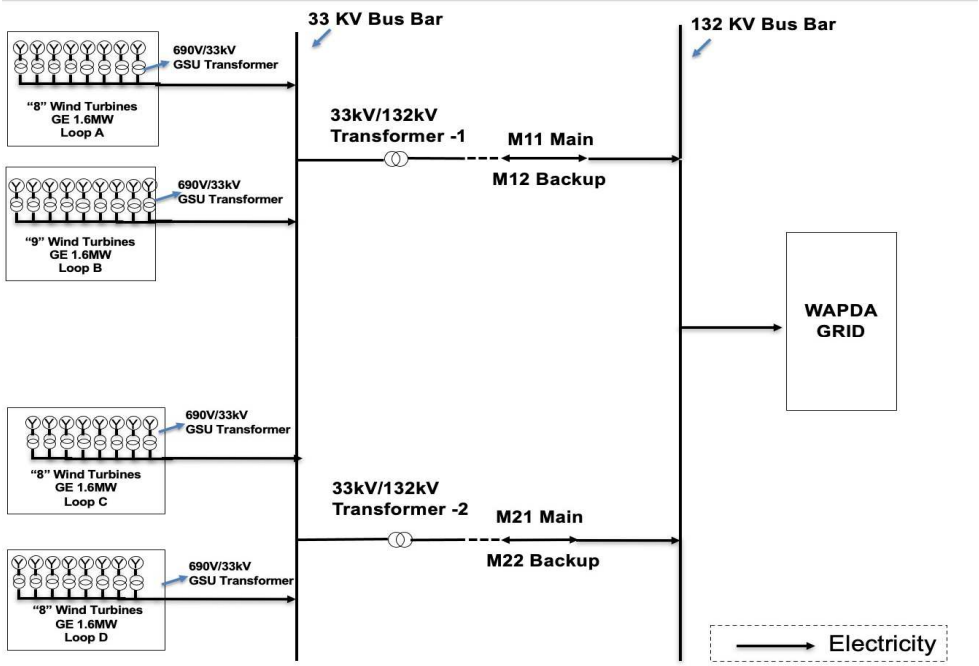

Figure 3: Technical and monitoring diagram of the project

B.1.1 Forward Action Requests
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There are three groups of FARs relevant to this Monitoring Report:

1. FARs raised in the Previous Verification Report;
2. FARs raised by Gold Standard from the Previous Performance Review; and
3. FARs raised in Transition Review.

Further information is provided below.

FARs Raised in Previous Verification Report

Two FARs were raised in the previous Verification Report:

FAR 01: The effectiveness of the grievance mechanism shall also be checked by interviewing the local stakeholders during the initial GS verification of the project.

This FAR is no longer relevant, having been reviewed during the initial GS verification of the project. Local stakeholders were interviewed during the initial GS verification of the project.

FAR 02: All relevant registries (domestic and international) that could hold RECs from the project activity e.g. RECs, I-RECs etc. shall also be checked for the avoidance of double counting during the initial GS verification of the project.

Yes, all relevant registries (domestic and international) that could hold RECs from the project activity e.g. RECs, I-RECs etc have been checked and no double counting of the project for the monitoring period (01/01/2021-31/12/2022) was found.

In addition, the project owner, i.e. Sapphire Wind Power Co. Ltd, signed a declaration letter regarding no double counting.

In the declaration letter, it's indicated that the project owner is aware that for a given vintage, a registered Gold Standard project can request the issuance of the emission reductions under only one standard/certification scheme. The project is registered as CDM and GS on 14/11/2012 and 07/02/2022, respectively. Currently, the project is seeking to convert some of the previously issued GS CERs for the monitoring period (02/08/2019-31/12/2020) into GS VERs. In addition, GS CERs and GS VERs will not be issued for the same monitoring period of the project, to avoid double Counting.

On 5 May 2023, the project was also registered on the I-REC Standard. The registration date is recorded as one year prior to this date as RECs can be claimed back by up to one year. As of today (6 October 2023), no RECs have been issued by the project[6]. The deadline for issuing 2022 RECs (i.e. the current monitoring period) on the I-REC Standard was 30 September 2023, so therefore no RECs can be issued by the project from the monitoring period. As part of the process to register on the I-REC Standard, the project owner has submitted an

[6] https://evident.app/IREC/device-register/52.8ES20001

Owner's Declaration Letter to confirm that they will not issue RECs and carbon credits of any kind from the same period of electricity generation. Apart from the I-REC Standard, GS and CDM, no other voluntary or compliance standard (regardless of domestic or international) has been applied.

FARs Raised by Gold Standard from Previous Performance Review

Gold Standard has raised three FARs from a previous Performance Review.

FAR#1: In-line with GS4GG Principles and Requirements, VVB and PP shall consider the rule below for future monitoring activities: 5.1.39: An annual update report shall be provided to GS -when design certification is achieved- for each monitoring year by the end of next calendar year for which verification is not completed.

The project was added to GSGG in 2022. A verification was conducted in 2022. An annual update report was also filed for 2022.

FAR#2: The CER issuance with serial number for Gold Standard labelling shall be submitted for the GS verification of the project.

The serial numbers of the CER issuance for Gold Standard labelling have previously been submitted to Gold Standard and are displayed on the registry at https://registry.goldstandard.org/projects/details/3328.

The serial numbers of the 2019 CER issuance are: PK-5-10435678-2-2-0-8163 - PK-5-10449070-2-2-0-8163

The serial numbers of the 2020 CER issuance are: PK-5-10449071-2-2-0-8163 – PK-5-10488414-2-2-0-8163

FAR # 3: The effectiveness of the grievance mechanism shall be checked by interviewing the local stakeholders during the GS verification of the project.

Local stakeholders were interviewed during the GS verification of the project.

FARs Raised in Transition Review

One FAR was raised during the Transition Review from GSCDM to GS VER

FAR#1: After GS CDM TO GS VER transition, the PD shall contract VVB for re validation under GS VER to claim CP2 01/01/2021 – 21/11/2025.

As confirmed with Gold Standard on 18 January 2024, as per page 10 of Rule Clarification "Design Certification Renewal Requirements – CDM Projects Transitioning to GS4GG", this project is not required to undergo design certification renewal and is therefore able to claim issuances up to 21 November 2025 without re-validation.

B.2. Post-Design Certification changes

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B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

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On 15 November 2023, the Project was granted a deviation from the Site Visit and Remote Audit Requirements and Procedures. Published as DEV_574, the approved deviation requires the following:

1. Ensure that a continuity in the Project's monitoring activities is maintained and PD is able to justify that no monitoring gaps exist (especially for SDG parameters) within the Monitoring Period(s). However, if gap(s) exist, the project shall justify that conservative approach(es) have been applied in line with section 3 of the Deviation Approval Requirements and Procedures (version 1.2) and overarching GS principles (as applicable).
2. PD shall comply with section 3.1 of Site Visit and Remote Audit Requirements and Procedures – V2.0 and conduct a physical site visit no later than 28/03/2024.
3. Document the deviation request, its implications, and GS' decision in the appropriate section of the GS Monitoring Report (for the relevant MP). The verifying VVB shall, through appropriate means at its disposal, evaluate the Project's compliance with the above condition and provide its opinion in the Verification Report.
4. SustainCERT shall review both the PD's response and the VVB's assessment/opinion of the same and take appropriate steps.

In response, the Project confirms that continuity in monitoring activities has been maintained and that no monitoring gap exists within the Monitoring Period, including for SDG parameters. Furthermore, a site visit will have occurred no later than 28/03/2024.

B.2.2. Corrections

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The latitude and longitude values of the individual WTGs have been corrected on request. Aside from this requested correction, no further corrections to project information or parameters fixed at validation have been submitted with this monitoring report.

B.2.3. Changes to start date of crediting period

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The start date of crediting period under CDM has been changed to be 22/11/2015 (formerly 01/01/2014)[4]. Such post-registration change (PRC-8163-001) was approved by CDM EB on 10/04/2017.

There are no changes to the start date of the crediting period for the project under the GS4GG project cycle.

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

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N/A. The project is implemented as described in the registered PDD and there are no permanent changes.

B.2.5. Changes to project design of approved project

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The installed power capacity has been increased from 49.5MW (33*1.5MW) to 52.8MW (33*1.6MW).

Such post-registration change (PRC-8163-001) has been approved by CDM EB on 10/04/2017 [7].

There are no changes to the project design of the approved GS registered project.

[7] https://cdm.unfccc.int/PRCContainer/DB/prcp771647029/view

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

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The monitoring system is designed in accordance with the requirements of methodology ACM0002 (Version 20.0) and the registered GS PDD.

1. Monitoring objects

For SDG7 and SDG13, the main monitoring objects are the net electricity supplied to the grid $EG_{facility,y}$ (i.e. electricity delivered to the grid $EG_{export,y}$ and the electricity imported from the grid $EG_{import,y}$) and the grid emission factor. To calculate the grid emission factor, the following parameters are monitored:

- Amount of fossil fuel type i consumed in the project electricity system in year y($FC_{i,y}$);
- Net calorific value (energy content) of fossil fuel type i in year y ($NCV_{i,y}$);
- CO2 emission factor of fossil fuel type i used in power unit m in year y ($EF_{CO2,i,y}$);
- Net electricity generated by the project electricity system in year y (EG_y);
- Average net energy conversion efficiency of power unit m in year y ($\eta_{m,y}$)

For SDG8, the number of jobs created during project implementation is monitored. For monitoring safeguarding principles, mitigation measures regarding working conditions, dust emissions and soil conditions, etc are monitored.

2. Management structure

A Carbon department set up by the project owner has appointed personnel to carry out the monitoring plan. The personnel structure is as follows:

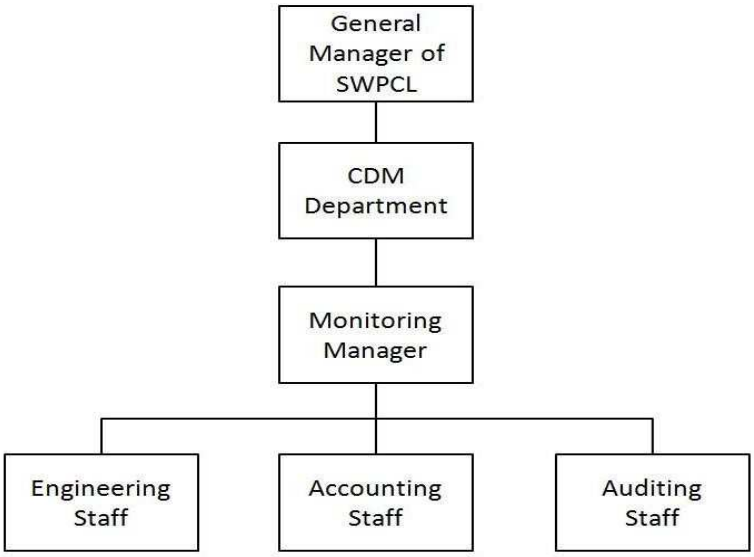

Figure 4: Monitoring organisation

- General manager is responsible to the implementation of monitoring as per the registered monitoring plan.
- A monitoring manager has been appointed to supervise the implementation of the monitoring plan, while further staff, including engineering staff, accounting staff and (internal) auditing staff, have been appointed to carry out the monitoring plan. The monitoring manager is also responsible to monitor mitigation measures regarding dust emissions and soil conditions, etc and number of jobs created (SDG8) during implementation of the project.
- The engineering staff is responsible for data collection (such as meter readings), daily maintenance of equipment (if required) and the emission reduction calculation.
- The accounting staff is responsible for the process of power transactions with the power grid company and power sale receipts keeping.
- The auditing staff is responsible for reviewing the data and receipts collected, ensuring the veracity and transparency of them.

3. Monitoring equipment and installation

Four electricity meters are adopted in the monitoring system of the project. The meters have been installed at the interconnection point to the grid for monitoring the electricity delivered to the grid.

Two bidirectional electricity meters with the accuracy of 0.2s (M11 and M21) are installed as the main meters at the High Voltage Side (132kV) of the Power Transformer of the Complex to monitor the electricity exported to the grid ($EG_{export,y}$) and imported from the grid ($EG_{import,y}$) by the project activity. The net electricity supplied to grid ($EG_{facility,y}$) is the difference between the electricity exported to the grid ($EG_{export,y}$) and imported from the grid ($EG_{import,y}$), i.e. $EG_{export,y}$ - $EG_{import,y}$. Another two bidirectional electricity meters of the same accuracy of 0.2s (M12 as backup meter for M11; M22 as backup meter for M21) are also installed as the backup meters of the main meters of M11 and M21 at the High Voltage Side (132kV) of the Power Transformer of the Complex.

The emission reductions are calculated based on records of the main meters, and can be cross-checked with electricity sales & purchase receipts.

The monitoring system is illustrated as follows:

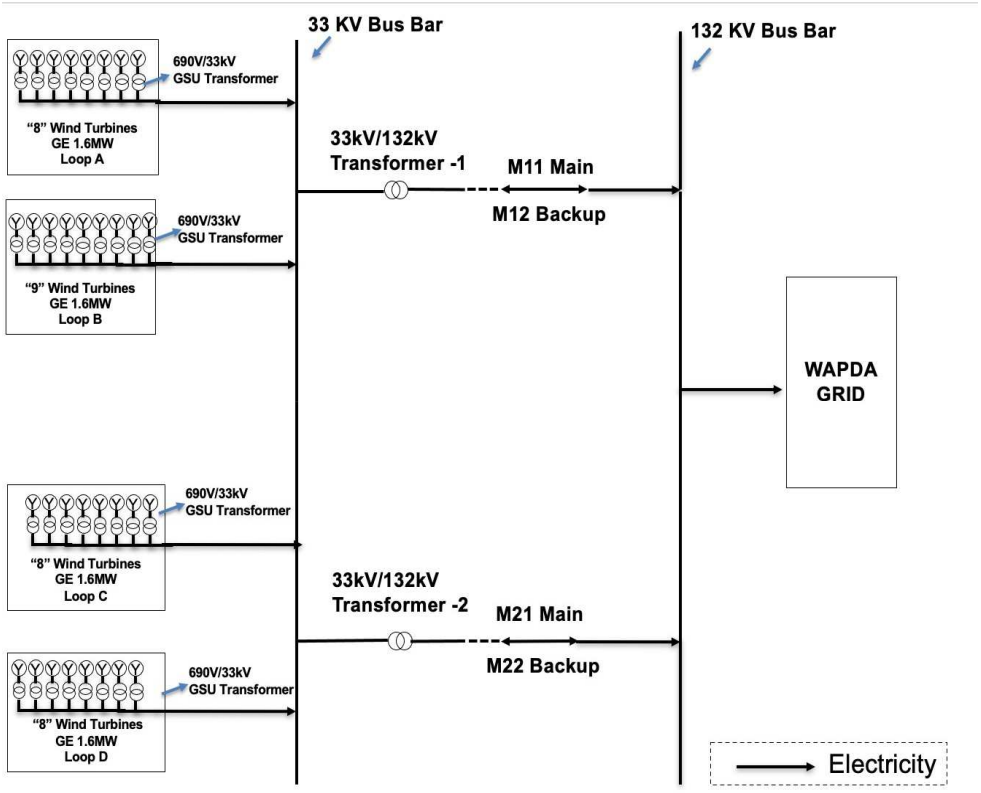

Figure 5: Monitoring diagram of the project

Net electricity generation supplied by the project to the grid during the year y ($EG_{facility,y}$) equals the difference between electricity exported to the grid ($EG_{export,y}$) and electricity imported from the grid ($EG_{import,y}$) by the project in year y.

Testing and calibration of all the energy meters M11, M12, M21 and M22 have been carried out by the grid operator (WAPDA) as per the specification in the Energy Purchase Agreement (EPA), which is signed between the grid company and Sapphire Wind Power Company Limited (SWPCL)[8]. The meters have been sealed after calibration. Neither the project owner nor the power grid company could unseal or change the meters without the presence of the other party.

Relevant monitoring parameters for the grid emission factor calculation are sourced from the latest Pakistan Energy Yearbooks published by the Ministry of Petroleum & Natural Resources. The grid emission factor is calculated based on the "Tool to calculate the emission factor for an electricity system" Version 7.0.

4. Data recording, collection and reporting

The monitoring staffs are responsible for the measurement of electricity by reading the meters on-site according to the Energy Purchase Agreement (EPA). Every month, the monitored data has been archived electronically, at the same time the paper document record has been archived. The accounting staff issues the receipts of power sales/purchase to the grid company every month and then keeps the receipts of power sales/purchase. The monitoring plan has been carried out mainly by the Carbon department and conducted by the appointed personnel. All key documents have been kept collectively.

The number of jobs created during project implementation is checked by the monitoring manager and certificates of workers are checked as well. In addition, the monitoring manager monitors mitigation measures regarding working conditions, dust emissions and soil conditions, etc by distributing a monitoring questionnaire to project workers. To promote candid responses, the project workers are allowed to fill out the questionnaires anonymously. The completed questionnaires are archived.

[8] This EPA is agreed between SWPCL and the grid company based on the manufacturer's recommendations and national standards

The grid emission factor is calculated annually based on the "Tool to calculate the emission factor for an electricity system" Version 7.0[9] and latest data from Pakistan Energy Yearbooks[10].

The monitored data will be kept during the whole crediting period and 2 years after the end of the crediting period or until the last issuance of VERs, whichever occurs later.

5. Emergency procedures for the monitoring system

Electricity measured by the main meters alone should suffice for the purpose of billing and emissions reduction verification as long as the error in the main meter is within the permissible limits. However, should either the project owner or the grid company find the function of the main meter abnormal or broken-down, the other party and the authorized meter inspection institution need to be informed immediately to address the issues and make the meter function normally again as soon as possible. In addition, should any previous monthly readings of the main meter be inaccurate by more than the allowable error, or be found to have functioned improperly, the electricity generated by the project shall be determined by:

A. First, by reading the backup meters, unless a test by either party reveals it is inaccurate;

B. If the backup meters fail to function normally, the project owner and the grid company shall jointly estimate the correct reading in a conservative manner;

C. If the project owner and the grid company fail to mutually estimate of the correct reading, the readings will be taken as zero, to be conservative.

No emergency occurred in relation to the monitoring system during this monitoring period and the meters functioned correctly.

[9] https://cdm.unfccc.int/methodologies/Pamethodologies/tools/am-tool-07-v7.0.pdf

[10] https://www.hdip.com.pk/pakistan-energy-yearbook

6. Confirmation on Avoidance of double counting:

The project owner, i.e. Sapphire Wind Power Co. Ltd, signed a declaration letter regarding no double counting.

In the declaration letter, it is confirmed that the project owner is aware that for a given vintage, a registered Gold Standard project can request the issuance of the emission reductions under only one standard/certification scheme. The project is registered as CDM and GS on 14/11/2012 and 07/02/2022, respectively. Currently, the project is seeking to convert some of the previously issued GS CERs for the monitoring period (02/08/2019-31/12/2020) into GS VERs. In addition, GS CERs and GS VERs will not be issued for the same monitoring period of the project, to avoid double Counting.

On 5 May 2023, the project was also registered on the I-REC Standard. The registration date is recorded as one year prior to this date as RECs can be claimed back by up to one year. As of today (6 October 2023), no RECs have been issued by the project[11]. The deadline for issuing 2022 RECs (i.e. the current monitoring period) on the I-REC Standard was 30 September 2023, so therefore no RECs can be issued by the project from the monitoring period. As part of the process to register on the I-REC Standard, the project owner has submitted an Owner's Declaration Letter to confirm that they will not issue RECs and carbon credits of any kind from the same period of electricity generation. Apart from the I-REC Standard, GS and CDM, no other voluntary or compliance standard (regardless of domestic or international) has been applied.

Therefore, it's confirmed that no double counting of carbon credits or RECs issuance will occur during this monitoring period.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

>>
Not applicable

[11] https://evident.app/IREC/device-register/52.8ES20001

D.2 Data and parameters monitored

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Relevant SDG Indicator	SDG7 – Affordable and Clean Energy SDG 13 – Climate Action
Data/Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Measured/calculated/ default	Measured and Calculated
Source of data	Continuous measurement, directly measured by the main meter or the backup meter installed at the output side of the 132 kV substation The following parameters are measured: (i) The quantity of electricity supplied by the project plant/unit to the grid ($EG_{export,y}$); and (ii) The quantity of electricity delivered to the project plant/unit from the grid ($EG_{import,y}$) Difference between $EG_{export,y}$ and $EG_{import,y}$ is taken as $EG_{facility,y}$
Value(s) of monitored parameter	

EGfacility,y	Value (MWh)
01/01/2021 - 31/01/21	5,947.17
01/02/2021 - 28/02/21	2,899.28
01/03/2021 - 31/03/21	5,966.99
01/04/2021 - 30/04/21	7,022.10
01/05/2021 - 31/05/21	14,614.76
01/06/2021 - 30/06/21	19,729.69
01/07/2021 - 31/07/21	21,226.07
01/08/2021 - 31/08/21	20,132.58
01/09/2021 - 30/09/21	6,500.02
01/10/2021 - 31/10/21	5,365.10
01/11/2021 - 30/11/21	5,231.38
01/12/2021 - 31/12/21	6,910.38
01/01/2022 - 31/01/22	5,978.04
01/02/2022 - 28/02/22	4,627.68
01/03/2022 - 31/03/22	6,151.17
01/04/2022 - 30/04/22	9,500.50

01/05/2022 - 31/05/22	17,951.36
01/06/2022 - 30/06/22	20,054.95
01/07/2022 - 31/07/22	11,272.24
01/08/2022 - 31/08/22	7,196.51
01/09/2022 - 30/09/22	9,594.62
01/10/2022 - 31/10/22	3,602.84
01/11/2022 - 30/11/22	2,803.57
01/12/2022 - 31/12/22	3,594.13
Subtotal for Year 2021	**121,545.51**
Subtotal for Year 2022	**102,327.60**
Total	**223,873.11**

Where,

- The values of $EG_{export,y}$ is as follows:

Meters	M11 (back up M12)	M21 (back up M22)	Total Wind Turbines
01/01/2021 - 31/01/21	3,094.46	2,894.11	5,988.57
01/02/2021 - 28/02/21	1,472.84	1,484.09	2,956.93
01/03/2021 - 31/03/21	3,094.94	2,913.38	6,008.32
01/04/2021 - 30/04/21	3,570.35	3,478.98	7,049.33
01/05/2021 - 31/05/21	7,349.36	7,284.36	14,633.72
01/06/2021 - 30/06/21	9,779.13	9,958.05	19,737.19
01/07/2021 - 31/07/21	10,683.21	10,556.09	21,239.31
01/08/2021 - 31/08/21	10,070.32	10,064.67	20,134.99
01/09/2021 - 30/09/21	3,353.94	3,177.33	6,531.27
01/10/2021 - 31/10/21	2,860.34	2,550.90	5,411.23
01/11/2021 - 30/11/21	2,745.41	2,540.89	5,286.30
01/12/2021 - 31/12/21	3,531.28	3,413.53	6,944.81
01/01/2022 - 31/01/22	3,100.44	2,928.15	6,028.59
01/02/2022 - 28/02/22	2,398.15	2,271.34	4,669.49
01/03/2022 - 31/03/22	3,093.90	3,086.86	6,180.76
01/04/2022 - 30/04/22	4,840.48	4,666.12	9,506.61
01/05/2022 - 31/05/22	9,094.60	8,859.75	17,954.35
01/06/2022 - 30/06/22	10,290.61	9,769.46	20,060.07
01/07/2022 - 31/07/22	5,829.96	5,468.40	11,298.36
01/08/2022 - 31/08/22	3,663.00	3,558.77	7,221.77
01/09/2022 - 30/09/22	4,813.78	4,798.59	9,612.37
01/10/2022 - 31/10/22	2,140.65	1,495.70	3,636.36
01/11/2022 - 30/11/22	1,417.50	1,443.04	2,860.53
01/12/2022 - 31/12/22	1,777.61	1,863.66	3,641.26
Subtotal for Year 2021	**61,605.59**	**60,316.38**	**121,921.96**
Subtotal for Year 2022	**56,261.95**	**53,912.75**	**110,174.71**
Total	**117,867.54**	**114,229.13**	**232,096.67**

- The values of $EG_{import,y}$ is as follows:

Meters	M11 (back up M12)	M21 (back up M22)	Total Wind Turbines
01/01/2021 - 31/01/21	21.92	19.49	41.40
01/02/2021 - 28/02/21	33.52	24.13	57.65
01/03/2021 - 31/03/21	25.84	15.49	41.33
01/04/2021 - 30/04/21	18.54	8.69	27.23
01/05/2021 - 31/05/21	12.89	6.07	18.96
01/06/2021 - 30/06/21	5.39	2.11	7.50
01/07/2021 - 31/07/21	8.91	4.33	13.24
01/08/2021 - 31/08/21	1.64	0.77	2.41
01/09/2021 - 30/09/21	20.74	10.52	31.25
01/10/2021 - 31/10/21	29.97	16.17	46.14
01/11/2021 - 30/11/21	32.64	22.29	54.92
01/12/2021 - 31/12/21	20.20	14.24	34.43
01/01/2022 - 31/01/22	29.75	20.81	50.56
01/02/2022 - 28/02/22	25.09	16.72	41.81
01/03/2022 - 31/03/22	17.01	12.58	29.59
01/04/2022 - 30/04/22	4.19	1.92	6.11
01/05/2022 - 31/05/22	2.13	0.86	2.99
01/06/2022 - 30/06/22	3.62	1.50	5.12
01/07/2022 - 31/07/22	17.45	8.67	26.12
01/08/2022 - 31/08/22	16.97	8.29	25.26
01/09/2022 - 30/09/22	12.18	5.57	17.75
01/10/2022 - 31/10/22	22.07	11.45	33.52
01/11/2022 - 30/11/22	35.08	21.88	56.96
01/12/2022 - 31/12/22	29.02	18.11	47.13
Subtotal for Year 2021	**232.18**	**144.28**	**376.46**
Subtotal for Year 2022	**211.18**	**129.61**	**340.79**
Total	**443.37**	**273.88**	**717.25**

Monitoring Equipment

Meter M11 (Main Meter)	
Type of meter	ISKRA MT-860
Accuracy of meter	0.2s
Serial number of meter	41601054
Calibration frequency	Once in every 2 years
Calibration dates	20/09/2017, 12/09/2019, 15/01/2020, 03/11/2022
Calibration Status and Validity	Active Valid until 3/11/2024

Meter M12 (Backup Meter)	
Type of meter	ISKRA MT-860
Accuracy of meter	0.2s
Serial number of meter	72440419
Calibration frequency	Once in every 2 years
Calibration dates	Previous meter 41601051 replaced 15/01/2020, 03/11/2022
Calibration Status and Validity	Active Valid until 3/11/2024

Meter M21 (Main Meter)	
Type of meter	ISKRA MT-860
Accuracy of meter	0.2s
Serial number of meter	41601050
Calibration frequency	Once in every 2 years
Calibration dates	20/09/2017, 12/09/2019, 15/01/2020, 03/11/2022
Calibration Status and Validity	Active Valid until 3/11/2024

Meter M22 (Backup Meter)	
Type of meter	ISKRA MT-860
Accuracy of meter	0.2s
Serial number of meter	72440423
Calibration frequency	Once in every 2 years
Calibration dates	Previous meter 41601049 replaced 15/01/2020, 03/11/2022
Calibration Status and Validity	Active Valid until 3/11/2024

Measuring/reading/recording frequency	Measured continuously and recorded monthly
Calculation method (if applicable)	$EG_{facility,y} = EG_{export,y} - EG_{import,y}$
QA/QC procedures	Monitoring equipment is tested and maintained in accordance with the manufacturer's recommendations and national standards (IEC 62052-11, IEC 62053-22 and IEC – 62053-23). The net on-grid electricity generation has been cross-checked by electricity sales & purchase receipts and found to be consistent.
Purpose of data/parameter	Baseline emissions calculation
Additional comments	None

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	$FC_{i,y}$
Unit:	Mass unit
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year y
Measured/ Calculated / Default:	Default
Source of data:	Pakistan Energy Yearbook 2020 and 2021, Ministry of Petroleum & Natural Resources
Value(s) of monitored parameter:	Refer to Emission Reductions sheet
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures:	NA
Purpose of data:	Baseline emission calculation
Additional comment:	None

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	$NCV_{i,y}$
Unit:	GJ/Mass unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Measured/ Calculated / Default:	Default
Source of data:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC
Value(s) of monitored parameter:	Refer to ER sheet
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures:	NA
Purpose of data:	Baseline emission calculation
Additional comment:	None

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	$EF_{CO2,y}$
Unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i used in power unit m in year y
Measured/ Calculated / Default:	Default
Source of data:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC
Value(s) of monitored parameter:	Refer to ER sheet
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	NA
Calculation method (if applicable):	NA
QA/QC procedures:	NA
Purpose of data:	Baseline emission calculation
Additional comment:	None

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	EG_y
Unit:	MWh
Description:	Net electricity generated by the power unit of electricity system in year y
Measured/ Calculated / Default:	Default
Source of data:	Pakistan Energy Yearbook 2020 and 2021, Ministry of Petroleum & Natural Resources
Value(s) of monitored parameter:	Refer to ER sheet
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures:	NA
Purpose of data:	Baseline emission calculation
Additional comment:	None

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	EFgrid,CM,y
Unit:	tCO_2e/MWh
Description:	Grid Emission factor of WAPDA grid
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated as per "Tool to calculate the emission factor for an electricity system" Version 7.0 and the latest data available from the Pakistan Energy Yearbook[12] 2020 and 2021, Ministry of Energy (Petroleum Division). As the monitoring period covers years 2021 and 2022, the grid emission factor is calculated separately.
Value(s) of monitored parameter:	Grid Emission Factor for year 2021: 0.4947; Grid Emission Factor for year 2022: 0.5016;
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Calculated annually as per "Tool to calculate the emission factor for an electricity system" Version 7.0 and the latest data available from the Pakistan Energy Yearbook 2020 and 2021
Calculation method (if applicable):	Calculated annually as per "Tool to calculate the emission factor for an electricity system" Version 7.0 and the latest data available from the Pakistan Energy Yearbook 2020 and 2021
QA/QC procedures:	Appropriateness of the data is reviewed and changes are applied annually by the project owner. It will be recalculated annually.
Purpose of data:	Baseline emission calculation
Additional comment:	The latest data available from the Pakistan Energy Yearbook 2020 and 2021 are used at the time of Monitoring Report (MR) writing, the calculated $EF_{grid,CM,y}$ is the emission factor of the WPADA grid in year 2021 and 2022.

[12] For grid emission factor calculation for year 2021 and 2022, the latest published Pakistan Energy Yearbook is Pakistan Energy Yearbook 2020 and 2021, respectively. Refer to section E.1 of the MR for details.

Relevant SDG Indicator	SDG 13 – Climate Action
Data / Parameter:	$\eta_{m,y}$
Unit:	-
Description:	Average net energy conversion efficiency of power unit m in year y
Measured/ Calculated / Default:	Default
Source of data:	The default values provided in the table in Annex 1 of the Tool to calculate the emission factor of an electricity system
Value(s) of monitored parameter:	Refer to ER sheet
Monitoring equipment:	NA
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	NA
QA/QC procedures:	NA
Purpose of data:	Baseline emission calculation
Additional comment:	None
Additional comment:	The latest data available from the Pakistan Energy Yearbook 2020 and 2021 are used at the time of MR writing, the calculated $EF_{grid,CM,y}$ is the emission factor of the WPADA grid in year 2021 and 2022

<table>
<tr><td>Relevant SDG Indicator</td><td>SDG 8 – Decent work and Economic Growth</td></tr>
<tr><td>Data / Parameter:</td><td>- Number of jobs created</td></tr>
<tr><td>Unit:</td><td>/</td></tr>
<tr><td>Description:</td><td>- Number of jobs created</td></tr>
<tr><td>Measured/
Calculated /
Default:</td><td>Calculated</td></tr>
<tr><td>Source of data:</td><td>Certificate of workers
Payroll records and labour contracts
Monitoring survey with workers</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>20 jobs were created, including skilled and unskilled workers. Details of the employees are provided in the table below.

<table>
<tr><th>Sr#</th><th>Department</th><th># of Employees</th><th>Category</th></tr>
<tr><td>1</td><td>Accounts</td><td>4</td><td>Skilled</td></tr>
<tr><td>2</td><td>Operations</td><td>6</td><td>Skilled</td></tr>
<tr><td>3</td><td>Administration</td><td>1</td><td>Skilled</td></tr>
<tr><td>4</td><td>Internal Audit</td><td>1</td><td>Skilled</td></tr>
<tr><td>5</td><td>Security</td><td>8</td><td>Un-skilled – Indirect (via contractor)</td></tr>
<tr><td></td><td>Total</td><td>20</td><td></td></tr>
</table>

Compensation of all the employees are above the minimum wage limits and in compliance with the local labor laws.

The monitoring survey was carried out on 20 January 2023, no negative issues were raised. HR and payroll records are available as relevant to workers as evidence of job creation.</td></tr>
<tr><td>Monitoring equipment:</td><td>/</td></tr>
<tr><td>Measuring/
Reading/
Recording frequency:</td><td>Monitored Annually</td></tr>
<tr><td>Calculation method (if applicable):</td><td>Payroll records are available, in addition to certificates of workers. Questionnaires were delivered to staffs on 20 January 2023.</td></tr>
</table>

QA/QC procedures:	The parameter is monitored via monitoring surveys with workers. Workers are available for interviews by a third party during verification for crosschecking. In addition, a continuous input / grievance mechanism has been available for all stakeholders, incl. workers staffs. Stakeholders can provide their comments at anytime via the comment book, GS contact (help@goldstandard.org), telephone and email access. Stakeholders are allowed to make anonymous comments should they wish.
Purpose of data:	SDG claim.
Additional comment:	

D.3. Comparison of monitored parameters with last monitoring period

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period
Amount of net electricity supplied to grid (average p.a.)	111,937	110,849
Number of jobs created	20	20

D.4. Implementation of sampling plan

>>
N/A

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

>>
SDG 13: Climate Action

Baseline emissions (BE_y) are calculated as follows:

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

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

Where:

BE_y Baseline emission in year y (tCO_2e)

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

$EF_{grid,CM,y}$ Combined margin CO_2 emission factor of the WAPDA grid in year y (tCO_2/MWh)

$EF_{grid,y}$ Grid Emission factor of WAPDA grid in year y (tCO_2/MWh), equals to $EF_{grid,CM,y}$

$EF_{grid,CM,y}$ = 0.4947 tCO_2/MWh for vintage 2021 and 0.5016 tCO_2/MWh for vintage 2022. The calculation is as follows:

Calculation of the grid emission factor

To calculate the second factor of equation to calculate the baseline emissions, the *Tool to calculate the emission factor for an electricity system* has to be used. Following the tool, this factor is calculated as a combined margin (CM), consisting of the simple average of the operating margin emission factor (OM) and the build margin (BM) emission factor:

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

With the input values:

$EF_{grid,CM,y}$ Combined margin grid emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ Operation margin grid emission factor in year *y* (tCO_2/MWh)

$EF_{grid,BM,y}$ Build margin grid emission factor in year *y* (tCO_2/MWh)

w_{OM} Weighting of operation margin factor (%)

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

For the calculation of these input values, the *Tool to calculate the emission factor for an electricity system* (version 7.0) describes six steps:

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1: Identify the relevant electricity systems

The Pakistani Designated National Authority (DNA) has not published any delineation of the project electricity system and a connected electricity system. Moreover, the criteria provided in the "Tool to calculate the emission factor for

an electricity system" (version 7.0) under Step 1 do not result in a clear grid boundary as:

1. there is no official data for market prices for electricity over periods of time in Pakistan; and
2. there is no official data available with regard to the operation of the transmission line between different electricity systems.

In such cases, the "Tool to calculate the emission factor for an electricity system" suggests "to use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial/regional/national)" to distinguish a connected electricity system. As a provincial grid definition may be too narrow, the national grid definition should be used by default, as per the tool.

Pakistan contains two electricity grids, the Karachi Electricity Supply Company (KESC) grid, which supplies Karachi city and adjoining areas of Sindh and Balochistan, and the national electricity grid, managed by the *Water and Power Development Authority (WAPDA).* The national grid covers the whole of Pakistan, except the city of Karachi, which is supplied by the KESC grid.

The Pakistan Energy Yearbook, which is annually published by the Government of Pakistan, Ministry of Energy (Petroleum Division), provides the official data for energy generation in Pakistan for KESC and WAPDA grids. Further it also provides data for the IPPs (Independent Power Producers), which deliver their generated power either to WAPDA or KESC[13].

The project is connected to the national electricity grid (WAPDA). According to the *Tool to calculate the emission factor for an electricity system,* the project electricity system can be identified as the national grid by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

Although the two grids are interconnected for occasional supply from the national grid to the smaller KESC grid, electricity imports and exports are not foreseen during standard operation. According to the definitions in the above-mentioned tool, the KESC grid can be identified as connected electricity system.

[13] On the website of the Private Power & Infrastructure Board, Government of Pakistan, Ministry of Water & Power (http://www.ppib.gov.pk/N_commissioned_ipps.htm) it states which IPPs deliver their generated power to which electricity system (WAPDA or KESC). Currently only two IPPs (Gul Ahmed, Karachi, and Tapal Energy, Karachi) deliver to KESC, while the other IPPs deliver to WAPDA. In 1998, as part of the government's privatization policy, the National Transmission & Despatch Company (NTDC) "was organized to take over all the properties, rights and assets obligations and liabilities of 220 KV and 500KV Grid Stations and Transmission Lines/Network Transmission Lines/Network owned by Pakistan Water and Power Development Authority (WAPDA) (See http://www.ntdc.com.pk). IPPs commissioned under the 2002 power policy are therefore mentioned as delivering their generated power to NTDC.

Since neither of the two grids is physically connected to foreign grids, electricity imports to the national grid can therefore be excluded.

Electricity exports are not subtracted from the electricity generation data, as advised in the *Tool to calculate the emission factor for an electricity system.*

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

According to Option I of step 2, off-grid power plants are not included in the calculation.

Step 3: Select a method to determine the operating margin (OM) Four alternatives for the calculation of OM are given in the tool:

a) Simple OM; or
b) Simple adjusted OM; or
c) Dispatch data analysis OM; or
d) Average OM.

The simple OM method (option a) can only be used if low-cost/must-run resources[14] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

As calculated with the data available from the Pakistan Energy Yearbooks, the share of low-cost/must-run resources has constituted less than 50% of total grid generation on average over the five most recent years:

2018	35.21%
2019	31.65%
2020	31.81%
2021	37.90%
2022	34.78%
Average	34.27%

[14] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

As this requirement is met according to the Energy Yearbooks of 2018 - 2022, the simple OM method (option a) is applicable.

For the calculation of $EF_{grid,OM,y}$, *ex post* calculation is chosen in the registered PDD. As per the tool,

> *Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.*

For the project, the *ex post* option is chosen. This means, that each monitoring report would have to include the latest calculation of the operation margin emission factor. The factor for the year proceeding the previous year (*y-1*) will be used for the calculations.

Step 4: Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

Two ways of calculation are described in the tool[15]:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Whereas Option B can only be applied if:

a) The necessary data for Option A is not available; and

[15] Cited from *Tool to calculate the emission factor for an electricity system*, v.7.0

b) *Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and*
c) *Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).*

The exact operation and emission factor data is not available for all connected power plants, only nuclear and hydro power have been considered as low-cost/must-run resources in Step 3 and Option I has been chosen in Step 2. Option B can therefore be chosen to calculate the OM emission factor using the total net electricity generation, emission and utilization data for each fuel type. The necessary data can be found in the current Pakistan Energy Yearbooks.

The calculation of the OM emission factor is based on the net electricity supplied to the grid by all power plants serving the system, not including the low-cost/must-run power plants. To carry out the calculation, the tool provides the following formula:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y}.NCV_{i,y}.EF_{CO2,i,y})}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type I in year *y* (tCO_2/GJ)
EG_y	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/most-run power plants/units, in year *y* (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year y
y	The relevant year as per the data vintage chosen in Step 3.

As a result of this calculation[16], the simple operation margins for the year 2021 and year 2022 are:

$EF_{gridOMsimple,2021}$ = 0.5269tCO2e/MWh

$EF_{gridOMsimple,2022}$ = 0.4871tCO2e/MWh

Step 5: Calculate the build margin (BM) emission factor

For the terms of data vintage, the tool offers two options[17]:

> ***Option 1:*** *For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.*

> ***Option 2:*** *For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.*

For the proposed project, option 2 is chosen and the build margin is updated every year of the crediting period. Therefore, the latest figures are calculated in each monitoring report.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

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[16] All relevant input values and calculations have been provided to the VVB(s) during verification.

[17] Cited from *Tool to calculate the emission factor for an electricity system*, v.7.0.

The sample group of power units *m* used to calculate the build margin should be determined as per the following procedure from the *Tool to calculate the emission factor for an electricity system*[18], consistent with the data vintage selected above:

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

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

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample\text{-}CDM}$) the annual electricity generation ($AEG_{SET\text{-}sample\text{-}CDM}$, in MWh);

[18] Cited from *Tool to calculate the emission factor for an electricity system*, v.7.0

If the annual electricity generation of that set comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET\text{-}sample\text{-}CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample\text{-}CDM}$ to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

(e) Include in the sample group $SET_{sample\text{-}CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$).

Calculation of $EF_{grid,BM,2021}$

Step (a)

The five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and for which official data about their annual electricity generation is available, are:

$SET_{5\text{-}units}$:

No.	Power Unit	Commission Date	Electricity generation 2020 (MWh)[19]
1	Engro PowerGen Thar	Year 2020	4,299,220
2	China HUB Power	Year 2020	6,118,150
3	T-4th	Year 2019	5,498,030
4	Golen Gol	Year 2019	88,850
5	CHASNUPP-IV	Year 2018	2,928,000

$AEG_{SET\text{-}5\text{-}units}$ = 18,932,250 MWh

[19] Pakistan Energy Yearbook 2021

Step (b)

According to Pakistan Energy Yearbook 2020, the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}) has been calculated as:

AEG_{total} = 112,010,310 MWh

The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} and for which official data about their annual electricity generation is available, are:

$SET_{\geq 20\%}$:

No.	Power Unit	Commission Date	Electricity generation 2020 (MWh)[20]
1	Engro PowerGen Thar	Year 2020	4,299,220
2	China HUB Power	Year 2020	6,118,150
3	T-4th	Year 2019	5,498,030
4	Golen Gol	Year 2019	88,850
5	CHASNUPP-IV	Year 2018	2,928,000
6	Baloki	Year 2018	5,911,930

$AEG_{SET-\geq 20\%}$, = 24,844,180 MWh

Step (c)

$SET_{\geq 20\%}$ comprises the larger annual electricity generation and is therefore SET_{sample}. As none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then SET_{sample} is used to calculate the build margin.

According to the *Tool to calculate the emission factor for an electricity system (version 7.0),* the build margin emissions factor is the generation-weighted average emission factor of all power units *m* during the most recent year *y*, for which electricity generation data is available. It can be calculated using the following formula:

[20] Pakistan Energy Yearbook 2021

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

Where:

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

As a result of this calculation[21], the build margin for 2021 is:

$EF_{grid,BM,2021}$ = 0.3982 tCO_2e/MWh

Calculation of $EF_{grid,BM,2022}$

Step (a)

The five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and for which official data about their annual electricity generation is available, are:

$SET_{5\text{-units}}$:

No.	Power Unit	Commission Date	Electricity generation 2021 (MWh)[22]
1	Engro PowerGen Thar	Year 2020	3,909,500
2	China HUB Power	Year 2020	7,923,400
3	T-4th	Year 2019	342,717
4	Golen Gol	Year 2019	84,880
5	CHASNUPP-IV	Year 2018	2,456,000

$AEG_{SET\text{-}5\text{-}units}$ = 14,716,497 MWh

[21] All relevant input values are provided to the DOE(s) during verification.
[22] Pakistan Energy Yearbook 2022

Step (b)
According to Pakistan Energy Yearbook 2022, the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}) has been calculated as:

AEG_{total} = 113,907,627 MWh

The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} and for which official data about their annual electricity generation is available, are:

$SET_{\geq 20\%}$:

No.	Power Unit	Commission Date	Electricity generation 2021 (MWh)[23]
1	Engro PowerGen Thar	Year 2020	4,299,220
2	China HUB Power	Year 2020	6,118,150
3	T-4th	Year 2019	5,498,030
4	Golen Gol	Year 2019	88,850
5	CHASNUPP-IV	Year 2018	2,928,000
6	Baloki	Year 2018	5,911,930
7	Port Qasim	Year 2018	4,299,220

$AEG_{SET-\geq 20\%}$, = 29,122,687 MWh

Step (c)
$SET_{\geq 20\%}$ comprises the larger annual electricity generation and is therefore SET_{sample}. And none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} is used to calculate the build margin.

According to the *Tool to calculate the emission factor for an electricity system (version 7.0),* the build margin emissions factor is the generation-weighted average emission factor of all power units *m* during the most recent year *y*, for which electricity generation data is available. It can be calculated using the following formula:

[23] Pakistan Energy Yearbook 2022

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

Where:

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

As a result of this calculation[24], the build margin for 2022 is:

$EF_{grid,BM,2020}$ = 0.5453 tCO_2e/MWh

As described above, the combined margin emission factor for an electricity system is calculated using the following formula:

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

The weighting factors w_{OM} and w_{BM} are defined by the *Tool to calculate the emission factor for an electricity system*[25]*:*

> *Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;*
>
> *All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.*

Therefore, the combined emission factor for the national grid in Pakistan is:

$EF_{grid,CM,2021}$ = (0.5269 x 0.75) + (0.3982 x 0.25) = 0.4947

[24] All relevant input values are provided to the VVB(s) during verification.
[25] Cited from *Tool to calculate the emission factor for an electricity system*, v.7.0

$EF_{grid,CM,2022}$ = (0.4871 x 0.75) + (0.5453 x 0.25) = 0.5016

The $EG_{facility,y}$ during this monitoring period is as follows:

Monitoring period	**$EG_{facility,y}$** (MWh)
01/01/2021 - 31/01/21	5,947.17
01/02/2021 - 28/02/21	2,899.28
01/03/2021 - 31/03/21	5,966.99
01/04/2021 - 30/04/21	7,022.10
01/05/2021 - 31/05/21	14,614.76
01/06/2021 - 30/06/21	19,729.69
01/07/2021 - 31/07/21	21,226.07
01/08/2021 - 31/08/21	20,132.58
01/09/2021 - 30/09/21	6,500.02
01/10/2021 - 31/10/21	5,365.10
01/11/2021 - 30/11/21	5,231.38
01/12/2021 - 31/12/21	6,910.38
01/01/2022 - 31/01/22	5,978.04
01/02/2022 - 28/02/22	4,627.68
01/03/2022 - 31/03/22	6,151.17
01/04/2022 - 30/04/22	9,500.50
01/05/2022 - 31/05/22	17,951.36
01/06/2022 - 30/06/22	20,054.95
01/07/2022 - 31/07/22	11,272.24
01/08/2022 - 31/08/22	7,196.51
01/09/2022 - 30/09/22	9,594.62
01/10/2022 - 31/10/22	3,602.84
01/11/2022 - 30/11/22	2,803.57
01/12/2022 - 31/12/22	3,594.13
Subtotal for Year 2021	**121,545.51**
Subtotal for Year 2022	**102,327.60**
Total	**223,873.11**
Average	**111,936.55**

During the monitoring period,

For vintage 2021:

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

= 121,545.51 MWh × 0.4947 tCO_2/MWh = 60,128 tCO_2e

For vintage 2022:

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

= 102,327.60 MWh × 0.5016 tCO_2/MWh = 51,327 tCO_2e

The total emission reductions during this monitoring period are 111,455 tCO_2e.

SDG 7: Affordable and Clean Energy
Parameter: Net amount of electricity supplied to grid

In the baseline scenario, there is no power generation unit at the site of the project and no clean energy is available in the baseline.

SDG 8: Decent work and Economic Growth
Parameter: Number of jobs created

In the baseline scenario, without the implementation of the project, no jobs opportunities are created.

E.2. Calculation of project value or estimation of project situation of each SDG Impact

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SDG 13: Climate Action

As per methodology ACM0002 (Version 20.0), for a wind power project, PE_y = 0.

SDG 7: Affordable and Clean Energy
Parameter: Net amount of electricity supplied to grid

During this monitoring period, according to electricity readings by grid, the electricity exported to the grid minus electricity imported from the grid is calculated as 223,873MWh (121,546MWh for vintage 2021 and 102,328MWh for vintage 2022).

SDG 8: Decent work and Economic Growth
Parameter: Number of jobs created

With the implementation of the project, 20 jobs opportunities are created for vintage 2021 and vintage 2022 during the monitoring period.

E.3. Calculation of leakage

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As per methodology ACM0002 (version 20.0), no leakage emissions are considered for a wind power project. The sources of main emissions potentially giving rise to leakage are neglected.

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
13	Climate Action – Emission Reductions (tCO2e)	111,455	0	111,455
7	Affordable and Clean Energy – Net amount of electricity generated and supplied to grid (MWh)	0	223,873	223,873
8	Decent work and Economic Growth – Number of jobs created	0	20	20

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values[26] achieved during this monitoring period
13	123,996 tCO_2e	111,455 tCO_2e
7	275,000 MWh	223,873 MWh
8	20 jobs	20 jobs

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

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SDG 13: Climate action

The annual emission reduction of the project was estimated at 61,998tCO_2e/yr ex ante, the duration of monitoring period is 2 years, therefore, the emission reductions estimated as per the PDD for this monitoring period are calculated as: 123,996 tCO2e (= 61,998 tCO2e * 2 years).

SDG 7: Affordable and Clean energy

[26] Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

The net amount of electricity supplied to grid was estimated at 137,500MWh/yr ex ante, the duration of monitoring period is 2 years, therefore, the net amount of electricity supplied to grid ex ante estimated as per the PDD for this monitoring period is calculated as: 275,000 MWh (= 137,500MWh * 2 years).

SDG 8: Decent work and Economic Growth

20 skilled jobs are created during this monitoring period, same as the figure in the registered GS PDD.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

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SDG 7: Affordable and Clean energy

The actual electricity supplied to grid (223,873 MWh) during the current monitoring period is slightly less than estimated (275,000 MWh) in the registered PDD of the project, due to wind resources during the monitoring period being slightly less than forecast.

SDG 13: Climate Action

The actual emission reductions achieved (111,455 tCO_2e) during the current monitoring period are slightly less than estimated (123,996 tCO_2e) in the registered PDD of the project, mainly resulting from decreased electricity supplied to the grid due to the above reasons.

SDG 8: Decent work and Economic Growth

20 skilled jobs are created during this monitoring period, which is the same as the figure in the registered GS PDD.

SECTION F. SAFEGUARDS REPORTING

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Relevant SDG Indicator	Safeguarding Principle 9.4 Release of pollutants
Data/parameter:	Dust emissions
Unit	N.A.
Description	In order to reduce dust emissions during the construction phase, the following dust suppression measures were stipulated and implemented: • Frequent watering of exposed area or worksite of excavation to maintain surface wet, if necessary and practical; • Imposition of speed controls for vehicles and unpaved site roads; - Well-maintained diesel-powered mechanical equipment to avoid black smoke emissions; • Shut-down of diesel-powered mechanical equipment or trucks inside the worksites when they are not in operation.
Measured/calculated/default	Interview with workers
Source of data	Monitoring survey with workers. Monitoring survey questionnaire was provided to staff on 20/01/2023, respectively. In the questionnaire, workers were asked about the project's impact on air quality and dust emissions.
Value(s) of monitored parameter	Respondents confirmed the project has not had a negative impact on air quality during the project implementation.
Monitoring equipment	/
Measuring/reading/recording frequency:	Once per monitoring period
Calculation method (if applicable):	NA
QA/QC procedures:	The parameter has been monitored via a monitoring survey with workers, and operation worker staffs are available for interviews by a third party during verification for crosschecking. In addition, a continuous input / grievance mechanism has been available for all stakeholders, incl. workers staffs. All stakeholders can provide their comments at anytime via the comment book, GS contact (help@goldstandard.org), telephone and email access. Stakeholders are allowed to make anonymous comments should they wish.
Purpose of data:	To monitor the air quality indicator.
Additional comments:	

Relevant SDG Indicator	Safeguarding Principle 9.1 Landscape Modification and Soil
Data/parameter:	Soil condition
Unit	N.A.
Description	General soil erosion and sediment control measures would include: Keep open areas of excavation to a minimum; Maintain sediment control structures along drainage lines to prevent the transport of sediment from the site; Stockpiles of materials should be located away from drainage lines and formed with sediment control structures placed immediately down slope; Control drainage in areas of construction areas using a water truck; Minimization of traffic in construction zones and use of a dedicated parking area, i.e. site compound; Revegetate disturbed areas i.e. around turbine foundations as soon as practical.
Measured/calculated/default	Interview with workers
Source of data	Monitoring survey with workers. Monitoring survey questionnaire was provided to staff on 20/01/2023. In the questionnaire, workers were asked about the project's impact on soil.
Value(s) of monitored parameter	Respondents confirmed the project has not had a negative impact on soil during the project implementation.
Monitoring equipment	/
Measuring/reading/recording frequency:	Once per monitoring period
Calculation method (if applicable):	NA
QA/QC procedures:	The parameter has been monitored via a monitoring survey with workers and interviews with operation worker staffs has been carried out by a third party during verification for crosschecking. In addition, continuous input / grievance mechanism has been available for all stakeholders incl. workers staffs. All stakeholders can provide their comments at anytime via comment book, GS contact (help@goldstandard.org), telephone and email access. Stakeholders are allowed to make anonymous comments should they wish.
Purpose of data:	To monitor the soil condition indicator.
Additional comments:	

Relevant SDG Indicator	Safeguarding Principle 3 - Community Health, Safety and Working Conditions
Data/parameter:	SG principle #8 (The project provides workers with a safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments)
Unit	NA.
Description	Measures are taken to eliminate safety hazards related to the operations, incl. maintain good housekeeping, dispose of left over materials, eliminate over-head work of welders and burners; use good lighting to illuminate work areas, pathways, corridors, hall ways, working platforms, have a supply of flashlights; keep work areas cleared, dry, sanded, use personal protective equipment, etc.
Measured/calculated/default	Interview with workers
Source of data	Monitoring survey with workers. Monitoring survey questionnaire was provided to staff on 20/01/2023. In the questionnaire, workers were asked about the project's impact on safety hazards.
Value(s) of monitored parameter	Respondents confirmed the plant had not created safety hazards during the project implementation. There was one material safety incident during the monitoring period relating to a fire at a turbine. There were no injuries or fatalities in this incident, and relevant authorities were informed.
Monitoring equipment	/
Measuring/reading/recording frequency:	Once per monitoring period
Calculation method (if applicable):	NA
QA/QC procedures:	The parameter has been monitored via monitoring survey with workers. Operation worker staffs are available for interview by a third party during verification for crosschecking. In addition, continuous input / grievance mechanism has been available for all stakeholders and all stakeholders, incl. workers staffs, can provide their comments at anytime via comment book, GS contact (help@goldstandard.org), telephone and email access. Stakeholders are allowed to make anonymous comments should they wish.
Purpose of data:	
Additional comments:	

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

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Stakeholders can provide comments via comment book, phone and email access. Comment book is in the reception room at project site. The phone (+92 300 4222232) and email of Mr. Jawad Siddiqui of Sapphire (jawad.siddiqui@sapphiretextiles.com.pk) is provided to contact.

1) Comment book. It is in the reception room at project site. All stakeholders have access to provide feedback on this project on this book. The contact information of Mr. Jawad Siddiqui is listed on the first page of the book. On each page that follows there is one table, incl. Date, Comment, Response from Sapphire and Response Date, etc. Stakeholders are allowed to make anonymous comments should they wish.

2) Telephone access. Stakeholders can also provide comments via phone. The telephone number of Mr. Jawad Siddiqui of Sapphire (+92 300 4222232) is provided to contact. Calls received are logged and recorded in the same way as the comment book mentioned above, with the date, comment and project response recorded for each call. Stakeholders are not required to give their personal information.

3) Email access. Email address of Mr. Jawad Siddiqui of Sapphire (jawad.siddiqui@sapphiretextiles.com.pk) is provided as well for stakeholders to provide comments in the internet. Emails comments received are logged and recorded in the same way in the comment book, with the date, comment and project response recorded for each message. As with all the methods, stakeholders are not required to give their personal details when they wish to make a comment.

All input is logged in the comment book. 16 comments or grievances were received during this monitoring period.

The majority of these related to: a) requests for community assistance at a local school; b) issues of food quality for staff; c) issues of late payment for staff engaged by contractors and d) issues of late delivery of water by a contractor.

In all instances, the matters were dealt with promptly and resolved.

Inputs and Grievances Received	Project Mitigations or Actions
Security guard requested better food	Cook instructed to prepare better food. Issue closed.
Local resident requested consideration of a new school	Renovation of school started. Issue closed.
Local resident requested furniture for school	Furniture provided for school. Issue closed.
Local resident had not received water tanker on time	Meeting with contractor to send water on time. Issue closed.
Security guard salary was not received on time.	Meeting with contractor to ensure salary paid on time. Undertook to correct and issue closed.
Security and cooking staff did not receive drinking water on time.	Meeting with contractor to ensure water delivery occurs on time. Issue closed.
Local did not receive drinking water on time.	Meeting with contractor to ensure water delivery occurs on time. Issue closed.
Local did not receive drinking water on time.	Meeting with contractor to ensure water delivery occurs on time. Issue closed.
Security guard requested better food	Cook instructed to prepare better food. Issue closed.
Security guard salary was not received on time.	Related to banking issues at year end for the contractor. Undertook to correct and issue closed.
Local resident had not received water supply on time	Meeting with contractor to deliver water on time. Issue closed.
Cooking staff did not receive drinking water on time.	Meeting with contractor to ensure water delivery occurs on time. Issue closed.
Local residents had not received water supply on time	Meeting with contractor to deliver water on time. Issue closed.
Security guard salary was not received on time.	Related to accountant illness at contractor. Undertook to correct and issue closed.
Local residents had not received water supply on time	Meeting with contractor to deliver water on time. Issue closed.
Security guard requested better food	Cook instructed to prepare better food. Issue closed.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

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N/A. There were no mitigations that required to be monitored.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

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NA. No legal challenges have arisen during the monitoring period.

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption