**Monitoring report form for CDM project activity**
**(Version 06.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

| MONITORING REPORT | |
|---|---|
| **Title of the project activity** | NORTHWIND BANGUI BAY PROJECT |
| **UNFCCC reference number of the project activity** | 0453 |
| **Version number of the PDD applicable to this monitoring report** | 03 |
| **Version number of this monitoring report** | 01 |
| **Completion date of this monitoring report** | 23/04/2018 |
| **Monitoring period number** | 9 |
| **Duration of this monitoring period** | 26/05/2015 to 25/05/2017<br>(including the dates mentioned above) |
| **Monitoring report number for this monitoring report** | 01 |
| **Project participants** | **Philippines**;<br>NorthWind Power Development Corporation<br>**Netherlands:**<br>Netherlands' Ministry of Infrastructure and the Environment (IenM)<br>Electrabel N.V.<br>Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I)<br>**Finland:**<br>Government of Finland - Ministry of Foreign Affairs of Finland<br>Fortum Corporation<br>**Sweden:**<br>Government of Sweden - Swedish Energy Agency<br>**Japan:**<br>Kyushu Electric Power Co., Inc.<br>Shikoku Electric Power Co., Inc<br>The Chugoku Electric Power Co., Inc<br>Chubu Electric Power Company, Inc<br>Tokyo Electric Power Co, Inc.<br>Tohoku Electric Power Co, Inc.<br>Mitsubishi Corporation<br>Japan International Cooperation Agency (JICA)<br>Mitsui & Co. Ltd.<br>**United Kingdom of Great Britain and Northern Ireland:**<br>Deutsche Bank AG<br>BP Alternative Energy International Ltd |

| | | |
|---|---|---|
| | **France:**<br>GDF SUEZ<br>**Norway**<br>Statoil ASA<br>Government of Norway - Ministry of Foreign Affairs<br>Norsk Hydro ASA<br>**Germany:**<br>RWE Power AG<br>**Bilateral and Multilateral Funds:**<br>International Bank for Reconstruction and Development(IBRD) as the Trustee of the Prototype Carbon Fund (PCF) | |
| **Host Party** | Philippines | |
| **Sectoral scopes** | 1 : Energy industries (renewable - / non-renewable sources) | |
| **Applied methodologies and standardized baselines** | ACM0002 - "Consolidated baseline methodology for grid connected electricity generation from renewable sources, Version 12.3.0". | |
| **Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period** | Amount achieved before 1 January 2013 | Amount achieved from 1 January 2013 |
| | 0 t-$CO_2$e | 64,332 t-$CO_2$e |
| **Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD** | 87,392 t-$CO_2$e | |

# SECTION A. Description of project activity

## A.1. General description of project activity

>> The project is a 33 MW wind turbine power plant located in Bangui Bay (Republic of the Philippines) that produces electricity without emitting greenhouse gases (GHG). The electricity generated by the project displaces grid electricity generated from fossil fuels and reduces GHG emissions by an amount of approximately 43,696 tCO2e (tons of carbon dioxide equivalent) per year for the duration of the project activity. A reduction of approximately 305,872 tCO2e is forecast for the second 7-year crediting period. The expected load factor of the plant is 30%, resulting in an annual electricity generation of 86.7 GWh. The project was developed by NorthWind Power Development Corporation (NorthWind) and will have an expected minimum plant operating life of 20 years.

The Philippines faced serious power shortages in the early 1990s and the Philippine Government is currently in the process of restructuring the power sector in order to provide reliable power supply that helps to sustain the country's economic growth and development. The power sector is currently undergoing transition from a state-owned control to a privatized, regulated sector.

This project represents the first commercial wind power project in the ASEAN region. It provides zero GHG emission power and help to enhance technology transfer to the Philippines.

The project activity displaces the emission of greenhouse gases by generating electricity from renewable wind resources. Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants in the Luzon-Visayas grid and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Employment and job opportunities for locals were realized during the wind turbines installation phase of the plant and for the duration of its operation. The project has become an effective transfer medium for wind power technology. Additionally, being the first wind power plant in the ASEAN region, it had attracted an increased number of tourists to the area, which resulted in the injection of much needed revenue into local businesses and the local community as a whole. Furthermore, the project reduces the dependence of the Philippines from imported fossil fuels it relies to generate electricity.

The project activity was implemented in 2 phases. Construction of Phase I for 15 units started on 7/05/2004. The first turbine was erected on 12/03/2005. It went on line, under pre-commissioning conditions, and delivered the first electrical energy generated by the plant to Ilocos Norte Electric Cooperative (INEC), on 13/04/2005.

Commissioning of Phase I was conducted starting 01/05/2005 and completed on 28/05/2005 when these units completed their initial 100 hour reliability performance. The conditional "Taking-Over Certificate" (TOC) was issued to the wind farm contractor on 20/06/2005. On the same day, conditional TOCs were likewise issued to the contractor of the 30 MVA sub-station and the 69 kV Transmission Line.

Phase II on the other hand, started construction on January 2008, involving the addition of 5 x 1.65 MW (same units as Phase I) and was completed by the same contractor in August 2008. The "Taking-over Certificate" was issued to the contractor 26/08/2008. With the commissioning of Phase II, the Northwind Bangui Bay project became a 20-unit wind farm having a total capacity of 33 MW.

Total emission reductions achieved during the current monitoring period (26/05/2015 – 25/05/2017) are 64,332 tCO2e.

## A.2. Location of project activity

a) Host Party : Republic of the Philippines
(b) Region/state/province : Ilocos Norte
(c) City/town/community : Bangui Bay, Bangui
(d) Physical/geographical location:

>> The project site is located approximately 460 km north of Manila on the main island of Luzon on the foreshore of Bangui Bay. This area borders the South China Sea and was identified by a governmental study1 as a good-excellent wind resource for utility-scale applications. The site is located on a strip of

cleared land (free of any trees and vegetation) that measures approximately 9 km long by 100 meters wide. The GPS coordinates of the wind mills are as given below:

| Name | Code | Longitude | Latitude |
|---|---|---|---|
| WTG01 | RW01 | +120.68742400 | +18.52987300 |
| WTG02 | RC12 | +120.69049200 | +18.52958400 |
| WTG03 | RC13 | +120.69357100 | +18.52931300 |
| WTG04 | RC14 | +120.69664500 | +18.52907200 |
| WTG05 | RC15 | +120.69971100 | +18.52885700 |
| WTG06 | RC16 | +120.70276800 | +18.52867900 |
| WTG07 | RC17 | +120.70584200 | +18.52853300 |
| WTG08 | RC18 | +120.70890800 | +18.52842500 |
| WTG09 | RC19 | +120.71199800 | +18.52833400 |
| WTG10 | RC20 | +120.71508400 | +18.52833600 |
| WTG11 | RC21 | +120.71815800 | +18.52840200 |
| WTG12 | RC22 | +120.72124700 | +18.52848000 |
| WTG13 | RC23 | +120.72427500 | +18.52862900 |
| WTG14 | RC24 | +120.72738600 | +18.52882400 |
| WTG15 | RC25 | +120.73044700 | +18.52912800 |
| WTG16 | RC26 | +120.73368100 | +18.52960500 |
| WTG17 | RC27 | +120.73710600 | +18.53017600 |
| WTG18 | RC28 | +120.74066100 | +18.53093200 |
| WTG19 | RC29 | +120.74435200 | +18.53193000 |
| WTG20 | RC30 | +120.74818400 | +18.53310300 |
| Base Station | NWP | +120.68715300 | +18.52687500 |

## A.3. Parties and project participants

| Parties involved | Project participants | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| Philippines (host) | Northwind Power Development Corporation<br>… | No |
| Netherlands | Netherlands' Ministry of Infrastructure and the Environment (IenM)<br><br>Electrabel N.V<br><br>Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I) | Yes |
| Finland | Government of Finland - Ministry of Foreign Affairs of Finland<br><br>Fortum Corporation | Yes |
| Sweden | Government of Sweden - Swedish Energy Agency | Yes |
| Japan | Kyushu Electric Power Co., Inc.<br><br>Shikoku Electric Power Co., Inc<br><br>The Chugoku Electric Power Co., Inc<br><br>Chubu Electric Power Company, Inc<br><br>Tokyo Electric Power Co, Inc.<br><br>Tohoku Electric Power Co, Inc.<br><br>Mitsubishi Corporation<br><br>Japan International Cooperation Agency (JICA<br><br>Mitsui & Co. Ltd. | No |
| United Kingdom of Great Britain and Northern Ireland | Deutsche Bank AG<br><br>BP Alternative Energy International Ltd | No |
| France | GDF SUEZ | No |

| Parties involved | Project participants | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| Norway | Statoil ASA<br><br>Government of Norway - Ministry of Foreign Affairs<br><br>Norsk Hydro ASA | Yes |
| Germany | RWE Power AG | No |

### A.4. Reference to applied methodologies and standardized baselines

Applied Methodology: Version 12.3.0 of ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”1

Related Tools:
Version 2.2.1 of the “Tool to calculate the emission factor for an electricity system2
Version 5.2.1 of the “Tool for the demonstration and assessment of additionality3

2 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
3 http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

### A.5. Crediting period type and duration

>> The crediting period corresponding to this monitoring period covers 7-years from 01/05/2012 to 30/04/2019. This is the second crediting period.

## SECTION B. Implementation of project activity

### B.1. Description of implemented project activity

>>This project involves the development and operation of a wind farm consisting of 20 wind turbine towers, a switchyard and a control station, and the installation and operation of a 50-km, 69 kV overhead transmission line. The wind turbine towers are erected on a 9-km stretch of undeveloped and uninhabited foreshore area in Bangui Bay, which is covered by lease agreement with the Philippine Government.

The wind turbines used in the project are state-of-the-art models designed, tested and manufactured by NEG Micon (NEGM). The turbine model is called NM82 and it has a generation capacity of 1650 kW. This particular model used in the project was issued a Statement of Compliance by Det Norske Veritas (DNV) on 01/12/2003. The NM82/1650 Bangui Bay version complies with requirements as outlined in IEC61400-1:1999 and IEC WT01 covering the actual conditions:

- Ve50 of 70 m/s
- Vaverage of 7.0 m/s at 50M
- L15 of 11% at 50M

The NM82/1650 turbine is equipped with 3 pitchable blades and mechanical brakes acting on the high-speed side of the gear. Blades and mechanical brakes are driven independently by hydraulics and designed to be fail-safe even if the system is not pressurized.

NEGM, now merged with Vestas, is one of the world’s leading suppliers of wind turbines and has supplied equipment for approximately 20% of the world’s wind power capacity. The company specializes in supplying turnkey wind turbine solutions as well as offering project development and execution services, and plant services/maintenance.

Commissioning of the first 15 wind turbines under Phase I project was conducted starting 01/05/2005 and completed on 28/05/2005 when these units completed their initial 100 hour reliability performance. The conditional “Taking-Over Certificate” (TOC) was issued to the wind farm contractor on 20/06/2005. On the

same day, conditional TOCs were likewise issued to the contractor of the 30 MVA sub-station and the 69 kV Transmission Line.

Phase II of the project (under same contract as Phase I as amended), comprising the addition of 5 x 1.65 MW (same units as Phase I) was completed by the same contractor in August 2008. The "Taking-over Certificate" was issued to the contractor 26/08/2008.

With the commissioning of Phase II, the Northwind Bangui Bay project became a 20-unit wind farm having a total capacity of 33 MW.

The project, being the first wind power plant in the Philippines, will contribute significantly to the country's knowledge base in terms of wind power plant operation. This transfer of technology and expertise from one of the leading wind power generation companies in the world will provide Philippine staff with the necessary skills to operate the equipment.

**Sustainable Development Monitoring Plan ("SDMP")**

As per the PDD, the SDMP covers the project's area of influence and inhabitants. The following sustainable development indicators and targets framework were described to facilitate the measurement of progress towards sustainability. The indicators will be measured by the project sponsor and revised annually by the verifier to check compliance with targets. During the period of this verification, four Compliance and Monitoring Reports (CMR) were completed: Annex 30- CMR #21 (21 June 2015 – 20 December 2015); Annex #31- CMR #22 (21 December 2015 – 20 June 2016); Annex #32- CMR #23 (21 June 2016 – 20 December 2016); and Annex 33- CMR #24 (21 December 2016 – 20 June 2017).

**SDMP Indicators and Targets Framework**

| Concern/Issue | Required Measures/Actions | Verifiable Indicators | Timing/Schedule | Status as of end of 24th SDMP Compliance and Monitoring Report (21 December 2015 – 20 June 2017) |
|---|---|---|---|---|
| Possible oil and grease contamination of the beach | ▪ Provision of fail-safe oil and grease equipment<br>▪ Oil and grease monitoring of beach area | ▪ Absence of oil and grease leaks or spills in the vicinity<br>▪ Oil and grease analysis reports | Submission of compliance and monitoring report every 6 months | *No oil or gas contamination was identified for the period in review which was reported in the 21st-24th Compliance and Monitoring Reports prepared for the purpose.* |
| Observation of Turtles | ▪ Sightings surveillance and monitoring | ▪ Reports on sightings and/or nesting | Submission of compliance and monitoring report every 6 months | *Turtle Nest with 95 Eggs was discovered in an area near WTG #1 for the period in review, which was reported in the 22nd Compliance and Monitoring Report prepared for the purpose.* |
| Possible bird collision | ▪ Bird kill/collisions surveillance/monitoring | ▪ Bird kill/collisions surveillance reports | Submission of compliance and monitoring report every 6 months | A total of 7 bats and 2 birds of the local variety were recorded to have been possibly hit by the WTGs during the period. |

### B.2. Post-registration changes

#### B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

>> None.

#### B.2.2. Corrections

>> None

#### B.2.3. Changes to the start date of the crediting period

>> None

#### B.2.4. Inclusion of monitoring plan

>> None

#### B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

>> None

#### B.2.6. Changes to project design

>> None

## SECTION C. Description of monitoring system

>> The project is a grid-connected zero-emission renewable power generation activity and meets all the following conditions that are stated in the Monitoring Methodology (ACM0002, Version 12.3.0):

- The project supplies electricity capacity addition from wind source;
- The project is not an activity that involves switching from fossil fuels to renewable energy at the project site;
- The electricity grid is clearly identified (as Luzon-Visayas grid) and information is available on the characteristics of the grid

The following variables will be monitored as stipulated by the Monitoring Methodology:

- Electricity generation delivered from the project to the grid (double checking through quality control/assurance procedures) at Bangui substation; and
- Electricity received by the project from the grid at Bangui substation

The latest Luzon-Visayas grid data supplied by the Philippine Department of Energy is utilized for calculation of the simple OM *ex ante* based on the most recent 3 years of actual data and this value is used throughout the crediting period.

Computation of the net electricity delivered by the project activity to the grid through Wholesale Electricity Spot Market (WESM) is as follows:

Net Electricity = Electricity delivered by the project activity to WESM, MWh;
= Electricity delivered by the project activity to WESM - Electricity received by the project activity from WESM

The net electricity delivered by the project activity to the grid is cross-checked with Statement of Accounts coming from WESM and load profile data from National Grid Corporation of the Philippines (NGCP).

## Organizational, Operational and Monitoring Obligations

### A. Obligations of the Operator

Monitoring the project's performance in terms of ERs achievement requires the fulfillment of operational data collection and processing obligations from the operator. The operator has the primary obligation to calculate the project ERs based on the most recent available information, following the ERs Calculation Procedure ("ERCP") presented in this Monitoring Plan (MP) and to abide to the ERCP Organizational Structure and the ERCP Quality Control presented in the annex section of this MP.

The ERCP Organizational Structure aims at showing that the ERCP Manager will be the responsible for performing the ERCP (monthly), and the MP Steering Committee will be the responsible for supervising the ERCP Manager monitoring work (monthly). The ERCP Manager will report to the MP Steering Committee (monthly); and both the ERCP Manager and MP Steering Committee co-ordinately will report to the verifier (when the verification takes place), allowing for a successful verification of the project accounted ERs.

The ERCP Quality Control aims at providing guidance on how to handle monitoring data as to ensure that sufficient and accurate information is made available to the verifier, allowing for a successful verification of accounted ERs. The ERCP Quality Control presented in the annex section of this MP provides guidance on how to trace back the electricity produced by the project to NGCP, through the wholesale electricity spot market operator. It is the responsibility of the operator to enter in agreements with both sorts of data-sources to ensure that data is made available monthly to the ERCP Manager. All data required for the MP will come from a third party: WESM and NGCP information systems, being the latter the preferred data provider.

The billing meters are the property of NGCP and as such NGCP maintains and calibrates them once a year to be able to comply with the grid code requirement.

The MP approach presented here will result in an accurate, yet conservative calculation of ERs. However some uncertainties may lead to a deviation of monitored ERs and the verified ERs, especially errors in the data monitoring and processed system. The operator is expected to prevent such errors and the verification audits are expected to uncover any possible errors. The Certified Emissions Reductions ("CERs") would be granted ex-post verification.

### B. Data Collection

On a daily basis, NGCP issues hourly "Metered Quantity" (MQ) to each generating plant, which provides the quantities exported by the project to the grid as well as the imports for the plant's station use. These MQs are sent via password-protected emails.

For Northwind, the day to day records handling involves manual entry of the mentioned MQs into the monthly monitoring worksheet "Northwind ERs at "monthly period in question".xls. This will be matched with the daily settlement from the spot market for counterchecking purposes.

Five to seven days after the end of each billing month, NGCP issues complete load profile of the exports and imports of the plant presented in intervals of 15-minutes. The data provided by NGCP are then entered into the yearly worksheet "Northwind ERs at "yearly period in question".xls for cumulative monitoring of ERs.

The Philippine Electricity Market Corp (PEMC), the administrator of the spot market, issues a monthly statement of account showing quantity bought from the project on a net metering arrangement, meaning the electric energy sold to the grid are net already of the imports for station use. PEMC issues the documents preliminary by password-protected emails and finally original hard copies by courier. The data from PEMC provide a basis for counterchecking purposes with the actual MQs from NGCP.

These two sets of data are produced in hard copy format for Northwind's files as well as saved in the computer for easy retrieval.

Monitoring records, including soft copies are kept in the ERCP manager's computer with back-up in the company's server. Copies are also sent to Northwind's central database for storage. These files, both soft and hard, will be saved for a minimum two (2) years in the active files after the end of crediting period.

**Monthly Data Collection – Parties Involved**

**Monthly Data Collection – Parties Involved**

| | |
|---|---|
| WESM<br>(Data Provider) | Should provide monthly to the operator a written proof of the project's monthly generation purchased by them. |
| NGCP<br>(Data Provider) | -Should provide monthly to the operator a written proof of the project's monthly generation registered by it. |
| The operator<br>(Data Processor) | -- Should keep statement of account of sales from WESM<br>- Should keep load profile data from NGCP.<br>-Should perform monthly calculation of ERs following the ERCP.<br>-Should perform the annual report of ERs achieved to the verifier.<br>-Should establish the necessary agreements with both WESM and NGCP to assure that they both provide (monthly) a written report of the project's monthly generation bought and registered, respectively. |

## C. Emissions Reductions Calculation Procedure and Required Spreadsheets

The ERCP is the basic instrument for gathering, recording and processing information that will result in the measured ERs. The operator shall consider the project's ERCP as a manual. The ERCP should contain: i) data gathered from WESM and NGCP information systems, being the latter the preferred data provider, and ii) data processed by the operator. All data processing should be done in Excel. The ERCP is designed for monthly and yearly calculation, based on final monthly NGCP reports and WESM monthly recording. Filling data monthly in the required spreadsheets will provide time to review formulas, minimize errors and have data readily available for the verifier in any period of the year. There will be in only 1 spreadsheet to be reviewed by the verifier named Northwind ERs at "yearly period in question".xls**.** However, as the verifier could require preliminary calculations, the ERCP responsible ("ERCP manager") should keep the name of the file and follow by the date at which the latest adjustment is made, every time he works on the file. Doing so will allow to save old versions in disk and keep them as a record to show to the verifier, if required.

When the ERs calculation for the month is completed, the file should be named Northwind ERs at "month in question".xls, to allow differentiating scratch versions from the final monthly calculation. Likewise, after the calculation of the ERs of the last month of the year, the file should change its name to Northwind ERs at "yearly period in question".xls.

This monthly-filled file will be composed by 3 worksheets:

(a) Worksheet # 1: Original Data from NGCP
(b) Worksheet # 2: Original Data WESM
(c) Worksheet # 3: Organized Data, Processed Data and Result

1. **Worksheet #1**: Should contain data as it was handed in, by NGCP, through a CD or email, arranged in months. The ERCP manager should not manipulate this data other than copy and paste it from the file it was handed in. The CD or e-mail through which data comes from provider should be kept as proof for the verifier.

2. **Worksheet # 2:** The same procedure as Worksheet#1, but from data coming from WESM.

3. **Worksheet # 3:** The ERCP manager should put in a column (1 column per month) the monthly project generation. In this same Worksheet, the ERCP manager should calculate monthly ERs (measured in tCO2e) by multiplying the generation in MWh times 0.504 in tCO2e/MWh, which is the baseline emission factor for the project that will be used for the second crediting period (7 years). No rounding needs to be made per month when calculating monthly ERs -as this is only done to measure progress. At the end of the year, the ERCP manager should sum the resulting monthly ERs of the project to obtain the yearly project ERs ready for verification. Resulting yearly ERs must be rounded down to the nearest integer.

Once the yearly ERs calculation is completed in the Northwind ERs, this file should become Northwind ERs at "yearly period in question".xls.

Worksheet # 3 also allows the ERCP manager to calculate the cumulative generation and cumulative ERs along the year and be aware of the project's environmental benefits progresses regarding ERs.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

*(Copy this table for each data or parameter.)*

| **Data/Parameter** | **$EG_{m,y}$** |
|---|---|
| Unit | MWh |
| Description | Net quantity of electricity generated and delivered to the grid by power unit m in years 2006, 2007, 2008, 2009 and 2010 |
| Source of data | Philippines Department of Energy |
| Value(s) applied | Data are provided by electricity generation technology from 2006 to 2010. Refer EF calculation Excel sheets. |
| Choice of data or measurement methods and procedures | • Data for most recent 5 years are used to determine the share of low cost must run in the grid and select the simple OM method<br>• Data for most recent 3 year (2008, 2009, 2010) are used for calculation of the simple OM<br>• Data for 2010 are used to calculate the bulid margin. |
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Not applicable |

| **Data/Parameter** | **$EF_{CO2,m,i,y}$** |
|---|---|
| Unit | $tCO_2/GJ$ |
| Description | $CO_2$ emissions factor of fossil fuel type i used in power unit m in year y |
| Source of data | IPCC default values at the lower limit of uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG inventories |
| Value(s) applied | The following values are used: |
| Choice of data or measurement methods and procedures | No data on the fuels used was available, hence IPCC defaults are used. |
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Not applicable |

| **Type of Fuel** | **CO2 Emission Factors** |
|---|---|
| Coal | 0.0946 |
| Oil | 0.0711 |
| Diesel | 0.0726 |
| Natural Gas | 0.0543 |

| **Data/Parameter** | **$\eta_{m,y}$** |
|---|---|
| Unit | - |
| Description | Average net energy conversion efficiency of power unit m in year y |

| | |
|---|---|
| Source of data | Default values of "Tool to calculate the emissions factor for an electricity system", version 02.2.1 |
| Value(s) applied | Default values as per Tool to calculate the emissions factor for an electricity System: |

| Fuel | Technology | Efficiency |
|---|---|---|
| Coal | Coal - CFBS | 40.0% |
| Oil - Combined Cycle | Oil – Combined Cycle | 46.0% |
| Oil - Diesel | Oil – Open Cycle | 39.5% |
| Gas Turbine | Gas – Combined Cycle | 60.0% |
| Oil Thermal | Oil - Steam | 39.0% |
| Natural gas | Natural Gas – Combined Cycle | 60.0% |

| | |
|---|---|
| Choice of data or measurement methods and procedures | National data of power plant efficiencies were not available so IPCC default values are used. |
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Not applicable |

| **Data/Parameter** | **$EF_{grid, CM, y}$** |
|---|---|
| Unit | $tCO_2e/MWh$ |
| Description | Grid emission factor for the Luzon-Visayas grid. Combined margin $CO_2$ emission factor for the grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" |
| Source of data | Philippines Department of Energy (PDOE); IPCC |
| Value(s) applied | 0.504 |
| Choice of data or measurement methods and procedures | The combined margin is calculated based on official data sources from the Philippine Department of Energy (PDOE). This data is the latest available data that is publicly available to CDM project developers in the Philippines. The grid emission factor will be fixed throughout the crediting period. |
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Calculated ex ante as a weighted sum of the OM and BM emission factors at the start of each new crediting period |

| **Data/Parameter** | **$EF_{grid, OM, y}$** |
|---|---|
| Unit | $tCO_2e/MWh$ |
| Description | Operating margin grid emission factor for the Luzon-Visayas grid. Operating margin CO2 emission factor for the grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" |
| Source of data | Philippines Department of Energy (PDOE); IPCC |
| Value(s) applied | 0.565 |
| Choice of data or measurement methods and procedures | The operating margin is calculated based on official data sources from the Philippine Department of Energy (PDOE). This data is the latest available data that is publicly available to CDM project developers in the Philippines. The operating margin emission factor will be fixed throughout the crediting period. |

| | |
|---|---|
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Calculated ex ante as a weighted sum of the OM and BM emission factors at the start of each new crediting period |

| **Data/Parameter** | **$EF_{grid, BM, y}$** |
|---|---|
| Unit | $tCO_2e/MWh$ |
| Description | Build margin emission factor for the Luzon-Visayas grid. Build margin CO2 emission factor for the grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" |
| Source of data | Philippines Department of Energy (PDOE); IPCC |
| Value(s) applied | 0.323 |
| Choice of data or measurement methods and procedures | The build margin is calculated based on official data sources from the Philippine Department of Energy (PDOE). This data is the latest available data that is publicly available to CDM project developers in the Philippines. The build margin emission factor will be fixed throughout the crediting period. |
| Purpose of data/parameter | Data are used for Baseline emission calculations |
| Additional comments | Calculated ex ante as a weighted sum of the OM and BM emission factors at the start of each new crediting period |

## D.2. Data and parameters monitored

*(Copy this table for each data or parameter.)*

| **Data/Parameter** | **$EG_y$** |
|---|---|
| Unit | MWh |
| Description | Net electricity supplied to the grid by the project |
| Measured/calculated/ default | Calculated |
| Source of data | NGCP and WESM |
| Value(s) of monitored parameter | 127,644.839 |
| Monitoring equipment | **Main Meter**<br>Type: Ametek Jemstar<br>Accuracy class: 0.3<br>Serial number: 1349 21762<br>Calibration frequency: At least once a year to comply with Grid Code<br>Date of last calibration: 09/18/2014; 09/30/2015; 09/07/2016<br>Validity 09/06/2017<br>Note: This ERC-calibrated Meter was installed on 09/18/2014 as replacement of the old meter, Nexus with SN: 2004 411 94876<br><br>**Backup meter:**<br>Type: Ametek Jemstar<br>Accuracy class: 0.3<br>Serial number: 1536 31357<br>Calibration frequency: At least once a year to comply with Grid Code<br>Date of last calibration: 09/18/2014; 09/30/2015; 09/07/2016<br>Validity: 09/06/2017<br>Note: This ERC-calibrated Meter was installed on 09/07/2016 as replacement of the old meter, Landis Gyr with SN: 107341182 |
| Measuring/reading/recording frequency | Hourly Measurement and monthly recording |

| | |
|---|---|
| Calculation method (if applicable) | Net electricity is calculated according to the following formulae:<br>Net electricity delivered:<br>$EG_y$ = Electricity delivered by the project activity to WESM - Electricity received by the project activity from WESM |
| QA/QC procedures | Double check with Statements of Account from WESM and load profile information from NGCP. |
| Purpose of data/parameter | For baseline emissions calculations. |
| Additional comments | Refer to the attached copies of NGCP Meter Test Reports for reference:<br>1. MS-14-0220 (3 pages) conducted by NGCP on 09/18/2014;<br>2. Report #7314 dated 09/30/2015;<br>3. Report #5203 dated 09/07/2016;<br>4. Report #7315 dated 09/30/2015;<br>5. Report #5204 dated 09/07/2016; |

### D.3. Implementation of sampling plan

>> Not Applicable.

## SECTION E. Calculation of emission reductions or net anthropogenic removals

### E.1. Calculation of baseline emissions or baseline net removals

>> The baseline emissions are calculated using the following formula:

Baseline emissions = Net electricity supplied to the grid by the project activity (EGy) x $CO_2$ emission factor of the grid ($EF_{grid, CM, y}$).

The CO2 emission factor of the grid is calculated ex-ante and is fixed for the entire second crediting period. The ex-ante grid emission factor calculated for the project is 0.504 tCO2/MWh.

Net electricity is calculated according to the following formulae:

Net electricity delivered:

$EG_y$ = Electricity delivered by the project activity to WESM - Electricity received by the project activity from WESM

Table showing values for each month of the monitoring period is as follows

| Billing Month | Period Covered | Electricity delivered by the project activity to WESM, Mwh | Electricity received by the project activity from WESM, MWh | Net Electricity delivered by the project activity to WESM, MWh |
|---|---|---|---|---|
| Jun 2015 | 26/05/15 to 25/06/15 | 1,372.308 | 87.171 | 1,285.137 |
| Jul 2015 | 26/06/15 to 25/07/15 | 3,354.771 | 29.463 | 3,325.308 |
| Aug 2015 | 26/07/15 to 25/08/15 | 1,816.773 | 67.914 | 1,748.859 |
| Sep 2015 | 26/08/15 to 25/09/15 | 1,935.717 | 81.480 | 1,854.237 |
| Oct 2015 | 26/09/15 to 25/10/15 | 5,876.990 | 43.344 | 5,833.646 |

| | | | | |
|---|---|---|---|---|
| Nov 2015 | 26/10/15 to 25/11/15 | 8,131.340 | 48.636 | 8,082.704 |
| Dec 2015 | 26/11/15 to 25/12/15 | 10,250.492 | 36.540 | 10,213.952 |
| Jan 2016 | 26/12/15 to 25/01/16 | 7,220.612 | 62.608 | 7,158.004 |
| Feb 2016 | 26/01/16 to 25/02/16 | 10,050.628 | 60.536 | 9,990.092 |
| Mar 2016 | 26/02/16 to 25/03/16 | 6,723.388 | 62.972 | 6,660.416 |
| Apr 2016 | 26/03/16 to 25/04/16 | 2,903.992 | 116.620 | 2,787.372 |
| May 2016 | 26/04/16 to 25/05/16 | 1,536.948 | 123.844 | 1,413.104 |
| Jun 2016 | 26/05/16 to 25/06/16 | 1,957.200 | 82.488 | 1,874.712 |
| Jul 2016 | 26/06/16 to 25/07/16 | 1,743.028 | 94.500 | 1,648.528 |
| Aug 2016 | 26/07/16 to 25/08/16 | 1,444.772 | 41.524 | 1,403.248 |
| Sep 2016 | 26/08/16 to 25/09/16 | 4,579.568 | 67.900 | 4,511.668 |
| Oct 2016 | 26/09/16 to 25/10/16 | 2,876.188 | 78.204 | 2,797.984 |
| Nov 2016 | 26/10/16 to 25/11/16 | 9,237.592 | 31.668 | 9,205.924 |
| Dec 2016 | 26/11/16 to 25/12/16 | 10,577.448 | 10.920 | 10,566.528 |
| Jan 2017 | 26/12/16 to 25/01/17 | 12,137.412 | 28.308 | 12,109.104 |
| Feb 2017 | 26/01/17 to 25/02/17 | 10,946.404 | 30.352 | 10,916.052 |
| Mar 2017 | 26/02/17 to 25/03/17 | 6,987.204 | 52.388 | 6,934.816 |
| Apr 2017 | 26/03/17 to 25/04/17 | 4,018.336 | 86.800 | 3,931.536 |
| May 2017 | 26/04/17 to 25/05/17 | 1,489.824 | 97.916 | 1,391.908 |
| **Total** | **26/05/2015 to 25/05/2017** | **129,168.935** | **1,524.096** | **127,644.839** |

Total net electricity delivered to the grid thru WESM (EGy) during the monitoring period is 127,644.839 MWh.

Baseline emissions = Net electricity delivered by the project activity to the grid (EGy) x $CO_2$ emission factor of the grid ($EF_{grid, CM, y}$).

**Baseline Emissions (BEy) = 127,644.839MWh x 0.504 tCO2/MWh = 64,332 tCO2e**

## E.2. Calculation of project emissions or actual net removals

>> No project emissions ($PE_y$) are considered for the project as per the methodology used. Hence, $PE_y = 0$.

## E.3. Calculation of leakage emissions

>> No leakage emissions (Ly) are considered for the project as per the methodology used. Hence, $LE_y = 0$.

## E.4. Calculation of emission reductions or net anthropogenic removals

| | Baseline GHG emissions or baseline net GHG removals (t $CO_2e$) | Project GHG emissions or actual net GHG removals (t $CO_2e$) | Leakage GHG emissions (t $CO_2e$) | GHG emission reductions or net anthropogenic GHG removals (t $CO_2e$) | | |
|---|---|---|---|---|---|---|
| | | | | Before 01/01/2013 | From 01/01/2013 | Total amount |
| **Total** | 64,332 | 0 | 0 | 0 | 64,332 | 64,332 |

## E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

| Amount achieved during this monitoring period (t $CO_2e$) | Amount estimated ex ante (t $CO_2e$) |
|---|---|
| 64,332 | 87,392 |

## E.6. Remarks on increase in achieved emission reductions

>> The difference from the estimated value in the registered PDD was attributed mainly to the lower than expected wind regime for the period covered. Other major contributors to the wide difference were the following:

(i) The curtailment of the generating capacity of the wind turbines by the Grid Operator, NGCP, to allow usage sharing of the transmission line when the other wind farms in the area were commissioned while the expansion of the same transmission line of NGCP has not been completed. This period of curtailment covered from late 2014 to Oct 2015, which affected a portion of this MR period;

(ii) The several failures of gearboxes involving WTGs #2, 5, 12 & 15 causing combined downtime period of 276 days, most of which happened at times when wind was strong;

(iii) The failures of three generators of WTGs 3, 4 & 7 causing combined downtime of 80 days happening also at times when wind was strong;

(iv) The failures of 4 blade bearings involving WTGs 6 &10 causing combined downtime period of 157 days; and

(v) And other equipment downtimes due to failures in: (a) water pump of WTG #13 for 32 days; and (b) yaw brake disc of WTG #17 for 79 days;

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## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 06.0 | 7 June 2017 | Revision to:<br>• Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN);<br>• Make editorial improvements. |
| 05.1 | 4 May 2015 | Editorial revision to correct version numbering. |
| 05.0 | 1 April 2015 | Revisions to:<br>• Include provisions related to delayed submission of a monitoring plan;<br>• Provisions related to the Host Party;<br>• Remove reference to programme of activities;<br>• Overall editorial improvement. |
| 04.0 | 25 June 2014 | Revisions to:<br>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));<br>• Include provisions related to standardized baselines;<br>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;<br>• Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*;<br>• Editorial improvement. |
| 03.2 | 5 November 2013 | Editorial revision to correct table in page 1. |
| 03.1 | 2 January 2013 | Editorial revision to correct table in section E.5. |
| 03.0 | 3 December 2012 | Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11). |
| 02.0 | 13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01.0 | 28 May 2010 | EB 54, Annex 34. Initial adoption. |

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