	Project design document form (Version 12.0)
BASIC INFORMATION	
Title of the project activity	24 MW wind power project in Tamil Nadu, India
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	1.9
Completion date of the PDD	22/05/2023
Project participants	Green Infra Wind Farms Limited[1]
Host Party	India
Applied methodologies and standardized baselines	ACM0002 ver. 12 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources[2]
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	49,467 metric tonnes CO2 equivalent per annum

[1] https://cdm.unfccc.int/Projects/DB/RWTUV1352192814.76/view

[2] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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This project activity is the new installation of 16 numbers of Wind Turbine Generators (WTGs) of 1500 kW each of Suzlon make in Tirunelveli District in the State of Tamil Nadu in Southern India. Its geographical coordinates are 8°49'35" North and 77°49'20" East. The project proponent M/s. Green Infra Wind Farms Limited (GIWFL) is a subsidiary of M/s. Green Infra Limited (GIL). The project activity commenced operations in July 2009 and marked GIWFL's first foray into development of wind power projects. The generated power from the project activity will be sold to the third party via the Unified Indian Grid. Thus, the baseline for the project activity is grid power, which is predominantly fossil fuel based. The project activity aims to have certain positive impacts as mentioned below.

1. Most important is that it will replace thermal energy/energy from conventional sources of power that is dispatched at the operating margin and also delay the expansion of any conventional powersources planned by the State.
2. The Project will contribute to the overall energy goal of the Country which envisages power for all by 2012[3] wherein a major capacity addition is envisaged from Renewable Energy sector.
3. It will also increase the power supply to the local grid thereby improving stability and helping reduce losses in the distribution system.
4. The Project will assist in a small way to narrow the large demand and supply gap In the State.
5. It will reduce greenhouse gas emissions as well as emissions of local pollutants from power generation by using a cleaner energy source than what typically would have been used.
6. The development of the project also provides important knowledge and experience for other project developers that are striving to participate in the competitive national and regional market.

The project activity will lead to estimated annual GHG reductions of 49,467 tCO_2 and a total of 494,670 tCO_2 for the chosen crediting period of 10 years.

Project's contribution to sustainable development
The implementation of this project activity would contribute to the sustainable development of the region in the following ways as stipulated by the Ministry of Environment, Forests & Climate Change (MoEF & CC) in the interim approval guidelines for CDM projects[4].

Social well being
There will be a good amount of employment opportunity created for the local workforce during the project construction phase, and the project after implementation will continue to provide employment opportunities for the local workforce in a sustained manner over the project life time. As both the genders of the society will be given equal opportunity this will aid to social parity and women enlistment, thereby elevating the social standards.

Economic well-being
The enhanced employment opportunities created by this project activity will lead to alleviation of poverty, and educated unemployment, as it is ideal and more feasible for the project developer to employ local work force during the construction period and operational life time.

[3] http://powermin.nic.in/indian_electricity_scenario/power_for_all_target.htm

[4] http://envfor.nic.in/divisions/ccd/cdm_iac.html

Environmental well-being
As this project activity would be using the available wind potential in Tirunelveli region for power generation process, which has no associated GHG emissions this will certainly have a positive impact on the environment both at local and global level.

Technological well-being
The project activity will be making use of the reliable and proven technology available in India, to ensure an environmentally safe technology is only being implemented in the proposed project activity. Setting up of this project will also increase the private sector participation in this project category thereby contributing to more green power to the grid system.

A.2. Location of project activity

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Country –India
Host party – Government of India
State – Tamilnadu
District- Tirunelveli
Village: Madhavakurchi, Manur, Pudur, Ettankulam and Uganthanpatti, near Deverkulam.

The project site is located around 20 km North-West of Tirunelveli town on a plain terrain near Deverkulam at Madhavakurchi and 4 other adjoining villages, in Tirunelveli District in Tamil Nadu state. The project is connected to substation at Rasta, near Deverkulam. The site can be approached from Tirunelveli through State Highway by going towards Sankarankovil around 20 km in North-West direction. The latitude and longitude of the site are 8°49'35" North and 77°49'20" East respectively.

The unique identification of this project activity will be the High Tension Service Connection (HTSC) number allotted by the Tamil Nadu Electricity Board (TNEB) to the individual WTGs at the time of commissioning. However a map indicating the district in which the WTGs are commissioned is provided, and the commissioning dated of the individual WTGs along with Universal Transverse Mercator (UTM) co-ordinates of their locations.

Sl. No.	WTG Make & Capacity	Commissioning Date	HTSC No.	Latitude			Longitude		
	(kW)	DD/MM/YYYY		Deg	Min	Sec	Deg	Min	Sec
1	Suzlon – 1500	15/06/2009	2853	8	51	6.2	77	38	34
2	Suzlon – 1500	15/06/2009	2854	8	49	56	77	35	35
3	Suzlon – 1500	22/06/2009	2860	8	50	35	77	37	31
4	Suzlon – 1500	22/06/2009	2861	8	50	29	77	37	9.8
5	Suzlon – 1500	22/06/2009	2862	8	49	34	77	36	8.1
6	Suzlon – 1500	22/06/2009	2863	8	49	24	77	35	19
7	Suzlon – 1500	22/06/2009	2864	8	50	6.9	77	35	54
8	Suzlon – 1500	22/06/2009	2865	8	50	49	77	35	29
9	Suzlon – 1500	22/06/2009	2866	8	50	53	77	36	2
10	Suzlon – 1500	22/06/2009	2867	8	50	22	77	36	27
11	Suzlon – 1500	22/06/2009	2868	8	49	53	77	36	59
12	Suzlon – 1500	22/06/2009	2869	8	49	23	77	37	39
13	Suzlon – 1500	22/06/2009	2870	8	49	14	77	37	22
14	Suzlon – 1500	22/06/2009	2871	8	48	47	77	36	53
15	Suzlon – 1500	22/06/2009	2872	8	47	41	77	38	5.6
16	Suzlon – 1500	22/06/2009	2873	8	52	25	77	38	6.4

A.3. Technologies/measures

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Application of environmentally sound and safe technology

The technology employed for the project activity is the current best practice in wind power sector in India. The project involves the installation of 16 numbers of 1500 kW WTGs supplied by M/s. Suzlon Energy Ltd, Flagship Company of Suzlon group, considered to be one of the leading manufacturers of site specific WTGs with strong Research & Development (R&D) back up and having R&D centers in Germany, Netherlands & Asia5. They have supplied the model S 82/1500 kW WTGs, for this project.

Thus, this project involves electricity generation using the available technology through sustainable means without causing any negative impacts on the environment. Hence, the technology applied for the project activity is environmentally safe and sound.

Technical details of the project activity

The Project activity utilises the velocity of the wind for power generation by using WTGs. The project activity uses the horizontal axis WTGs having three rotor blades. The power generation takes place when the kinetic energy of wind is converted into mechanical energy and then converted into electrical energy by using electric generators. WTGs are monitored and controlled by a microprocessor based control unit. The technical specification of the WTG is provided in Appendix 8. The load factors for WTGs primarily depend on the wind availability in any particular region.

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host Party)	Green Infra Wind Farms Limited (Private Entity)	No

[5] http://www.suzlon.com/products/l3.aspx?l1=2&l2=10&l3=70

A.5. Public funding of project activity

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There is no public funding involved in this project activity.

A.6. History of project activity

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Start date of the project activity is 15/06/2009 (Memorandum of Understanding for Civil works and Hydro mechanical works), the project has commissioned on 15/06/2009 and 22/06/2009 or date of registration of project activity with UNFCCC. Project registration date in UNFCCC is 23/11/2012.

The link for the project activity is provided below:-
https://cdm.unfccc.int/Projects/DB/RWTUV1352192814.76/view

The CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA). The CDM project activity is also not a project activity that has been deregistered. The CDM project activity was not a CPA that has been excluded from a registered CDM PoA.

No registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the CDM project activity.

A.7. Debundling

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The project activity is not a debundled component of a large-scale project activity. Hence Not Applicable.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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Approved consolidated baseline and monitoring methodology ACM0002 - “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” Version 12.3.0/ Sectoral Scope 01 – EB 66.

Tools –Following links of tools used to calculate the emission factor for an electricity system and demonstration of additionality.

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

B.2. Applicability of methodologies and standardized baselines

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This project activity involves grid connected electricity generation from renewable source that is wind energy and hence the methodology ACM0002 Version 12.3.0, EB 66 has been chosen for this project activity. The project activity meets all the applicability criteria as defined in the methodology asdemonstrated below:

Applicability Conditions as per ACM0002 Ver 12.3.0	Applicability to this project activity

The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	This Project activity generates Electricity from wind power project. Hence this methodology is applicable for this project activity.
In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The project activity is the installation of a new grid connected wind power plant. Hence, no capacity expansion or retrofit of the plant is envisaged.
In case of hydro power plants, one of the following conditions must apply: ➢ The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of reservoirs; or ➢ The project activity is implemented in an existing single or multiple reservoirs, where the volume of reservoirs is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity; or ➢ The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per definitions given in the Project Emissions section, is greater than 4 W/m2 after the implementation of the project activity.	This is a new wind power project hence not applicable.

Methodology is not applicable to the project activity for following applicability criteria- :

Project activities that involve switching from fossil fuelsto renewable energy sources at the site of the project activity, since in this case the baseline may be thecontinued use of fossil fuels at the site;	The project activity is the installation ofgrid connected wind power plant and does not involve switching from fossil fuels to renewable energy sources.
Biomass fired power plants;	The project activity is the installation of grid connected wind power plant and not a biomass fired power plant
A Hydro power plant that results in a new single Reservoir or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	The project activity is the installation of grid connected wind power plant and not a hydro power plant

B.3. Project boundary, sources and greenhouse gases (GHGs)

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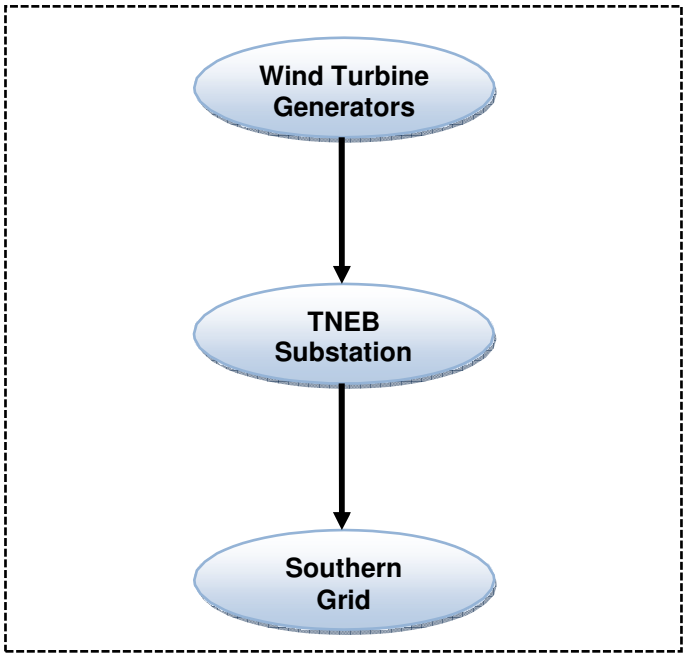
According to ACM0002 Version 12.3.0 the spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. The schematic is as represented in the figure below.



(Schematic explanation of choice of project boundary for calculation of emission reductions)

Emission sources and gases included in the project boundary:

	Source	Gas	Included	Justification / Explanation
Baseline	CO2emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. (Unified Indian Grid)	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.

There are three choices available for choosing the grid system for the project activity, viz. State grid, Unified Indian Grid or National grid. Since the CDM project would be supplying electricity to third party under open access using TNEB sub-station in turn connected to the Southern region grid, it is preferable to take the Unified Indian Grid as project boundary rather than the State boundary. This will also minimize the effect of inter-state power transactions, which are dynamic and vary widely. Considering free flow of electricity among the member states connected to the Southern Region Load Dispatch Centre (SRLDC), the entire Southern grid is considered as a single entity for estimation of baseline.

As per the Baseline Study in the Unified Indian grid, it is estimated that the primary and critical source of emission is the CO_2 emissions from the conventional power generation systems, which is a part of the baseline study. The other likely emissions are that of CH_4 and N_2O, but both emissions were conservative and are excluded for simplification of the project. Also, in-direct emissions can result from project construction, transportation of materials and other related activities. In case of this Project, these emissions are thought to be comparable or less to the life cycle emissions which would result from the eventual construction and operation of alternative capacity. The life cycle emissions of alternative power generation plants, in particular fossil fuel plants, are much higher than from wind power plants due to the nature of activities involved like mining, refining and transportation of fossil fuel. The project does not claim emissions reductions from these activities. Therefore no significant net leakage from the above activity was identified. The Methodology does not take into account the leakage that would arise from the import and export of electricity to the local grid. It is concluded that since this is a wind power project there would be minimum or no leakage and hence this is not considered significant.

B.4. Establishment and description of baseline scenario

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Identification of the baseline scenario
The project activity uses the approach described in the ACM0002, Version 12.3.0
- "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

As per the methodology ACM0002, version 12.3.0, if the project activity is the installation of a new grid- connected renewable power plant/unit, the baseline scenario is the following:

"Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" version 02.2.1, EB 63, annex 19.

Based on the above, 'Tool to calculate the emission factor for an electricity system' (version 02.2.1, EB 63, annex 19) is used for emission factor calculation. Data for the calculations of the emission factor has been taken from the Baseline Carbon Dioxide Emissions Database, Version 4.0[6], published by the Central Electricity Authority, India, the derived values for the baseline determination are as follows:

Key parameters	Value	Data Source	Website
EF_y	Baseline emission factor for the UNIFIED INDIAN[7] grid	CEA published baseline emission factor for various Unified Indian Grids, Ex- ante fixed for the entire fixed crediting period of 10 years.	https://cea.nic.in/cdm-co2-baseline-database/?lang=en

[6] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

EG_y	Net power export to the grid per annum		
OM	0.998 tCO_2/MWh	Data published in the "CO_2 Baseline database for the Indian power sector" version 4.0 by central Electrical Authority of India (CEA), India.	
BM	0.713 tCO_2/MWh		
CM	0.927 tCO_2/MWh	The combined margin emission factor is calculated as the weighted average of the OM emission factor and BM emission factor. Since the project activity is a hydro power plant, the weighted factor for OM is taken as 0.75 and for BM is taken as 0.25 , following the "Tool to calculate the emission factor for an electricity system" version02.2.1	

Please refer to Section B.6.1 for the detailed calculation for emission factor.

B.5. Demonstration of additionality

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GIWFL was aware of the possible revenues through CDM for mitigating financial risks associated with investment in wind power generation, as wind is highly unreliable source of power because nature is unpredictable. They had factored in the possible benefits in the form of CER revenue during the financial planning stage of the project in order to aid in decision making to proceed with the project activity.

As per the decision 17/cp.[7] Para 43, a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered project activity. As per the selected methodology ACM0002, the project developer is required to establish that the GHG emission reductions due to the project activity are additional to those that would have occurred in the absence of the current project activity as per the "Tool for the demonstration and assessment of additionality, version 06.1.0, EB 69, annex 20"[8]

The step-wise approach to establish additionality of the project activity is as follows:

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations Sub-step 1a: Define alternatives to the project activity
This step asks for identification of other realistic and credible alternative scenario(s) that deliver outputs and services (e.g. electricity) with comparable quality, properties and application areas.

The project involves the installation of 16 numbers of 1500 kW WTGs supplied by Suzlon Energy Ltd, flagship company of Suzlon group and exports the generated power

[7] Northern Eastern Western North Eastern

[8] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf

to the Southern Unified Indian Grid. The alternatives which were available with the project participant are as follows:

Alternative 1 - The proposed project activity not undertaken as a CDM project activity.
In the said alternative GIWFL would have gone ahead with the implementation of project activity, generating renewable electricity and exporting the same to third party under open access, making use of the sub-station of the State electricity grid under a power purchase agreement thereby displacing equivalent units of power generated by fossil fuel based plants in the grid. There would be no emissions of greenhouse gases to atmosphere. This alternative is in compliance with all applicable legal and regulatory requirements and may be a part of the baseline scenario. However there exist barriers to the implementation of the proposed project activity without CDM revenues as explained in step 2 and step 3 below.

Alternative 2 - In the absence of this project activity the existing scenario in the grid system would have continued and equivalent amount of energy would have been produced by the grid system and by the new capacity additions predominantly through conventional sources of power being planned.

Outcome of Sub-step 1a: In the absence of the project activity where in the equivalent amount of energy would have been produced by the project, grid electricity system through its currently running power plants and by new capacity additions (which are mostly thermal) is the most plausible alternative as baseline option for the project in accordance with ACM0002. Thus suitable grid mix has been selected as the baseline scenario.

Sub step 1b. Consistency with mandatory laws and regulations
The alternative(s) shall be in compliance with all applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally-binding status.).

- Electricity generation from wind farm is not legal and regulatory requirements or a mandatory choice.
- The India Electricity Act 2003 does not restrict or empower any authority to restrict the fuel choice for power generation

Outcome of Step 1b: Thus, considering that all the alternatives are in line with the applicable legal and regulatory requirements, the “no project option” i.e. continuation of current practise where in the equivalent amount of energy would have been produced by the project grid electricity system through its currently running power plants and by new capacity additions is the chosen baseline scenario which would have happened in the absence of the proposed project activity.

Step 2: **Investment analysis**

Sub-step 2a: Determine appropriate analysis method
As the project would generate revenue from sale of power other than CDM revenue, Option I is ruled out. Option II and Option III are thus available to PP for investment analysis. PP has chosen Option III for the investment analysis as Option II which is Investment Comparison Analysis does not apply to the project case as PP, in case of not going ahead with the project activity, would have not invested in any other project to provide similar service and equivalent power would be supplied by the grid connected power plants.

Sub-step 2b: Option III. Apply benchmark analysis

Project IRR has been chosen as the financial indicator for benchmark analysis. This is as per the Guidance on the Assessment of Investment Analysis, Version 05, EB 62, Annex 5. Further in line with para 12 of the guideline, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. As in the project activity, Project IRR is chosen as the financial indicator, Base Prime Lending Rate (BPLR) of Reserve Bank of India (RBI) at the time of taking investment decision is chosen as the appropriate benchmark. At the time of decision making on 17/12/2008 the BPLR of RBI was 13.00[9] and hence this becomes the benchmark for the project activity.

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

Financial analysis
The Project IRR for the proposed project activity without CDM revenues was computed for a period of 20 years, corresponding to the lifetime of the 24 MW wind farm based on the following assumptions. The analysis has been carried out for 20 years which is in line with para 3 of Annex 5 of EB 62:

Financial Assumptions:
Details relevant for the computation of financial indicator are as follows:

Project Details

Description	Unit	Value	References
Capacity of the WTGs	kW	1500	As per the DPR
No of WTGs	Nos.	16	As per the DPR
Project Size	MW	24	As per the DPR
Estimated Generation and supply to the grid	GWh/Annum	53.366	As per the DPR
Net Billable power after wheeling[10]	GWh/Annum	50.68	As per the DPR

Capital Cost

Description	Unit	Value	References
Total Project Cost	Rs. Million	1498.5266	As per the Detailed Project Report. This is more conservative than the value considered in the offer letter (~Rs. 1520 Million) from the technology supplier which was available at the time of decision making.

Operational Costs

Description	Unit	Value	References
O&M cost	Rs. Million	22.80	As per the DPR
Free O&M (No of years)	Years	2	As per the DPR
Annual Escalation in O&M	%	5.0%	As per the DPR
Infrastructure development charges	Rs. 2.575 Million/MW	61.8	As per the DPR

[9] Publication date 21/11/2008, http://rbidocs.rbi.org.in/rdocs/Wss/PDFs/88944.pdf

[10] After discounting for 5% wheeling charge of estimated generation for open access

Other expenses (Management services fee)	Rs. Million/annum	6	As per the DPR
Annual escalation of other expenses	%	5.0%	As per the DPR
Insurance cost	Rs. Million/annum	0.6	As per the details in the DPR. 0.6 Million out of the 6.6 million (Other expenses) is considered as Insurance cost. This is conservative as the actual cost is 1.1 million per annum.

Project Funding

Description	Unit	Value	References
Debt	%	75%	As per DPR. Actual debt is 70% of the project cost. 75% is conservative and hence considered in the analysis.
Equity	%	25%	As per DPR
Interest rate	%	10.3%	As per DPR.

Revenue Components

Description	Unit	Value	References
Tariff rate	Rs./ kWh	4.13 for first year, 4.33 for next 4 years and 4.88 from 6th year onwards	As per the DPR.

Financial Indicator

Description	Unit	Value
IRR without CDM revenues	%	10.95%

The Project IRR without CDM benefits is 10.95% against the benchmark value of 13.00% demonstrating that the project is additional.

Sub-step 2d: Sensitivity analysis

The robustness of the conclusion derived above, i.e., the project is additional has been tested with a sensitivity analysis. According to Guidance to the assessment of additionality issued by the EB, PP has subjected the critical assumptions made in the projections (which account for more than 20% of the cost and revenue) to reasonable variations, i.e., by ±10%. The PP has chosen four variables, viz., project cost, power generation or capacity utilization factor, power tariff and O&M cost. The results of the sensitivity analysis are as follows:

Sensitivityfactor	% Change over base value	IRR
Tariff	10%	12.96%
O&M	-10%	11.15%
Project cost	-10%	12.69%
Generation	10%	12.77%

Though the robustness of the conclusion arrived at, has been established with the sensitivity analysis, the PP submits that the optimistic assumptions made for the purpose of sensitivity analysis are not realistic and such conditions are unlikely to occur for the following reasons. Also, in doing so, PP has covered the scenarios occurring post decision making for the critical factors:

1. **Project cost**: The project cost is based on the Detailed Project Report. This cost was available at the time of decision making and is less than the cost received in the offer letter from the WTG supplier prior to decision making and hence is conservative.

However, the final accrued cost of Rs. 1429.855 million is less than this cost and hence sensitivity is carried out to cover the actual cost as well. 10% reduction in assumed cost makes it Rs. 1348.674 million which is far below the actual cost. Even at this level, IRR remains 12.69% much below the benchmark rate. Only variation as low as ~-12% makes the IRR cross the benchmark.

2.**Capacity Utilization Factor (CUF**): The Capacity Utilization Factor has been recommended by Consolidated Energy Consultants Limited (CECL), a third party firm appointed by GIWFL to arrive at Annual Energy Production estimates for the proposed 24 MW wind farm, after collection and analysis of exhaustive data on wind in the project region. The possibility of the project activity to achieve a CUF of more than what is estimated is deemed impractical and the sustenance of the increase over the life time of project is deemed even more improbable. Even an increase of ~10% in the considered CUF does not help IRR cross the benchmark rate and it remains at 12.77%.

3. **O&M Cost**: The PP has signed the O&M (Operation & Maintenance) Contract with Suzlon Infrastructure Services Limited, valid for initial 7 years, which provides for only annual escalation. Hence, any reduction in O&M Cost is also unrealistic. Even a 50% reduction in O&M cost does not make project any more attractive and IRR remains below the benchmark.

4. **Tariff Rate**: In the project activity, PP is selling power to third parties through open access. In the base case, different year on year tariff rates were considered in the DPR. However, the actual tariff based on the contracts (Power Purchase Agreements (PPAs)) signed with various consumers result in different values for different consumers. Hence, to cover the actual scenario, PP has run the financial analysis considering the weighted average tariff value of all contracts also. IRR with the weighted average of actual tariff rates comes out to be 11.04% which is less than the benchmark. Sensitivity analysis has been carried out for change in tariff (based on DPR as well as signed PPAs) for the whole period of 20 years. The IRR values for 10% sensitivity over DPR tariff and actual tariff becomes 12.77% and 12.96% respectively. Only ~11.3% increase in the assumed rate (DPR tariff) and ~10.2% (over PPA tariff) would be able to help IRR cross the benchmark rate.

In the above background, the PP submits that the project is unlikely to achieve the benchmark of 13% and hence the project is additional and not a business as usual scenario. Thus, concluding that the project activity is not financially attractive to the PP, analysis has been taken to step 4 (as per the “Tool for the demonstration and assessment of additionality” Version 06.1.0)

Step 4: Common practice analysis

This analysis stands as a credibility check to complement the investment analysis (Step 2). As per para 47 of “Tool for the demonstration and assessment of additionality”, Version 6.1.0, the common practice analysis has to be demonstrated by following steps for measures that are listed in paragraph 6. Step 4(a) and Step 4(b) of the tool are covered under this analysis.

For all the measures listed in paragraph 6 of the “Tool for the demonstration and assessment of additionality”, the common practice analysis has been performed through the following steps.

The analysis stands as a credibility check to complement the investment analysis (Step 2). Guidelines on Common Practice ver 2.0, EB 69, annex 8 has been used for performing the common practice analysis for the project activity. As per the same, the identification of projects and further analysis has been done in the following step wise manner:

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

As the proposed project activity is of 24 MW capacity, the applicable output range for the identification of projects is 12 MW to 36 MW.

Step 2: Identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;	As required in para 1 of the guideline, Host country India has been considered asthe applicable geographical area.
(b) The projects apply the same measure as theproposed project activity;	In line with para 2 (b) of the guideline, only renewable energy projects are considered.
(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;	According to para 4(a), as the project activity is a wind energy project, therefore only Wind projects have been considered in the analysis.
(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant	All wind projects considered are power only projects.
(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;	Only wind projects falling within the capacity range of 12MW-36MW have been considered as set in Step 1.
(f) The projects started commercial operation	The start date of the project is 22/02/2009
before the project design document (CDM- PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.	which is earlier than the date of PDD publishing for global stakeholder consultation is 28/11/2009, hence projects which started commercial operation prior to 22/02/2009 have been considered.

This step gives a total of 72 wind power projects in India which are eligible for further analysis.

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

Out of these 72 projects, there are 27 registered CDM projects, 0 projects submitted for registration and 14 projects are undergoing validation. So, 31 projects have been identified which make N[11].

Therefore, $N_{all} = 31$

Projects[12]

[11] Details of data collated and analysis done are provided to DOE for validation

[12] Source, Wind Power Directory, dated August,2009

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

As per para 4 of guideline, technology can be different by at least one of the following –

(a) Energy source/fuel (example: energy generation by different energy sources such as wind and hydro and different types of fuels such as biomass and natural gas);	Since N_{all} considers only wind projects, this is notapplicable.
(b) Feed stock (example: production of fuel ethanol from different feed stocks such as sugar cane and starch, production of cement with varying percentage of alternative fuels or less carbon-intensive fuels);	This is a wind power project and hence this is notapplicable.
(c) Size of installation (power capacity)/energy savings: *(i)* Micro (as defined in paragraph 24 of decision 2/CMP.5 and paragraph 39 of decision 3/CMP.6); *(ii)* Small (as defined in paragraph 28 of decision 1/CMP.2); *(iii)* Large.	Project activity is a large scale wind power projects and the applicable range of capacity identified in Step 1 is 12MW-24MW and therefore projects falling in 12MW-15MW range have been excluded from the analysis.
(d) Investment climate on the date of the investmentdecision, inter alia: *(i)* Access to technology; *(ii)* Subsidies or other financial flows; *(iii)* Promotional policies; *(iv)* Legal regulations;	In India, each state can set its own policy for wind power projects through its State Electricity Regulatory Commission (SERC). Hence the climate for investment is different in different states. Even the PLF available is different in different states. Since the project activity falls within the state of Tamilnadu have only been
	Considered. Further, In India, major reform in the power sector has taken place post to Electricity Act 2003. Hence wind projects from 2003 and started commercial Operation prior to start of the project activity is considered in the analysis.
(e) Other features, inter alia: (i) Nature of the investment (example: unit cost of capacity or output is considered different if the Costs differ by at least 20 %).	This criterion has not been applied.

Therefore,
N_{diff}= Small scale wind power projects in Tamil Nadu[13] + Wind project before Electricity Act 2003[14]
+ Wind project in other states of India[15]

[13] Projects differ by capacity (small scale)

[14] Projects differ by different investment climate (Different policy regime)

[15] Projects differ by different investment climate (Different policy regime)

= 28

Step 5: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity
F= 1-(28/31)
=0.10
The proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3.

As the factor F has been calculated to be 0.10 (not greater than 0.2) and $N_{all}-N_{dif}f$ = 3 (not greater than 3), the proposed project activity is not a common practice.

Impact of CDM registration
- The revenues from sale of CERs will improve the project IRR, which will have a positive impact on the feasibility of the project
- The successful registration will invite for active participation from private investors to set up this type of project activity and will increase their faith in Kyoto Mechanisms
- In addition it leads to a positive impact on climate change as the power generation process has no associated GHG emissions

CDM Consideration:
PP sent the intimation to UNFCCC as per EB 41, annex 46 (Guidance available at that time) which required PP to inform the DNA and/ or UNFCCC within six months. PP opted to send such intimation to UNFCCC only. The reference to such intimation is available on UNFCCC website. It may be noted that the requirement of sending this intimation to both DNA and UNFCCC came only after EB 41.

PP sent the intimation letter to the UNFCCC Secretariat in writing on 27/11/2008 about the commencement of the project activity. This was done even before the start date of the project activity (i.e. 22/02/2009), complying to the guideline which requires the intimation to be sent within six months of the start date of this project activity. This meets the requirement of prior consideration of CDM in the proposed project activity.

To render more clarity on the steps taken by the PP towards the project implementation as well as the CDM registration, the important stages have been tabulated below:

Stage of project implementation	Date	Remarks
Proposal from Suzlon, WTG Supplier	22-Jul-08	
Contract with CECL for preparation of Detailed Project Report	12-Sep-08	PP engaged third party for the assessment ofpower generation potential from the project for the site.
UNFCCC letter sent as per EB 41	27-Nov-08	PP intimated UNFCCC about its intent of putting up wind power project in line with EB 41.
UNFCCC receipt on the intimation	27-Nov-08	
Engagement of CDM advisor	5-Dec-08	CDM advisor was engaged to assess the CDM potential and start the project registration project before the start of the project activity implementation
Board resolution meeting for the implementation of the project activity	17-Dec-2008	Date of decision making
Purchase Order to Suzlon for supply of WTGs	22-Feb-09	Purchase orders placed with the equipment supplier (Project Start Date)

Engagement of NERD Society for carrying out Stakeholder Consultation	15-Apr-09	PP engaged Non-conventional Energy andRural Development Society (NERD), an NGO for carrying put stakeholder consultation for the project.
Newspaper advertisement on Stakeholder consultation	12-May-09	PP published newspaper advertisement for stakeholder consultation.
Stakeholder consultation	18-May-09	Meetings conducted by NERD
Commissioning of first WTG	15-Jun-09	First WTG installed and commissioned in the project activity.
Loan agreement with IREDA	30-Jul-09	The final loan sanction for the project activity.
Host Country Approval	20-Jan-10	HCA received from DNA.

The above detail indicates that not only PP considered CDM revenue as part of decision making but also made concerted efforts towards project registration along with implementation of the project.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

>>

As per ACM0002, ver 12.3.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

• Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the .Tool to calculate the emission factor for an electricity system.

Estimation of Baseline Emissions
Baseline emissions (BEy in tCO2) due to displacement of grid-electricity are calculated as the product of the Baseline Emissions Factor (EFy in tCO2/MWh) calculated as described below and the electricity supplied by the project activity to the grid, over the crediting period.

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

Where:

BE_y = Baseline emissions in year y (tCO2)
$EG_{PJ,\,y}$ = Quantity of net electricity generation that is produced and fed into the grid as result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$= Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system". (tCO_2/MWh)

As the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

Where

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

$E_{GPJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

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

The baseline emission factor ($EF_{grid,CM,y}$) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors calculated according to the version
02.2.1 of "Tool to calculate the emission factor for an electricity system", using the following six steps: Project participants shall apply the following 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) emissions factor
STEP 6: Calculate the combined margin (CM) emissions factor

The tool defines the electric power system as the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Keeping this into consideration, the Central Electricity Authority (CEA)[16], Government of India has divided the Indian Power Sector into Unified Indian Grid (see table below).

NEWNE Grid				Southern Grid
Northern	**Eastern**	**Western**	**North-Eastern**	**Southern**
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Pondicherry
Punjab	Andaman-Nicobar	Maharashtra	Nagaland	Lakshadweep
Rajasthan		Goa	Tripura	
Uttar Pradesh				
Uttarakhand				

Since the project supplies electricity to the Southern grid, emissions generated due to the electricity generated by the southern Unified Indian Grid as per CM calculations will serve as the baseline for this project. The Southern Region grid managed by Southern Region Electricity Board (SREB) constitutes five states (viz Andhra Pradesh, Karnataka, Kerala, Lakshadweep & one union territory Pondicherry). These States

[16] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

under the Unified Indian Grid have their own power generating stations as well as centrally shared power- generating stations.

Step 2 Choose whether to include off-grid power plants in the project electricity systems (Optional) The Project Participant chooses the grid power plants (Option I) to calculate the operating margin and build margin Emission Factor.

STEP 3: Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{OM,y}$) is based on one of the following methods:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

Any of the four methods can be used. However, the simple OM method (option a) can only be used if low-cost/must-run resources 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.

In the southern Unified Indian Grid the power generation is dominated by fossil fuel based power plants and the power generation by low cost/must run resources constitute (average of the five most recent years) less than 50% of total grid generation, so simple operating margin method is used for operating margin emission factor calculation. According to the current scenario in southern Unified Indian Grid, the power generation by fossil fuel based thermal power plants are dominating the grid.

Year	2003-04	2004-05	2005-06	2006-07	2007-08
Southern Grid	16.2%	21.6%	27.0%	28.3%	27.1%

(Source: https://cea.nic.in/cdm-co2-baseline-database/?lang=en)

The above table clearly shows that the percentage of total grid generation by low-cost/must-run plants (on the basis of average of five most recent years) for the Southern Unified Indian Grid is only 27.1% which is much lesser than 50% of the total generation. Thus, Simple OM method can be used for calculating the emission factor.

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

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

•Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

•Ex post option: 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.

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants/units.

Method adopted for Simple OM in the project activity

In the project activity, (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission has been considered. The data is published annually by the Central Electricity Authority. It is confirmed that ex-ante vintage is considered in the project activity and cannot be changed during the crediting period. The weighted average of the Simple Operating Margin is as follows

Operating Margin	**2005-06**	**2006-07**	**2007-08**
Absolute Emissions (tCO2)	101,551,293	109,020,456	113,626,240
Net Generation in Operating Margin (GWh)	100,978	109,116	114,702
Operating Margin (tCO2/MWh)	0.998		

Source: Central Electricity Authority: CO_2 Baseline Database. Version: 4, Dated Sep 2008 https://cea.nic.in/cdm-co2-baseline-database/?lang=en

STEP 5: Calculate the build margin (BM) emission factor ($EF_{grid, BM,y}$)

Option 1 as described above is chosen in the project activity. BM is calculated ex-ante based on the most recent information available at the time of submission of PDD and is fixed for the entire crediting period. **The build margin emission factor is as follows**

Build Margin	**2007-08**
Absolute Emissions (tCO_2)	22,550,310
Net Generation in Build Margin (GWh)	31,613
Build Margin (tCO_2/MWh)	0.713

Source: Central Electricity Authority: CO2 Baseline Database, Version: 4, Dated Sep 2008 https://cea.nic.in/cdm-co2-baseline-database/?lang=en

STEP 6: Calculate the combined margin emissions factor ($EF_{grid, CM, y}$)

The Combined Margin emission factor can be calculated as per the following:

$$EF_{grid, CM, y} = EF_{grid, OM, y} \times W_{OM} + {}^{*}EF_{grid, BM, y} \times W_{BM}$$

Where,

$EF_{grid, OM,y}$ = Operating Margin CO_2 emission factor in the year *y* (tCO_2/MWh)
$EF_{grid, BM,y}$ = Build Margin CO_2 emission factor in the year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emission factor (%)
w_{BM} = Weighting of build margin emission factor (%)

Owing to their intermittent and non-dispatchable nature, the default weights for wind and solar projectsare as follows:

w_{OM} = 75% and w_{BM} = 25%

EF_{OM}	-	0.998 tCO_2/MWh
w_{OM}	-	0.75
EF_{BM}	-	0.713 tCO_2/MWh
w_{BM}	-	0.25
$EF_{grid,CM,y}$ =		0.75* 0.998 + 0.25* 0.713

Baseline emission factor will be ($EF_{grid,CM,y}$) = 0.927 tCO_2/MWh

Year	Average
Operating Margin Emission Factor (tCO_2 / MWh)	0.998
Build Margin (tCO_2 / MWh)	0.713
Combined Margin (tCO_2 / MWh)	0.927

Thus, the CM emission factor ($EF_{grid, CM, y}$) for the project has been calculated to be $EF_{grid, CM, y}$ = 0.927 tCO2/MWh and is fixed ex-ante for the entire crediting period.

Source: Baseline Carbon Dioxide Emissions from Power Sector Version 04 published by the Central Electricity Authority, India. For further details on baseline study please refer to Annex[17]

[17] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin emission factor of the Unified Indian Grid
Source of data	Fixed and ex-ante combined margin emission factor as per Central Electricity Authority (CEA) of India's Database https://cea.nic.in/cdm-co2-baseline-database/?lang=en
Value(s) applied	0.927
Choice of data or measurement methods and procedures	Calculated by CEA for all the Unified Indian Grids in India. Specifically meant for usein CDM project activities.
Purpose of data	to calculate emission factor
Additional comment	The latest available information on CM emission factor value at the time ofsubmission of project for request for registration would be used and **this is fixed ex-ante** for the entire crediting period.

B.6.3. Ex ante calculation of emission reductions

Baseline Emission calculation
$BEy = EG_{PJ,y} \times EF_{grid, CM,y}$
$EGP,J,y = 53,366$ MWh
$EF_{grid, CM,y} = 0.927$ tCO2e/MWh
$BE_y = 49,467$ tCO2e

Project Emission
The operation of WTGs does not lead to any associated GHG emissions. So, PEy = 0

Leakage Emission
The methodology accounts that the main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects). Thus project participants do not need to consider these emission sources as leakage in applying this methodology as wind power projects do not have any associated GHG emissions. So,

LEy=0

Emission Reduction
The project activity reduces carbon dioxide through displacement of grid electricity generation with fossil
fuel based power plants by renewable-hydro energy based electricity. The emission reduction ERy due to
the project activity during a given year y is calculated as the difference between baseline emissions (BEy),
project emissions (PEy) and emissions due to leakage (Ly) as follows:

$ER_y = BE_y – PE_y - LE_y$
$ER_y = 49,467-0 - 0$

ER_y = 49,467 tCO2e

So, the total emission reductions (ER) from this project activity are 49,467 tCO2/ annum

B.6.4. Summary of ex ante estimates of emission reductions

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2012 – 2013	0	49,467	0	49,467
2013 – 2014	0	49,467	0	49,467
2014 – 2015	0	49,467	0	49,467
2015 – 2016	0	49,467	0	49,467
2016 – 2017	0	49,467	0	49,467
2017 – 2018	0	49,467	0	49,467
2018 – 2019	0	49,467	0	49,467
2019 – 2020	0	49,467	0	49,467
2020 - 2021	0	49,467	0	49,467
2021 - 2022	0	49,467	0	49,467
Total	**0**	**494,670**	**0**	**494,670**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y
Source of data	Monthly energy meter readings recorded by TNEB personnel in the presence of PPs representatives
Value(s) applied	53,366
Measurement methods and procedures	Electricity will be measured continuously and aggregated monthly using calibrated energy meters, the readings will be recorded on a chosen date on month by TNEB personnel in the presence of site in charge/site personnel.
Monitoring frequency	Monthly
QA/QC procedures	The energy meters used will be calibrated periodically by the state electricity utility. The power sale records to the third party and the TNEB monthly statements are used to cross check the data and hence ensure consistency. Frequency of calibration: at least once in a year Accuracy of meters: 0.2 Data Archiving: Electronically/ paper In case of miss-match in start date of billing cycle of monthly generation statement and start date of monitoring period, apportioning procedure should be follow for the conservative approach to calculate emission reductions. For more details refer section B.7.3.
Purpose of data	To calculate emission reductions
Additional comment	-

B.7.2. Sampling plan

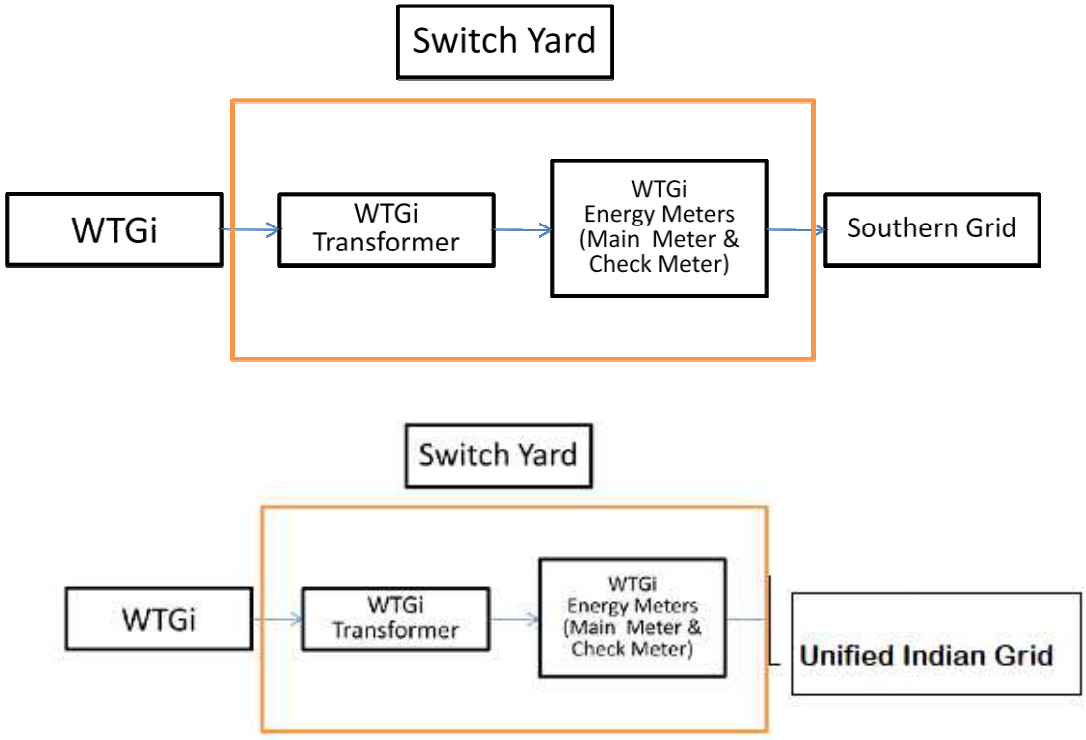
>>
No sampling plan required for this project activity.

B.7.3. Other elements of monitoring plan

>>
The project activity is operated and managed by the PP with the help of site O&M contractor (Suzlon Infrastructure Services Limited)). For the accurate execution of the project activity a project team has been constructed. The project team is delegated with the responsibility to monitor and document the electricity generated and also safe keeping of the recorded data.

The electricity being generated is monitored at the main meters and the check meters at the delivery points at the respective WTG sites which are installed and owned by the PP. Each WTG is connected to one set of main and check meters. These meters record the electricity generated on a continuous basis. Main meter readings are considered in normal course. In the event of main meter are found to defective or stopped, check meter readings are to be considered. In case, if both the main meter & the check meter are found non-operational then the emission reductions for that period will not be claimed.

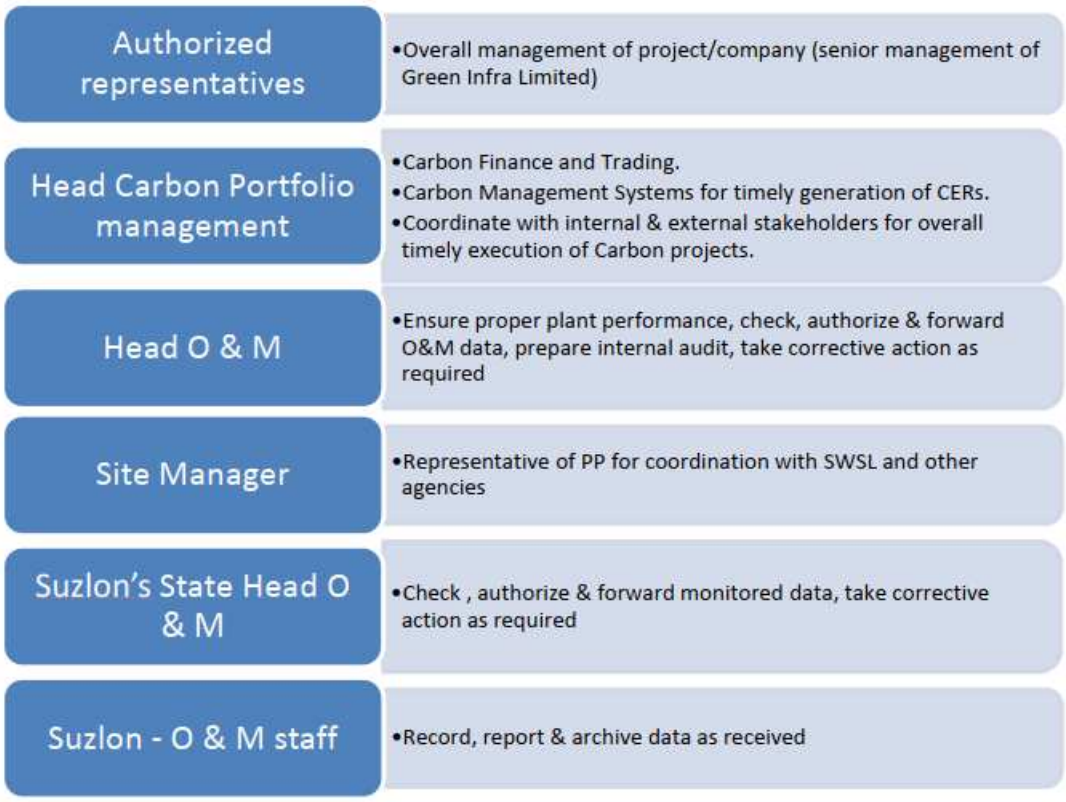
Following arrangement of metering is followed for all WTGs at the site –



Every month officials of the TNEB visit each metering point in the presence of site in-charge and the meter reading is recorded. All the monitoring data is stored/will be recorded and kept under safe custody. The period of storage will be 2 years after the end of crediting period or till the last issuance of CERs for the project activity whichever occurs later.

Relevant clauses of the wheeling agreement with TNEB shall be followed for metering purpose. All the energy meters are calibrated once in a year by TNEB (or any other third party) to assure the quality of the recorded data. A record of the calibration is also maintained.

The organisational structure for data reporting and management as proposed by the PP is as follows:



Training needs –

PP has employed third party for operation and maintenance of the project. This party is also responsible for monitoring and recording of data. The person will be given the proper training to maintain the plant records. However, proper training of CDM requirement compliance would be provided once the project is registered.

In case of miss-match in start date of billing cycle of monthly generation statement and start date of monitoring period, apportioning procedure should be follow for the conservative approach to calculate emission reductions. Apportioning procedure mentioned as follows.

Apportioning procedure:
Apportioning Procedures in case the dates of monitoring period do not match with billing cycle dates
The dates of the monitoring period for the project activity may not coincide with the dates of the genera tion statement issued by TANGEDCO. For instance the monitoring period may start on the 20th of the month whereas the generation statement may report the net electricity generation data from the first of the month to the first of the next month. In such a scenario, the net electricity supplied to the grid data would have to be apportioned.

For carrying out the apportioning procedures, WTG controller data (data recorded by the WTG controller software) would be utilized. The electricity generation from WTG controllers is recorded on a daily basis in the Power Generation Reports maintained by the O&M contractors. The data from Power Generation Reports would be referred for determination of the apportioning ratio.

The following steps will be applied to carry out the apportioning:
(i) Apportioning Ratio = (Generation at WTG controller for apportioning period) / (Generation at

WTG controller for period covered under generation statement)
(ii) Apportioned Electricity Export = Apportioning Ratio x Electricity Export as per Generation statement
(iii) Apportioned Electricity Import = Apportioning Ratio x Electricity Import as per Generation statement
(iv) Apportioned Net Electricity exported = Apportioned Electricity Export – Apportioned Electricity Import
Following electricity generation apportioning procedure will be followed, if the crediting period date of the project activity falls in-between the billing cycle of TNEB.
The option presented below will be adopted for arriving at the partial day's electricity generation of the month.

Based on average generation per day calculated from TNEB generation report for the month: Apportioned days of operation of month: A

Total days of operation of month: B
Generation as per TNEB generation report per month: C
Electricity generation for apportioned days as per TNEB Generation statement used for emission reduction calculations (MWh): (A/B) *C

Calculation of Net generation units:

The project activity includes the banking procedure of generated units from connected grid, due to banking of generated units in some period which consumes in consecutive financial year, because of this procedure banking charges, T&D losses and adjusted banking units to nullify and to get the conservative approach in calculation of year wise net generation.

Net generation calculates with the following formula for this project activity.

Net generation = (Gross generation – banking charges-T&D loss- energy sent to banked generation +energy taken from banked generation units)

Net generation will be used for emission reduction to get the conservative approach in accurate calculation of emission reductions.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>

22/02/2009, the purchase order date is considered as the start date of the project activity.

C.2. Expected operational lifetime of project activity

>>

20 years and 00 months (Technology supplier information)

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Fixed crediting period

C.3.2. Start date of crediting period

>>
15/11/2012

C.3.3. Duration of crediting period

>>
10 years 00 Months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
As per the Ministry of Environment and Forests (Government of India) notification the project activity does not fall under the purview of the Environmental Impact Assessment thus the project activity is exempted from the environmental clearances[18].

It should be noted here that EIA is not a regulatory requirement in India for wind energy projects. There are no negative environmental impacts that are envisaged due to the project activity. The following are the positive impacts due to the project activity.

- Impact on air and water: wind energy is renewable electricity generation; hence there would be no release of GHG into the atmosphere. Also as there is no fuel used for electricity generation, there aren't any effluents discharged into the water.

- Socio economic impact: The project activity helps the upliftment of skilled and unskilled manpower in the region. The project will be providing employment opportunity to not only during the construction phase, but also during its operational life time. The project activity improves employment rate and livelihood of local populace in the vicinity of the project. Moreover, the project generates eco-friendly, GHG free power, which contributes to sustainable development of the region.

D.2. Environmental impact assessment

>>
Not applicable. The Environmental Impacts are not considered significant by both project participants and the host party.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
The government of India, through Ministry of New and Renewable Energy (MNRE), has been promoting energy conservation, demand side management and renewable energy projects including wind, small hydro, hydro and biomass.

The Ministry of Environment & Forests is the Designated National Authority in India. The government of India, through Ministry of Environment and Forests (MoEF) is encouraging project participants to take up such climate change initiatives. In view of this, GIWFL plans to set up the 24 MW wind power project in the state of Tamil Nadu.

The following are the stakeholders identified by GIWFL

[18] http://envfor.nic.in/legis/eia/so1533.pdf

1. Government officials
a. The Executive Engineer, Agricultural Engineering Department, Tirunelveli
b. The Project Officer, District Rural Development Agency, Tirunelveli
c. The Block Development Officer, Manoor Panchayat Union, Manoor
d. The Technician(Biogas), District Rural Development Agency, Tirunelveli
e. The Head Master, Government High School, Rastha, Madhavakurchi
2. Local Gram Panchyat
a. The President, Madhavakurchi, Panchayat, Nanjankulam Post, Manoor Union
3. Local Community
a. Villagers
b. Women SHGs

GIWFL had communicated to the Government officials and Gram Panchayat through invitation letter dated 12/05/2009 sent by registered post about their plan to implement the proposed wind power project and the stakeholder consultation was conducted on 18/05/2009.

GIWFL through a Non Governmental Organization (NGO- Non-conventional Energy and Rural Development Society) had published an advertisement on 12/05/2009 in "Dinamalar", a Tamil daily, inviting local people for stakeholder consultation meeting. Apart from the invitation made through new papers and public notices, women Self Help Group (SHG) members and local people were invited in person one day prior to the meeting. A brief summary of the stakeholder comments is given in the next section.

E.2. Summary of comments received

>> Dr. S. Kamaraj, Professor in Bio-energy Tamil Nadu Agricultural University introduced the objectives of the stakeholder consultation meeting and delivered a brief on the CDM project cycle and the role of local stake holders in the project. He briefed the participants about the Kyoto Protocol and Clean Development mechanisms there in and elaborated the need for the project under this mechanism to catalyse sustainable development. He also outlined that the local stakeholders particularly the women Self Help Group members concerned are to be internalized in any project, elucidating the likely environmental and social impacts of the project, followed by the salient technical and environmental features of the project and the proposed Wind Power Project of 24 MW would reduce Green House Gas emission was also mentioned.
The participants were called to seek clarifications and express their concerns on the likely impacts of the project, and it being structured as Clean Development Mechanisms Project under Kyoto Protocol. Specific questions asked and the replies given are summarized in the table given below.

S.No	Stakeholder question / comments	Reply given
1	Does the project reduce the ground water table?	No. It will not affect the ground water table.
2	Whether wind mills cause soil erosion?	No. Because of the operation of wind mills, there will not be any increase in velocity of wind and no chance for soil erosion because of wind mills.
3	Does the project generate any waste materials including hazardous waste?	No. Since the wind mills operate with wind only, without any other input/feed material, there is no waste generation at all.
4	Does the project promote employment generation?	The project provides employment in Foundation work, fabrication work and operation of the system.
5	What is the role of Green Infra Wind Farms Limited in the Environmental Protection?	Green Infra Wind Farms Limited as a responsible business house has decided to reduce green house gases emission to the atmosphere and thereby protectthe environment by investing in Wind Power.
6	Any safety mechanism to be	No need since it is totally safe in and around the
	followed by the public near the	project site.

	wind mill project site.	
7	Does the project help to generate the electricity at lesser cost?	At present the peak demand is 10,500 MW and the normal demand is about 9000 MW whereas generation is 8500 MW in the state of Tamil Nadu. To overcome this present power shortage, the Tamil Nadu Electricity Board is purchasing from outside at the rate of more than Rs. 10/- per unit, whereas the Tamil Nadu Electricity Board is purchasing from wind mill owners at the rate of Rs. 3.39 per unit only.
8.	What type of health hazard may takes place near the project site?	Absolutely no health hazard will take place because of the operation of wind mills
9	What is the role of Green Infra Wind Farms Limited in providing additional employment for the nearby farm workers?	Green Infra Wind Farms Limited intends to develop the wind farms as model agricultural farms with horticultural and cash crops instead of rain-fed cultivation. This will help more employment opportunities for the farm labourers in the coming years.

During the question & answer session cum open forum discussion, Er. S. Chandran, Executive Engineer (Agricultural Engineering) of Agricultural Engineering Department, Government of Tamilnadu, Mr. Sundararajan, Biogas technician of District Rural Development Agency, Mrs. Kalai Arasi, President of Madhavakurchi Village Panchayat, expressed their views on the project and thanked GIWFL for the upcoming project.

Furthermore GIWFLs plan to share the CDM revenues for the development of the local community was welcome by one and all.

E.3. Consideration of comments received

>> In summing up, the project has not received any negative or discouraging feedback from the stakeholders. All the stakeholders have appreciated the measures taken by PP; they were also in favour of many such projects being developed in their region. As this has lead to various direct and indirect benefits socially and economically. All the stakeholders have entrusted their support for this project activity. The documents supporting the stakeholder consultation would be made available to DOE

SECTION F. Approval and authorization

>>
The approval letter from the host country DNA is available for project activity and having reference no 4/19/2009-CCC[19] dated 20/01/2010.

[19] chrome-https://cdm.unfccc.int/filestorage/u/y/65CB8SWM902K4VI1RP7A3UJXQHYLED.pdf/8046%20HCA.pdf?t=ckF8cmtpNnA0fDBtLugCr9YGDHHMpAcK_K_k

Appendix 1. Contact information of project participants

Organization name	Green Infra Wind Farms Limited
Country	India
Address	Push Vihar, Sector 5, Saket, NBCC Plaza, Tower 2, Second Floor -Delhi
Telephone	011 – 39190500
Fax	011 – 39190510
E-mail	sunil@greeninfralimited.in
Website	www.greeninfralimited.in
Contact person	Mr. Sunil Jain

Appendix 2. Affirmation regarding public funding

There is no public funding involved in this project activity.

Appendix 3. Applicability of methodologies and standardized baselines

Refer section B.2

Appendix 4. Further background information on ex ante calculation of emission reductions

This project uses fixed ex-ante combined margin emission factor calculations for southern region grid published by the CEA of India, following the approaches and rules defined in Tool to calculate emission factor for an electricity system (Version 02.2.1) EB 63, Annex 19. For details please refer –

https://cea.nic.in/cdm-co2-baseline-database/?lang=en

1. Baseline Carbon Dioxide Emission Database Version 4.0 – LATEST
2. User Guide – Version 4.0 – LATEST

This corresponds to the baseline database as on October 2008, Version 4.0.

Appendix 5. Further background information on monitoring plan

The detailed monitoring plan is as provided in Section B.7.3

Appendix 6. Summary report of comments received from local stakeholders

The details are provided in Section E

Appendix 7. Summary of post-registration changes

PRC Category:
Corrections –
For the post registration changes for this project activity for the project design document preparation latest version of PDD has been used. The following changes have been made due to latest version of template of PDD which is version 12.0.

1. A Table has been added before section A.1 for the basic information in the latest version of PDD template 12.0.
2. B.7.2 for sampling plan is now added in the revised template version 12.0 of PDD.
3. Section F is added for approval and authorization in the revised version 12.0 of PDD.

In Section A –subsection A.4.5 is extended to the subsection A.7 and from Section A.1 to A.7 are now interchanged with the headings and sequences of information, however respective section's details are same in new version of PDD version 12.0

Following correction has been made during the post registration changes for this project activity. And same corrections have reflected in the revised PDD.

1. Newne Grid, South Indian Grid or Regional Grid has been replaced with Unified Indian Grid.

2. In section A.1 of PDD Ministry of Environment, Forests & Climate Change (MoEF & CC) has been replaced with MOeFF (Ministry of Environment & Forests).

Parameters as per old PDD	**Parameters as per new PDD**	**Reason**
Newne Grid, South Indian Grid and Regional Grid mentioned in old PDD to indicate the grid scenario in india	Newne Grid, South Indian Grid and Regional Grid has been replaced with Unified Indian Grid	Newne Grid, South Indian Grid and Regional Grid has now changed with unified Indian grid
In section A.1 of PDD Ministry of Environment, Forests & Climate Change (MoEF & CC) ha mentioned	section A.1 of PDD Ministry of Environment, Forests & Climate Change (MoEF & CC) has been replaced with MOeFF (Ministry of Environment & Forests	MoE&F is now MOeFF & CC

Permanent Changes in monitoring plan

The following Permanent changes in Post Registration Changes have been made:

- In section B.7.3 apportioning procedure has been included for in case of miss match of start date of billing period and start date of monitoring period.
- In section B.7.3, formulation included for net generation to demonstrate the adjustment of previous units sent to banked generation, T&D losses, banking charges and energy taken from banked generation
- In Section B.7.1 in QA/ QC procedure changed as -In case of miss-match in start date of billing cycle of monthly generation statement and start date of monitoring period, apportioning procedure should be follow for the conservative approach to calculate emission reductions.

Parameters as per old PDD	Parameters as per new PDD	Reason
In Section B.7.1 in QA/ QC and In monitoring plan apportioning procedure not included for in case of miss match of start date of billing period and start date of	In Section B.7.1 in QA/ QC and In section B.7.3 apportioning procedure has been included for in case of miss match of start date of billing period and start date of	Procedure should be there to demonstrate conservative approach in case of miss match of start date of billing period and start date of monitoring period to get

monitoring period	monitoring period.	more accurate emission reduction calculation.
In section B.7.3 net generation is similar to gross generation as no procedure was considered to adjustment of banked units, T&D loss and banking charges	In section B.7.3, formulation included for net generation to demonstrate the adjustment of previous banked units, T&D losses and banking charges	For adjustment of previous banking units to get more accuracy in calculation of net generation to get conservative emission reduction.

Appendix 8. Technical specifications of WTGs

SI No	Particulars	Specification
	Rotor	
1	Rotor diameter	82 m
2	Hub height	78.5 m above ground level
3	Installed electrical output	1500 kW
4	Rotor swept area	5281 m^2
5	Rotational speed – G1	18.4 rpm
6	Rotational speed – G2	16.3 rpm
7	Regulation	Pitch
	Operational	
8	Cut-in speed	4 m/s
9	Operational speed	14 m/s
10	Cut-out speed	20 m/s
11	Survival wind speed	52.5 m/s
	Generator	
12	Type	Asynchronous
13	Rated output	1500 kW
14	Rotational speed – G1	1511 rpm
15	Rated voltage	690 V
16	Frequency	50 Hz
17	Insulation class	B
18	Cooling system	Air cooled IC 616
19	Vibration category	N
	Gear box	
20	Type	Planetary + Helical
21	Gear ratio	1:95.09
22	Type of cooling	Oil-Air cooled
	Yaw drive	
23	Yaw driving system	Electrical driving system
	Tower	
24	Type	Tubular
25	Hub Height	78.5 m
26	Corrosion Protection	Epoxy/PU coated
	Operating breaks	
27	Aerodynamic break	Independent pitch regulation
28	Electro-mechanical	Disk Brake Hyd. Controlled
29	Lightning protection	Receptor in the blade Tip
	Weight	
30	Tower	145.424 tonne
31	Nacelle	59.900 tonne
32	Rotor	11.691 tonne
33	Total Weight	217.015 tonne
	Design lifetime	
34	Project lifetime	20 years

Document information

Version	*Date*	*Description*
12.0	8 October 2021	Revision to: Improve consistency with version 03.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN).
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.

Version	*Date*	*Description*
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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