CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Shibeishan Wind Power Generation Project in Huilai County, Guangdong Province
Version: 4.0.
Date: 15/Aug/2008.

A.2. Description of the project activity:

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Shibeishan Wind Power Generation Project (hereafter referred as the proposed project) is a grid connected renewable energy project. The objective of the proposed project is to generate electricity using state-of-the-art wind power generation technology and to sell into China Southern Power Grid. The proposed project will achieve CO_2 emission reduction by replacing electricity supplied by fossil fuel fired power plant connected into China Southern Power Grid.

The proposed project is to be located in Huilai County, Guangdong Province, South China. Totally 167 wind turbines with a nominal capacity of 600 KW will be installed, providing a total capacity of 100.2MW. With an average annual 198.96GWh supplied to the power grid, the proposed project is estimated to deliver 177,333 tonnes CO_2 emission reduction annually.

Being as an environmentally sound energy supply technology, wind power is a priority development area in China. The contributions of the proposed project to sustainable development goal are summarized as follows:

- Being located in a power grid dominated by fossil fuel fired power plants; the development of the proposed project will not only reduce GHG emissions but also mitigate local environmental pollution caused by gas, water and solid waste emissions from fossil fuel power generation.
- The proposed project could be helpful to diversify power mix of China Southern Power Grid.
- The project site is located in Guangdong Province, where there is electricity supply tension. The implementation of the proposed project will provide new power supply to the local power grid, which is help to mitigate the situation.
- Wind power development is at beginning stage both in local area and China. The successful implementation of the proposed project will be serving as a demonstration for wider deployment of wind power technology in local and national level.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
China (host)	Guangdong Yudean Shibeishan Wind Power Development Co. Ltd	No
Japan	The Tokyo Electric Power Co., Inc.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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Jinghai Town, Huilai County, Jieyang City, Guangdong Province, China

A.4.1.1. Host Party (ies):

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China.

A.4.1.2. Region/State/Province etc.:

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Guangdong Province.

A.4.1.3. City/Town/Community etc:

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Jinghai Town, Huilai County, Jieyang City.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The proposed wind power project is located in Jinghai Town, Huilai County, Jieyang City, Guangdong Province, close to the Shibeishan Lighthouse. The proposed project site is originally non-agrarian wasteland, the foothill on the seashore of South Sea, 25km distance from the Huilai County Seat, as shown in Figure 1.

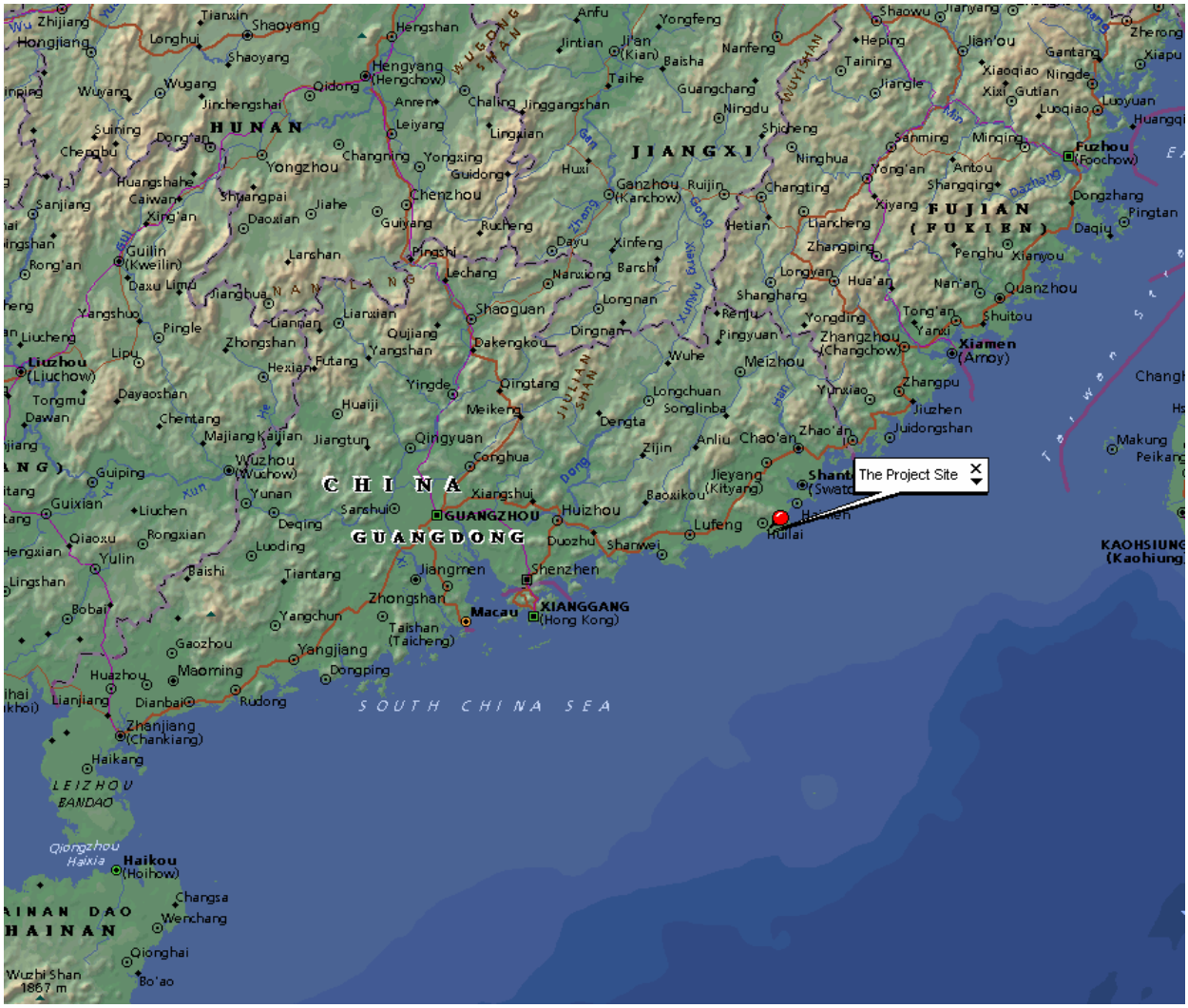

Figure 1. Location of the proposed project

A.4.2. Category(ies) of project activity:

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This category would fall within sectoral scope 1: energy industries.

A.4.3. Technology to be employed by the project activity:

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The total load of the proposed project will be 100.2MW, composed by 167 wind turbines with 600kW per unit. The type of the wind turbines is S43/600 produced by Xinjiang Gold Wind Technology Co. Ltd. The line spacing of the wind turbines is 240m, and the row spacing is 160m.

Two 110kV transformer stations will be constructed within the wind farm. Each turbine will have a 690V-to-10kV transformer, every 7 transformers are parallel-connected to the 10kV side of the 110kV transformer stations, and the transformer stations will be link to the local 220kV substation through two circles of 110kV lines.

The expected annual operation time of the wind power plant is 2000h, and there will be 198.96GWh power supply to the grid annually.

The development of the proposed project will contribute to promoting the application of 600kW wind technology, accelerating the accumulation of experiences and absorption of this kind of technology and advancement of domestic wind power technology.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

It is estimated that 1,241,331tCO_2e emission reductions will be generated during the first crediting period (2008-10-01~2015-9-30) of the proposed project, as shown in the following table. The detailed information on estimation of emission reduction will be presented in section B.6.

Years	Annual estimation of emission reductions in tonnes of CO2e
2008(1 Oct-31 Dec)	44,333
2009	177,333
2010	177,333
2011	177,333
2012	177,333
2013	177,333
2014	177,333
2015(1 Jan-30 Sep)	133,000
Total estimated reductions (tonnes of CO2e)	1,241,331
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO2e)	177,333

A.4.5. Public funding of the project activity:

No public funds from Annex I countries is involved in the proposed project.

SECTION B. Application of a baseline and monitoring methodology:

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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ACM0002 (version 6): Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources. More information about the methodology can be found on the website: http://cdm.unfccc.int/methodologies/approved .
Tool for the demonstration and assessment of additionality (Version 03)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

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The proposed project can meet the applicability criteria of the baseline and monitoring methodology (ACM0002), therefore, the methodology is applicable to the proposed project.

- The proposed project is a grid-connected zero-emission renewable power generation activity from wind source;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the proposed project site.
- The power grid (the China Southern Power Grid) which the proposed project is to be connected to is clearly identified and information on the characteristics of this grid is publicly available.
- The additionality of the proposed project can be verified using "Tools for the demonstration and assessment of additionality" requested by the baseline methodology ACM0002.

B.3. Description of how the sources and gases included in the project boundary:

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According to the methodology ACM0002, since the proposed project is a grid connected wind power project, only CO_2 emission from fossil fuels fired power plants in baseline scenario need to be considered.

	Source	Gas	Included?	Justification / Explanation
Baseline	Fossil fuels fired power plants	CO_2	Yes	Major emission sources
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	On-site fuel combustion to the project activity	CO_2	No	Excluded. It is a clean energy project.
		CH_4	No	Excluded. It is a clean energy project.
		N_2O	No	Excluded. It is a clean energy project.

According to the methodology (ACM0002), a project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. The proposed project is within the boundary of the China Southern Power Grid (excluding Hainan Power Grid), whose geographical range includes Guangdong Province, Guangxi Zhuang Autonomous Region, Yunnan Province, Guizhou Province, and several non-provincial power plants.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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To provide the same output or services comparable with the proposed CDM project activity, there would be the following alternatives:

a) No construction of the proposed project, and the regional power grid as the provider for the same electricity output as the proposed project.

b) The proposed project not undertaken as a CDM project activity.

c) Construction of a fossil fuel fired plant with the same capacity or annual electricity output as the proposed project.

d) Construction of another type of renewable energy power plant with the same capacity or annual electricity output as the proposed project.

The alternative b) is unrealistic because the investment analysis in section B.5. Step 2 will show that the proposed project without CER revenues is lack of the attraction for the potential investors.

The alternative c) is also unrealistic because the analysis in section B.5. Step 1b will show that this alternative does not comply with Chinese legal and regulatory requirement.

As to alternative d), among Chinese current renewable energy power generation technologies for choice are also unrealistic and should be eliminated from the following consideration. First, the hydro power is unrealistic because of the lack of exploitable hydro recourses in the proposed project. According to the feasible study report of the proposed project, Jinghai City, the proposed project site, is originally non-agrarian wasteland, the foothill on the seashore of South Sea. Therefore, around the site of the proposed project, there would be no hydro power resources.[1] Secondly, the technology of Solar PV has not been well developed. Meanwhile the solar resource is relatively limited[2] in the place where the proposed project located. Thirdly, there is no established biomass power plant with an installed capacity of 100MW in china, the same capacity as the proposed project. Otherwise the proposed project owner is only dedicated to wind power development in Guangdong Province, and has no experience and ability to develop other renewable energy power plant. Hence, the alternative d) is unrealistic too.

To summarize, the baseline scenario is concluded to be only alternative a), “No construction of the proposed project, and the regional power grid as the provider for the same electricity output as the proposed project”.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The Feasibility Study Report (FSR) for proposed project was completed in November 2003 and approved by NDRC in January 2004.

[1] http://www.agro-labs.ac.cn/21c/jpg/2-1-5.jpg

[2] http://cwera.cma.gov.cn/upload/b_3_left_02.jpg

Immediately the project owner had to seek the bank loan. During the pre-evaluation process of the loan application both the bank and project owner noticed that the project IRR would be lower than the estimation in the FSR due to the raising of turbines prices and construction materials directly resulting in the investment increase[3]. In February 2004, the project owner received "*Evaluation Report on Shibeishan Wind Farm*" by China Industrial and Commercial Bank Guangdong Branch, which was stated that applying for CDM project was one of the conditions the project owner should meet to be granted loans on the project. Then on 21 July 2004 the 1st Directorate decision was made to actively participate in CDM to make the project financially attractive[4].

From above, it has been demonstrated that the project owner had seriously considered CDM before the project construction permission was obtained on 20 August 2004 [5].

The following steps are used to demonstrate the additionality of the proposed project according to "Tools for the demonstration and assessment of additionality (Version 03)" agreed by Executive Board and requested by the baseline methodology (ACM0002).

Step1. Identification of alternatives to the project activity consistent with current laws and regulations.

Sub-step 1a. Define alternatives to the project activity.

As shown in Section B.4, to provide the same output or services comparable with the proposed CDM project activity, there would be the following alternatives:

a) No construction of the proposed project, and the regional power grid as the provider for the same electricity output as the proposed project.

b) The proposed project not undertaken as a CDM project activity.

c) Construction of a thermal power plant with the same capacity or annual electricity output as the proposed project.

d) Construction of another type of renewable energy power plant with the same capacity or annual electricity output as the proposed project.

The alternative b) is unrealistic because the investment analysis in Step 2 will show that the proposed project without CER revenues is lack of the attraction for the potential investors.

The alternative c) is also unrealistic because the analysis in Step 1b will show that this alternative does not comply with Chinese legal and regulatory requirement.

[3] The minutes for pre-evaluation of the bank loan, January 2004.

[4] The 1st Directorate decision document has been submitted to DOE.

[5] The notice of new start construction projects for the 8th & 9th group of 2004 issued by Guangdong province NDRC dated 20 August 2004 (Doc. No: [2004] 688#) .

As to alternative d), among Chinese current renewable energy power generation technologies for choice, are also unrealistic and should be eliminated from the following consideration. First, the hydro power is unrealistic because of the lack of exploitable hydro recourses in the proposed project. According to the feasible study report of the proposed project, Jinghai City, the proposed project site, is originally non-agrarian wasteland, the foothill on the seashore of South Sea. Therefore, around the site of the proposed project, there would be no hydro power resources.[6] Secondly, the technology of Solar PV has not been well developed. Meanwhile the solar resource is relatively limited[7] in the place where the proposed project located. Thirdly, there is no established biomass power plant with an installed capacity of 100MW in china, the same capacity as the proposed project. Otherwise the proposed project owner is only dedicated to wind power development in Guangdong Province, and has no experience and ability to develop other renewable energy power plant. Hence, the alternative d) is unrealistic too.

Step1b. Consistency with mandatory laws and regulations:

The applicable legal and regulatory requirement for the proposed project include laws, central government regulations, local regulations, departmental rules and disciplines related to electricity and environment protection.

The related laws and regulations can be found and downloaded on the website of State Electricity Regulatory Commission (SERC) and National Development and Reform Commission (NDRC): http://www.serc.gov.cn/opencms/export/serc/laws/index.html and http://nyj.ndrc.gov.cn .

Since the coal fired power plant operation hours are 2-3 times of wind farm operation hours, to provide the same output as the proposed project, the capacity of the above alternative c) will be less than 50MW, which will be categorized as the small scale coal power plant and should be shut down according to the regulations from NDRC (No.50 NDRC Bulletin of P.R.C). According to this regulation, the thermal power plants of under 50MW should be shut down and the construction of thermal power plant under 135MW will be prohibited within the grid connected area (On Prohibition of 135 MW and Smaller-scale Thermal Power Plants, General Office of State Council).

The project owner does not have obligations to construct a wind farm, and the alternative a) is realistic, credible alternative which is in compliance with all applicable legal and regulations, which is considered as the baseline scenario of the proposed project.
The following analysis shows that the major obstacles for the proposed project are its financial barriers and there are also some technical risks.

Step2. Investment analysis.

Sub-step 2a. Determine appropriate analysis method.

Three options can be applied for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.

The simple cost analysis is not applicable for the proposed project because the project activity will produce economic benefit (from electricity sale) other than CDM related income. The investment

[6]http://www.agro-labs.ac.cn/21c/jpg/2-1-5.jpg

[7] http://cwera.cma.gov.cn/upload/b_3_left_02.jpg

comparison analysis is also not applicable for the proposed project because the baseline scenario, "no construction of the proposed project, and the local power grid as the provider for the same electricity output as the proposed project", is not a project.
To conclude, the benchmark analysis will be used to identify whether the financial indicators (FIRR) of the proposed project is better than relevant benchmark value.

Sub-step 2b Apply benchmark analysis.

According to the *"Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects"*[8], a project will be financially acceptable when the Financial Internal Return Rate (FIRR) is better than the sectoral benchmark FIRR.

The sectoral benchmark FIRR on total investment for power industry is 8%.

The FIRR of the proposed project is calculated and compared as follows.

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

Table B.1 Main parameters for calculation of financial indicators[9]

Items	Unit	Amount	
Capacity	MW	100.2	
Total Investment (Total fixed asset investment)	Million Yuan	709.30	
Annually output	GWh/year	198.96	
Annually O&M costs	Million Yuan/year	10.77	
Electricity Tariff (including VAT)	Yuan/kWh	0.5013	Within 30000h operation hours
Electricity Tariff (including VAT)	Yuan/kWh	0.3038	After 30000h operation hours
Value Added Tax (VAT)	%	8.5	
Income tax	%	33	
Expected CERs Price	$/tCO$_2$	10	
Project operation life time	Year	23	
CERs crediting time	Year	10	

Note: The detail parameters needed for calculation of IRR and the calculation process of IRR for the proposed project are listed in Annex 5. The aforementioned parameters are taken from the project design report of Preliminary Design Report (PDR) and developed by the*" Modification of Financial Analysis on Shibeishan Wind Farm"*, which is a component of PDR. The PDR was developed by the Guangdong Electric Power Design Institute in July 2004, and approved by Guangdong Province Construction Bureau dated 30th July 2004[10].

[8] State Power Corporation of China. *"Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects"*. Beijing: China Electric Power Press, 2003.

[9] *"Modification of Financial Analysis on Shibeishan Wind Farm"*, Guangdong Electric Power Design Institute, July 2004.

[10] *The project preliminary design report and the approval letter by Guangdong Province Construction Bureau, Construction [2004] No. 306, dated 30 July 2004.*

The financial indicators (FIRR) with and without income from selling CERs are listed in Table B.2. Without income from selling CERs, the FIRR of the proposed project is lower than the benchmark FIRR and the proposed project is financially unacceptable because of its low profitability. While considering such income (assumption: 10US$/tCO$_2$), the financial acceptance will be changed, the FIRR of the proposed project is better than the benchmark then the proposed project is financially acceptable.

Table B.2 Comparison of financial indicators with and without income from CERs

	Without income from CERs	Benchmark	With income from CERs
FIRR (%)	7.05	8	8.23

As early as July 2004, the potential benefit of the CDM was considered by the project owner in a case study[11] and accordingly *"Modification of Financial Analysis on Shibeishan Wind Farm"*[12] to take the potential CDM revenue into account.

Sub-step 2d. Sensitivity analysis.

The objective of this sub step is to show the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

Three factors are considered in following sensitivity analysis:

1) Total investment.
2) Annual operation and maintenance cost.
3) Annual electricity output.

The tariff is not considered in the sensitivity analysis because the proposed project belongs to concession project, the price of which has already been fixed[13]. Assuming the above factors vary in the range of -10%-+10%, the FIRR of the proposed project (without income from selling CERs) varies to different extent, as shown in Figure 2.

[11] "*Case Study of Clean Development Mechanism Project of Shibeishan Wind Farm Project*", China Academy of Sciences Guangzhou Institute of Energy Conversion July 2004.
[12] "*Modification of Financial Analysis on Shibeishan Wind Farm"*, Guangdong Electric Power Design Institute, July 2004.

[13] The extract of *"Franchise Rights Agreement of Shibeishan Wind Farm Project"* has been submitted to DOE.

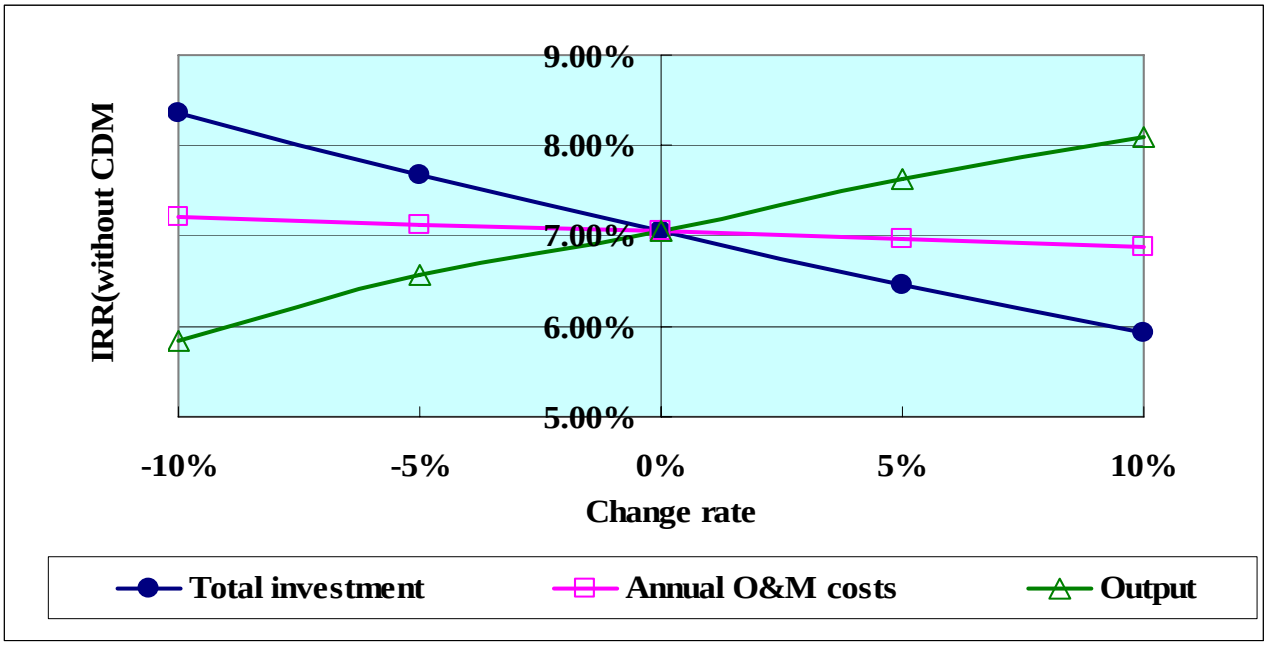

Figure 2 Sensitivity analysis of the proposed project

The change of total investment is one of the most important factors affecting the financial attractiveness of the proposed project. The impacts of the annual electricity output and annual operation and maintenance cost are less significant. In the case that the total investment decreases by about 10%, the FIRR of the proposed project will exceed the benchmark. However, considering the majority of total investment is due to wind turbine which had already been contracted[14]. It is very difficult to lower the total investment of the proposed project. Therefore, the proposed project is always lack of financial attractiveness within the reasonable range of total investment.

The change of electricity output is another important factor affecting the financial attractiveness of the proposed project. In the case that the annual electricity output increases by about 10%, the FIRR of the proposed project will exceed the benchmark. However, it would require the project annual operation hours raise significantly as much as 2200 hours, which is not realistic according to the actual operation data of two wind power projects(one is the propose project, the other is Huilai Haiwanshi Wind Farm that is near the propose project and has been come into operation in Year 2000[15]). From the "Certificate of main operation date for Guangdong Huilai Shibeishan Wind Farm Project"[16] that collects the main operation data from Sep 28, 2005 till now, it shows that the historical annual operation hours are less 1600h.According to the two years data, it could demonstrate that the annual operation hours were impossible reached 2200 hours. The other evidence, "Certificate of main operation date for Guangdong Huilai Haiwanshi Wind Farm Project"[17], showing that the historical annual operation hours are less

[14]The extract of "*Wind turbine purchase contract"* has been submitted to DOE.

[15] http://baike.baidu.com/view/94079.htm

[16] *"Certificate of main operation date for Guangdong Huilai Shibeishan Wind Farm Project"*, Guangdong Yudean Shibeishan Wind Power Development Co. Ltd, Oct, 2007 has been submitted to DOE.

[17] *"Certificate of main operation date for Guangdong Huilai Haiwanshi Wind Farm Project"*, Guangdong Wind Power Co.Ltd, Oct, 2007 has been submitted to DOE.

1800h, which also strongly demonstrates that in the area of propose project didn't reach 2200 hours according to the operation date from Year 2000 to Year 2006. Therefore, the proposed project is always lack of financial attractiveness within the reasonable range of electricity output.

The impact of the annual O&M cost is the slightest, the FIRR of the proposed project begins to exceed the benchmark when the annual O&M cost decreases by more than 10%. Therefore, the proposed project is always lack of financial attractiveness within the reasonable range of annual O&M cost.

To conclude, under the reasonable variations in the critical assumptions, the conclusion regarding the financial additionality is robust and supported by sensitivity analysis.

Step 3. Barrier analysis.

Sub-step 3a. Identify barriers that would prevent the implementation of the proposed CDM project activity:

Financing Barriers: Compared to commercialize fossil fuel power generation projects, wind power projects have the risks of high investment costs per unit and low financial return rates, which make it hard for the project owner to get loan from commercial banks. According to the analysis in Step 2, CDM would help to improve wind power projects' financial benefits and reduce the financial risks. China Industrial and Commercial Bank (CICB)[18] agreed to extend a loan to the project owner relying to a great extent on considering that the project risks would be partially compensated by the potential CER revenues.

Therefore, the proposed project faces great financing barriers and risks.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

As discussed in the above Steps, the only realistic and credible alternative is a) "no construction of the proposed project, and the local power grid as the provider for the same electricity output as the proposed project", in case of which the barriers mentioned above would not exist.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity:

The wind farms existing or under construction in China Southern Power Grid with installed capacity above 20 MW are listed in the following table:

Table 3 Wind farms with installed capacity above 20 MW in China Southern Power Grid

Wind farm	Owner	Installed Capacity

[18] *"Evaluation Report on Shibeishan Wind Farm"*, China Industrial and Commercial Bank Guangdong Branch, Feb, 2004.

Guangdong Honghaiwan Wind farm	Guangdong Jihua Wind Energy Co. Ltd.	20.4MW

Source: http://www.cwea.org.cn/upload/200612391640820.doc

Sub-step 4b. Discuss any similar options that are occurring:

Faced on the similar financial and technical barriers as the proposed project, the Guangdong Nanao Wind farm[19] and Guangdong Jiadong Wind farm[20] has already applied for CDM registration.

According to the Notice on Issuing Electric Power Sector Reform Programme by State Council on 10th February 2002[21], China began undertaking significant electric power sector reform including dividing the former single national power company into regional companies and separating generation and distribution responsibilities. This electric power sector reform has the following features:

Firstly, the State Power Grid Corporation and the China Southern Power Grid Corporation were established. The State Power Grid Corporation was responsible for establishing limited liability companies or corporations in five districts including North China, Northeast China, Northwest China, East China and Central China. The China Southern Power Grid Corporation was consisted of the grid assets of the former State Electric Power Corporation in Yunnan, Guizhou, Guangdong and Guangxi. According to the held grid assets ratio, ultimate controlling party was responsible for establishing the China Southern Power Grid Corporation. The electric power enterprises in Tibet were managed by the State Power Grid Corporation.

Secondly, the five main electricity generation groups were restructured. In the aspect of electricity generation, five electricity generation corporations were established including China Huaneng Corporation, China Datang Corporation, China Huadian Corporation, China Guodian Corporation, and China Electric Power Investment Corporation. In addition, four assisting corporations were established: China Electric Power Engineering & Consulting Corporation, China Hydropower Engineering & Consulting Corporation, China Hydropower Construction Corporation and China Gezhouba Corporation.

Thirdly, tariff competition policy has been shaped. The core content of this electric power sector reform was price competition, cost reduction and forming new electricity pricing system. The new pricing system designed by this electric power sector reform is, differentiating grid-in tariff, transmission/distribution tariff, and terminal sale tariff. The grid-in tariff was consisted of capacity price fixed by the state and electricity price from market competition price. For grid corporations still in operation/management monopoly status, their transmission/distribution pricing mechanism should be fixed by the government under strict efficiency principle, cost restriction and incentive policy, and their terminal sale price should be based on the above mentioned prices and the established grid-in electricity tariff linkage mechanism. If possible, electricity generation enterprises can supply electricity to big clients directly through negotiation, implement transmission/distribution price fixed by the state, and finally form relatively reasonable electricity sale price.

Fourthly, the State Electricity Regulatory Committee was established. According to the setting of vertical management system, it was necessary to dispatch delegate institution to regional grid corporation and electricity trade dispatching centre and encourage inner industry competition.

[19] http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1144397841.66/view

[20] http://cdm.unfccc.int/Projects/DB/BVQI1189424843.32/view

[21] http://www.lawon.cn/law/detail.dox?id=2211075

In conclusion, Guangdong Honghaiwan Wind farm project, which started its construction before 10th February 2002, has the essential difference and will be excluded from the similar projects

Therefore, the common practice analysis does not oppose but confirm the additionality of the proposed project.

As described above, the proposed project activity passed all criteria of "Tool for the demonstration and assessment of additionality". In conclusion, the proposed project is additional and not the baseline scenario.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

The calculation of the GHG emission reductions by the proposed project is followed the baseline methodology ACM0002 (Ver06). The project electricity system of the proposed project is defined as the China Southern Power Grid (exclude the Hainan Power Grid).

Firstly emission factors of Operating Margin ($EF_{OM,y}$) and Build Margin ($EF_{BM,y}$) were calculated. Then, the baseline emission factor (EF_y). All the calculation is in compliance with requirement of the baseline methodology ACM0002 (Ver06). The details are listed in the following steps.

Step 1: Calculation the Operating Margin emission factor ($EF_{OM,y}$)

According to The Methodology, four alternatives could be used to calculate the OM:
a) Simple OM
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

For the Project, the simple Operating Margin emission factor was chosen based on the following two reasons:
1. In China, the State Grid Corporation run the interregional dispatch system and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2. For the most recent 5 years (2000-2004), the low-cost/must run resources constitute less than 50% of total: 34.23%, 33.72%, 32.98%, 30.59% and 29.71% for 2000, 2001, 2002, 2003 and 2004 (the proportions are calculated by statistic data from China Electric Power Yearbook 2001, 2002, 2003, 2004 and 2005).

As a result, the simple OM method can be used.

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where $F_{i,j,y}$ is the amount of fuel *i* consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources *j* in years *y*,
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in years *y*, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*. In the China Electric Power Year Book and other data resources, only generation data is available. The generation from source *j* can be translated into electricity delivered to the grid by source *j* by the following formulation:

$$GEN_{j,y} = G_{j,y} \times (1 - e_{j,y}) \quad (2)$$

Where $G_{j,y}$ is the amount of generation (in MWh) by source *j* in year *y*; $e_{j,y}$ is the rate of plant self consumption of source *j* in year *y*.

The CO_2 emission coefficient of fuel type *i* $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i * 44/12 \quad (3)$$

Where:
NCV_i is the net calorific value per ton or m^3 of a fuel *i* (TJ/tce, TJ/m^3).
$OXID_i$ is the oxidation factor of the fuel *i*.
$EF_{CO2,i}$ is the Carbon emission factor per TJ of fuel type *i* (tC/TJ).

The Simple OM emission factor is calculated as electricity-to-the-grid weighted average in the China Southern Power Grid during the most recent 3-year (2002-2004), and will be fixed in the first crediting period. The detailed calculation data is in the Annex 3. The Operation Margin emission factor ($EF_{OM,y}$) of which the proposed project will serve is **0.9998tCO_2/MWh.**

Step2: Calculation the Build Margin emission factor ($EF_{BM,y}$)

The BM is calculated as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \quad (4)$$

Where

$F_{i,m,y}$ is the amount of fuel *i* (tce) consumed by plant *m* in year *y*.

$COEF_{i,m,y}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*.

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m*, equals to generation minus plant self consumption:

$$GEN_{m,y}=G_{m,y}\times(1-e_m), \quad (5)$$

Where,

$G_{m,y}$ is the electricity generation by plant *m* in year *y*;

e_m is the rate of plant self consumption.

There are two options for the calculation of the Build Margin emission factor $EF_{BM,y}$ in the ACM0002. Due to the data limitation, it is hard to acquire data at newly-built power plant level. Therefore, Option 1 is chosen for the proposed project: Calculate the $EF_{BM,y}$ *ex ante* based on the most recent information available on plants already built for sample *m* at the time of PDD submission. The sample group *m* consists of either

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

According to the latest CDM EB guideline, the BM calculation is as follows:

1. Since no data available at power plant level, the above samples are composed by the installed capacity increment by fuel type.

2. Find the starting year t_0 which meets the following in equation:

$$\sum_i CAP_{i,t-t_0} \geq 20\% \times \sum_i CAP_{i,t} \quad (6)$$

Where:
t is the most recent year in which data are available;
$CAP_{i,t-t0}$ is the installed capacity increment of fuel type i during the starting year t_0 to the current year t;
$CAP_{i,t}$ is the installed capacity of fuel type i in the current year t.

Based on the statistic data, the installed capacity increment in the China Southern Power Grid during 2002-2004 is 16.46GW, accounting for 20.97％ of the installed capacity in 2004. In addition, the installed capacity increment is obviously larger than the total installed capacity of 5 power plants. Therefore, it is feasible to calculate the Build Margin emission factor $EF_{BM,y}$ based on the data of the China Southern Power Grid during 2002-2004.

3. The emission factors of hydro power, nuclear power and other type of installed capacity increment are conservatively valued at 0. The emission factor of each thermal power type i (EF_i) is calculated by the following formula:

$$EF_i = 3.6/ EE_{i,adv} /1000* COEF_i \quad (7)$$

Where:
$EE_{i,adv}$ (%) is the electricity delivery efficiency of best technology commercially available by fuel type i; and

$COEF_i$ (tCO_2/MWh) is the CO_2 emission coefficient of fuel type *i*, and is obtained by the above Formula (3).

4. The Build Margin emission factor $EF_{BM,y}$ is the calculated as the proportions of different types of installed capacity increment in the total installed capacity increment multiplying the emission factor of the fuel type. The details are in Annex 3.

The Build Margin emission factor ($EF_{BM,y}$) of the China Southern Power Grid which the proposed project will serve is **0.5658** tCO_2/MWh.

Step3: Calculation the baseline emission factor (EF_y)

According to the baseline methodology (ACM0002), the baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$),:

$$EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y} \quad (7)$$

where the weights ω_{OM} and ω_{BM} are 0.75 and 0.25 by the default.

The baseline emission factor is: $EF_y = 0.75 * EF_{OM,y} + 0.25 * EF_{BM,y}$ = **0.8913tCO2/MWh**.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$F_{i,y}$
Data unit:	t/m^3
Description:	Amount of fuel *i* consumed in year(s) *y* for generation
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	$G_{i,y}$
Data unit:	MWh
Description:	The amount of generation (in MWh) by source *j* in year *y*.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.

Any comment:	

Data / Parameter:	$e_{i,y}$
Data unit:	%
Description:	The rate of plant self consumption of source *j* in year *y*.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed data by power plants are not publicly available, therefore the average data by fuel types are used instead.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/t(m^3)
Description:	Net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, the national specific value shall be used preferentially
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor of the fuel *i*
Source of data used:	IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of oxidation factors in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ
Description:	Carbon emission factor per unit of energy of the fuel *i*
Source of data used:	IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of fuel CO_2 emission factor in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$CAP_{i,t}$
Data unit:	MW
Description:	The installed capacity of fuel type i in the year t.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed data by power plants are not publicly available, therefore the average data by fuel types are used instead. Following the EB guidance regarding application of AM0005 in China, the capacity weighted is used instead of generation weighted in calculation of BM emission factor.
Any comment:	

Data / Parameter:	$CAP_{i,t0}$
Data unit:	MW
Description:	The installed capacity of fuel type i in the starting year t0.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed data by power plants are not publicly available, therefore the average data by fuel types are used instead. Following the EB guidance regarding application of AM0005 in China, the capacity weighted is used instead of generation weighted in calculation of BM emission factor.
Any comment:	

Data / Parameter:	$EE_{i,adv}$
Data unit:	%
Description:	The electricity delivery efficiency of best technology commercially available by fuel type i
Source of data used:	China DNA website: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to EB guidance, the efficiency level of the best technology commercially available in the provincial/regional or national grid of China can be used as a conservative proxy for each fuel type in estimating the fuel consumption to estimate the build margin (BM).
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

- Calculation of baseline emissions:

According to the descriptions and formulas in section B.6.1, the combined baseline emission factor of the China Southern Power Grid is: $\boldsymbol{EF_y}$**=0.8913tCO_2/MWh.**

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid will be: EG_y**=198,960MWh.**

The annual emissions of baseline scenario are: $BE_y=EG_y \times EF_y$**=177,333tCO_2.**

- Calculation of project emissions:

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e. PE_y=0.

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered, i.e. L_y=0.

Therefore, the proposed project activity emissions are zero, i.e. E.1+E.2=PE_y+L_y=0.

- Calculation of emission reductions:

The annual emission reductions of the proposed project during the first crediting period are estimated to be:

$ER_y=BE_y-PE_y= BE_y$ **=177,333tCO_2.**

B.6.4. Summary of the ex-ante estimation of emission reductions:

>>

Year	Estimation of Project activity Emission (tonnes of CO2e)	Estimation of baseline emission (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2e)	Estimation of Emission reductions (tonnes of CO2 e)
2008(1 Oct- 31 Dec)	0	44,333	0	44,333
2009	0	177,333	0	177,333
2010	0	177,333	0	177,333
2011	0	177,333	0	177,333
2012	0	177,333	0	177,333
2013		177,333	0	177,333
2014	0	177,333	0	177,333
2015(1 Jan- 30 Sep)	0	133,000	0	133,000
Total (t CO2e)	0	1,241,331	0	1,241,331

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Electricity delivered to the grid by the proposed project
Source of data to be used:	Electricity meter reading at project boundary
Value of data applied for the purpose of calculating expected emission reductions in section B.5	198,960

Description of measurement methods and procedures to be applied:	The readings of electricity meter will be hourly measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The electricity output from each turbine will be monitored and recorded at the on-site control centre using a computer system. The project operator is responsible for recording this set of data. Electricity sales invoices will also be obtained for double check.
Any comment:	Electricity supplied by the project activity to the grid. Double check by receipt of sales.

B.7.2. Description of the monitoring plan:

>>

a) the aim of the monitoring plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. To guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established.

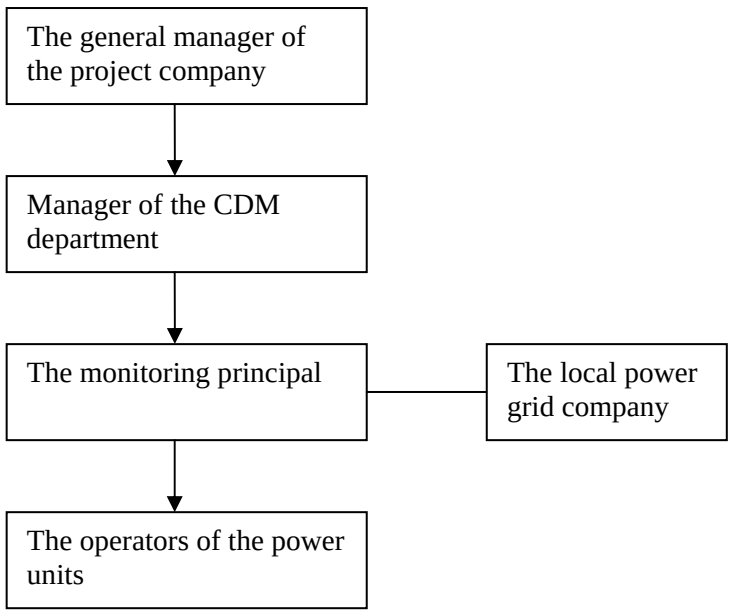
b) the data which needs to be monitored

i. The baseline emission factor: fixed on ex-ante calculation and need not to be monitored every year.

ii. The electricity output to the power grid: ex-post monitoring by year.

c) the organizational structure of monitoring

The monitoring plan will be executed and implemented by the monitoring principal who is appointed by the project owner. The local power grid company should cooperate in the check of data. The organizational structure is as the following figure:



The monitoring principal will arrange the turbine operators to collect and pack up the data, and be responsible for contact with the local power grid company to double check the data.

d) Installation and calibration of the monitoring equipments

The monitoring equipments in this monitoring plan are equipments to measure the electricity output to the grid, such as the pass ammeter. These equipments should be automatic systems complying with the national standards and technical requirements. The pass ammeter should meet the standard of national I type measurement reaching 0.5S of the precision and the license of Grid-connected Electric Equipments of Guangdong Province. The ammeters are produced by Hunan Weisheng Company and Shenzhen Kelu Electrical Company. The project site will install two series of measurement and monitoring equipments, one as the main equipment and the other as standby.

The institute authorized by Electric Science Institute of Guangdong Province Power Grid Company will calibrate the equipments after its installation and put seals on the surface of the equipments. Afterwards, Guangdong Province Electric Science Institute will do on-site calibration of the monitoring equipments every year. Guangdong Province Electric Science Institute has the Certificate issued by General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China.

e) Collection, packing up and storage of the data

The automatic measurement system will automatically read, transmit and copy all the data which are the original data for monitoring. The monitoring principal will arrange the unit operators to collect the electricity data monthly. At the end of each month, the monitoring data measured in the whole month will be copied into a CD and also printed out. The monitoring principal also needs to save the copies of electricity sales slip which the project owner provides for the power grid and the balance receipts which the local power grid provides for the project owner in order to check the data. The final electricity connected to the grid should be added and gathered each year. The electrical and paper documents of data should be kept in the whole crediting period and two years after of the crediting period.

The management manual and procedures for training and maintenance have been completed and will be submitted before the register of the proposed CDM project.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

The baseline study of the proposed project was completed on 1 September, 2006 by Global Climate Change Institute (GCCI) of Tsinghua University.

The persons involved in baseline study are listed as follows:

Dr. Xiaohua ZHANG, Global Climate Change Institute, Tsinghua University.
Address: Room C501, Energy Science Building, Tsinghua University, 100084, Beijing, China
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Ms. Qing TONG, Global Climate Change Institute, Tsinghua University.
Address: Room C501, Energy Science Building, Tsinghua University, 100084, Beijing, China

Telephone: +8610-62772753
Email: tongqing@tsinghua.org.cn
(Not the project participants listed in Annex 1)

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
20/Aug/2004 (Construction Permit Day)

C.1.2. Expected operational lifetime of the project activity:

>>
23 years.

C.2. Choice of the crediting period and related information:

>>

C.2.1. Renewable crediting period

>>

C.2.1.1. Starting date of the first crediting period:

>>
01/ October /2008.

C.2.1.2. Length of the first crediting period:

>>
7 years.

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

The Environmental Assessment Report of the proposed project was completed by South China Institute of Environmental Sciences.SEPA in July, 2006.

The waste water released during the construction period will be mainly living waste water which will be treated and released to meet the environmental standards. The impacts on the sound environment and air quality are short-term during the construction period. After the completion of the construction, the impacts will disappear naturally, and will not have large effect on the local environment.

The electromagnetism of wind power plant operation will be relatively low, and will have little impact on the neighbourhood environment. There will be no air pollutant emissions during the operation period of the proposed project. There will be a little amount of living waste water released during the operation period of the proposed project, which will be treated and released to meet the environmental standards. The noise source during the operation period of the proposed project will be mainly from the running of the wind power unit. The noise level will meet the environmental standards. The location of the proposed project is far from nature reserves and residents. The communications and bird migration will not be interfered.

In conclusion, being as a typical type of clean renewable energy, the proposed project has no significant impacts on local environment and will greatly contribute to achievement of sustainable development objective and promote local environmental protection.

The Environmental Assessment Report of the proposed project has been approved by the Environmental Protection Agency of Jieyang City[22] on August 8, 2006.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

Not applicable, since the construction and operation of the proposed project have no significant environmental impacts.

[22] http://www.sepa.gov.cn/download/1062452688406.xls;
http://www.china5e.com/news/huanbao/200310/200310230055.html;

SECTION E. Stakeholders' comments

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E.1. Brief description how comments by local stakeholders have been invited and compiled:

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- Source of local government comments: The Certificate of the Land Use by Huilai Shibeishan 100MW Wind Farm approved by the People's Government of Huilai County.
- Source of local environmental protection department comments: The Environmental Protection Comments approved by the Environmental Protection Bureau of Huilai County.
- Source of local public comments: On 01 Sep 2004, the project owner held a public comment meeting in the meeting room of Green Delta Vacation Hotel in Huilai County. Before the meeting, the county government help the project owner to inform and invite local residents to attend the meeting. After being acknowledged the meeting information, totally 16 public representatives attended the meeting, 8 from Jinghai Town of Huilai County, and the other 8 from Qianzhan Town of Huilai County.

E.2. Summary of the comments received:

>>

No opposite comment was received. The summary of the comments is as follows:

Comments from the local government: According to the regulations for the portfolio agreements, approve the land in Shibeishan and the surrounding 16km^2 for the construction of the proposed wind farm.

Comments from the local environmental protection department: The proposed project is located in foothill areas, there are few residents, and the wind energy is clean energy which will have little impacts on the local environment. Approve the construction of the proposed project.

Comments from villager representatives: The construction of the proposed wind farm will help to improve the local transportation condition and raise the fame of Huilai County. The villagers expect that the economic compensation standard could be reasonably raised, the local career opportunity could be enlarged, and some local welfare could be subsidized.

E.3. Report on how due account was taken of any comments received:

Since there is no negative comment received, it's no need to make adjustment on design, construction and operation of the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Guangdong Yudean Shibeishan Wind Power Development Co. Ltd
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in the proposed project.

Annex 3

BASELINE INFORMATION

Table 1. Data of the China Southern Power Grid in 2002

	Installed capacity (10^4kW)					Power generation (10^8kWh)					Thermal power plant self use rate (%)
	Total	Hydro power	Thermal power	Nuclear power	Other	Total	Hydro power	Thermal power	Nuclear power	Other	
Total	6168.02	2292.1	3596.92	279	0	2892.75	830.93	1851.68	208.77	0	--
Guangdong	3587.99	777.53	2523.78	279		1610.08	169.13	1230.81	208.77		5.58
Guangxi	751.95	436.33	315.62			317.03	186.34	130.69			8.31
Guizhou	706.86	242.61	464.25			427.43	95.12	332.31			7.9
Yunnan	876.91	583.63	293.27			408.49	250.62	157.87			8.21

Source: China Electric Power Yearbook 2003, China Electric Power Press, 2003

Table 2. Data of the China Southern Power Grid in 2003

	Installed capacity (10^4kW)					Power generation (10^8kWh)					Thermal power plant self use rate (%)
	Total	Hydro power	Thermal power	Nuclear power	Other	Total	Hydro power	Thermal power	Nuclear power	Other	
Total	6971.68	2540.93	4044.41	378	8.34	3351.4	832.71	2227.8	289.3	1.59	--
Guangdong	3920.2	810.72	2723.14	378	8.34	1895.77	171.36	1433.51	289.3	1.59	5.5
Guangxi	771.53	452.52	319.01			363.67	192.88	170.79			8.43
Guizhou	1017.95	371.37	646.58			513.14	80.19	432.95			7.4
Yunnan	1010	654.32	355.68			458.91	268.37	190.55			8.01

Source: China Electric Power Yearbook 2004, China Electric Power Press, 2004

Table 3. Data of the China Southern Power Grid in 2004

	Installed capacity (10^4kW)					Power generation (10^8kWh)					Thermal power plant self use rate (%)
	Sum	Hydro power	Thermal power	Nuclear power	Other	Sum	Hydro power	Thermal power	Nuclear power	Other	
Sum	7814.39	2762.08	4665.97	378	8.34	3762.77	840.72	2635.74	284.81	1.49	--
Guangdong	4262.1	858.46	3017.29	378	8.34	2121.33	141.13	1693.89	284.81	1.49	5.42
Guangxi	941.5	504.04	437.81			373.72	172.29	201.43			8.33
Guizhou	1221.9	441.72	780.18			629.24	132.04	497.2			7.06
Yunnan	1136.55	705.86	430.69			536.72	293.5	243.22			7.56

Source: China Electric Power Yearbook 2005, China Electric Power Press, 2005

1. Calculating the simple OM emission factor of the China Southern Power Grid:

Table 4. Calculate the OM of China Southern Power Grid in 2002

Fuel Type	Unit	NCV	Unit for NCV	EF (tCO_2/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G)*A*B*C
Raw Coal	Mt	20908	MJ/t	94.6	1	41.2106	7.1135	14.3068	11.4439	146512309.88
Clean Coal	Mt	26344	MJ/t	94.6	1					0.00
Other washed	Mt	8363	MJ/t	94.6	1			0.3526	0.1358	386392.68
Coke	Mt	28435	MJ/t	107	1				0.0644	195939.90
Crude Oil	Mt	41816	MJ/t	73.3	1	0.058				177776.54
Gasoline	Mt	43070	MJ/t	69.3	1	0.0001				298.48
Diesel	Mt	42652	MJ/t	74.1	1	0.7307	0.0067		0.005	2346365.00
Fuel Oil	Mt	41816	MJ/t	77.4	1	7.0141	0.002			22708017.39
LPG	Mt	50179	MJ/t	63.1	1	0.0009				2849.67
Refinery Gas	Mt	46055	MJ/t	57.6	1	0.0142				37669.31
Other petroleum products	Mt	41816	MJ/t	73.3	1	0.0791				242450.42

Natural Gas	Mm^3	38931	kJ/m^3	56.1	1					0.00
Coke Oven Gas	Mm^3	17354	kJ/m^3	44.4	1					0.00
Other Coal Gas	Mm^3	5227	kJ/m^3	44.4	1	0.63				146209.64
Total		***a***								**172756278.91**
Generation	GWh	***b***				123081	13069	32559	16396	185105
Self Consumption rate		***c***				5.58%	8.31%	7.90%	8.21%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				116213	11983	29987	15050	173233
The Calculation of OM: ***a*** : The total emissions of SCPG: **172756278.91 tCO_2** ***d***: The electricity delivered to SCPG by thermal power plants: 173233 **GWh** **OM=a/d*10^{-3}=0.9972**										
Data Sources: China Energy Statistical Yearbook 2000-2002, China Statistics Press, 2003. China Electric Power Yearbook 2003, China Electric Power Press, 2003 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.										

Table 5. Calculate the OM of China Southern Power Grid in 2003

Fuel Type	Unit	NCV	Unit for NCV	EF (tCO_2/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G) *A*B*C
Raw Coal	Mt	20908	MJ/t	94.6	1	44.9179	8.3184	21.6911	14.0527	175993455.05
Clean Coal	Mt	26344	MJ/t	94.6	1	0.0005				1246.07
Other washed	Mt	8363	MJ/t	94.6	1			0.3638	0.2037	448971.84
Coke	Mt	28435	MJ/t	107	1				0.005	15212.73
Crude Oil	Mt	41816	MJ/t	73.3	1	0.0685				209960.23
Gasoline	Mt	43070	MJ/t	69.3	1	0.0002				596.95
Diesel	Mt	42652	MJ/t	74.1	1	0.319			0.0076	1032223.61
Fuel Oil	Mt	41816	MJ/t	77.4	1	6.2722	0.003			20310051.27

LPG	Mt	50179	MJ/t	63.1	1					0.00
Refinery Gas	Mt	46055	MJ/t	57.6	1	0.0285				75603.89
Other petroleum products	Mt	41816	MJ/t	73.3	1	0.1135				347890.30
Natural Gas	Mm^3	38931	kJ/m^3	56.1	1					0.00
Coke Oven Gas	Mm^3	17354	kJ/m^3	44.4	1				0.004	3082.07
Other Coal Gas	Mm^3	16970	kJ/m^3	44.4	1	0.321			1.127	1091021.66
Total		***a***								**199529315.67**
Generation	GWh	***b***				141738	17028	43273	19390	221429
Self Consumption rate		***c***				5.50%	8.43%	7.40%	8.01%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				133942	15593	40071	17837	207443
The Calculation of OM: ***a*** : The total emissions of SCPG: **199529315.67 tCO_2** ***d***: The electricity delivered to SCPG by thermal power plants: 207443 **GWh** **OM=a/d*10^{-3}=0.9619**										
Data Sources: China Energy Statistical Yearbook 2004, China Statistics Press, 2005. China Electric Power Yearbook 2004, China Electric Power Press, 2004 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.										

Table 6. Calculate the OM of China Southern Power Grid in 2004

Fuel Type	Unit	NCV	Unit for NCV	EF (tCO_2/TJ)	OXID	Guangdong	Guangxi	Guizhou	Yunnan	CO2 Emission
		A		B	C	D	E	F	G	J=(D+E+F+G)*A*B*C
Raw Coal	Mt	20908	MJ/t	94.6	1	60.1770	13.05	26.4392	17.5128	231767969.13
Clean Coal	Mt	26344	MJ/t	94.6	1	0.0021				5233.50
Other washed	Mt	8363	MJ/t	94.6	1					0.00
Coke	Mt	28435	MJ/t	107	1					0.00

Crude Oil	Mt	41816	MJ/t	73.3	1	0.1689				517697.55
Gasoline	Mt	43070	MJ/t	69.3	1					0.00
Diesel	Mt	42652	MJ/t	74.1	1	0.4888			0.0183	1602696.24
Fuel Oil	Mt	41816	MJ/t	77.4	1	9.5771				30996843.45
LPG	Mt	50179	MJ/t	63.1	1					0.00
Refinery Gas	Mt	46055	MJ/t	57.6	1	0.286				758691.65
Other petroleum products	Mt	41816	MJ/t	73.3	1	0.166				508808.72
Natural Gas	Mm^3	38931	kJ/m^3	56.1	1	0.048				104833.40
Coke Oven Gas	Mm^3	17354	kJ/m^3	44.4	1					0.00
Other Coal Gas	Mm^3	16970	kJ/m^3	44.4	1	0.258				194394.74
Total		***a***								**266457168.38**
Generation	GWh	***b***				169300	20143	49679	24322	263444
Self Consumption rate		***c***				5.42%	8.33%	7.06%	7.56%	
Electricity delivered to Grid	GWh	***d=b*(1-c)***				160124	18465	46172	22483	247244

The Calculation of OM:
a : The total emissions of SCPG: **266457168.38 tCO_2**
d: The electricity delivered to SCPG by thermal power plants: 247244 **GWh**
$OM=a/d*10^{-3}=1.0777$

Data Sources:
China Energy Statistical Yearbook 2004, China Statistics Press, 2006.
China Electric Power Yearbook 2005, China Electric Power Press, 2005
2006 IPCC Guidelines for National Greenhouse Gas Inventories: Volume 2 Energy.

Table 7. Calculate the Simple OM (3 year generation weighted average)

	Year 2002	Year 2003	Year 2004	Sum
Emissions inside SCPG (tCO_2)	172756278.91	199529315.67	266457168.38	--
Emissions from Mid China Power Grid (tCO_2)	0	0	0	--
Electricity delivered inside SCPG (GWh)	173233	207443	247244	--
Electricity delivered by Mid China Power Grid (GWh)	0	11	10951	--

Total emissions (tCO_2)	172756278.91	199529315.67	266457168.38	638742762.96
Total electricity delivered (GWh)		207454	258195	638882
$EF_{OM,y}$ (tCO_2/MWh)	--	--	--	0.9998

2. Calculating the BM emission factor of the China Southern Power Grid:

Table 11. Installed Capacity of the China Southern Power Grid in 2004

	Guangdong	Guangxi	Yunnan	Guizhou	Total
	A	B	C	D	G=A+B+C+D
Coal-fired Capacity (MW)	18625	4378.1	4306.9	7801.8	35111.8
Oil-fired Capacity (MW)	11427	0	0	0	11427
Hydro Capacity (MW)	8584.6	7560.4	7058.6	4417.2	27620.8
Nuclear Capacity (MW)	3780	0	0	0	3780
Other Capacity (MW)	204.3				204.3
Total Capacity (MW)	42620.9	11938.5	11365.5	12219	78143.9

Sources: China Electric Power Yearbook 2005, China Electric Power Press, 2005

Table 12. Installed Capacity and generation of the China Southern Power Grid in 2003

	Guangdong	Guangxi	Yunnan	Guizhou	Total
	A	B	C	D	G=A+B+C+D
Coal-fired Capacity (MW)	17057.8	3184.7	3556.8	6465.8	30265.1
Oil-fired Capacity (MW)	10162.7	5.4	0	0	10168.1
Hydro Capacity (MW)	5707.2	4525.2	6543.2	3713.7	20489.3
Nuclear Capacity (MW)	3780	0	0	0	3780
Other Capacity (MW)	94.4				94.4
Total Capacity (MW)	36802.1	7715.3	10100	10179.5	64796.9

Sources: China Electric Power Yearbook 2004, China Electric Power Press, 2004

Table 13. Installed Capacity and generation of the China Southern Power Grid in 2002

	Guangdong	Guangxi	Yunnan	Guizhou	Total
	A	B	C	D	G=A+B+C+D
Coal-fired Capacity (MW)	15603.8	3156.2	4642.5	2932.7	26335.2
Oil-fired Capacity (MW)	9634	0	0	0	9634
Hydro Capacity (MW)	7775.3	4363.3	2426.1	5836.4	20401.1
Nuclear Capacity (MW)	2790	0	0	0	2790
Other Capacity (MW)	76.8				76.8
Total Capacity (MW)	35879.9	7519.5	7068.6	8769.1	59237.1

Sources: 1. China Electric Power Yearbook 2003, China Electric Power Press, 2003
2. http://disclosure.szse.cn/main/finalpage/2003-11-25/13089606.PDF

Table 14. Calculation of BM in the China Southern Power Grid

	Installed Capacity in year 2002 (MW)	Installed Capacity in year 2003 (MW)	Installed Capacity in year 2004 (MW)	Newly added capacity from 2002-2004 (**Build Margin**) (MW)	Weight of different generation technology
	A	B	C	D=C-A	
Coal-fired Capacity	26335.2	30265.1	35111.8	8776.6	53.56%
Oil-fired Capacity	9634	10168.1	11427	1793	10.94%
Gas-fired Capacity	0	0	0	0	0%
Hydro Capacity	22921	25409.3	27620.8	4699.8	28.68%
Nuclear Capacity	2790	3780	3780	990	6.04%
Other Capacity	76.8	94.4	204.3	127.5	0.78%
Total Capacity	61757.1	69716.9	78144	16386.9	100%
Percentage as installed capacity in 2004	79.03%	89.22%	100%		

Table 15. Calculation of BM emission factor in the China Southern Power Grid

	Electricity supply efficiency	Fuel emission factor (tc/TJ)	OXID	Emission Factor of electricity supply (tCO_2/MWh)	Weight	Weighed emission factor (tCO_2/MWh)
	A	B	C	D=3.6/A/1000*B*C*44/12	E	F=D*E
Coal-fired Capacity	36.53%	25.8	1	0.9323	53.56%	0.4993
Oil-fired Capacity	45.87%	21.1	1	0.6072	10.94%	0.0664
Gas-fired Capacity	45.87%	15.3	1	0.4403	0%	0
Hydro Capacity	--	0	--	0	28.68%	0
Nuclear Capacity	--	0	--	0	6.04%	0
Other Capacity	--	0	--	0	0.78%	0
Sum (EF_{BM})	--	--	--	--	100%	0.5658

Source: 2006 IPCC guidelines for National GHG Inventories Vol 2 Energy.
Chinese DNA, see also http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf .

Annex 4

MONITORING INFORMATION

No other information.

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Annex 5

IRR CALCULATION INFORMATION

The followings are the parameters needed for calculation of IRR and the calculation process of IRR for the proposed project. The aforementioned parameters are taken from the project design report of Preliminary Design Report (PDR) developed by the*" Modification of Financial Analysis on Shibeishan Wind Farm"*, which is a component of PDR. The PDR was developed by the Guangdong Electric Power Design Institute in July 2004.The calculation process of IRR for the proposed project is according to the "Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects" issued by State Power Corporation.

Basic data table

No.	Item	Unit	Figure	Note
1	Installed capacity	MW	100	The Modification of Financial Analysis on Shibeishan Wind Farm P2
2	Annual output	10000MWh	19.896	The Modification of Financial Analysis on Shibeishan Wind Farm P2
3	Electricity tariff(excluding VAT)	Yuan/ kWh	0.462	The Modification of Financial Analysis on Shibeishan Wind Farm P4
4	Static total investment	10000Yuan	70930	The Modification of Financial Analysis on Shibeishan Wind Farm P4
5	Liquid capital	10000Yuan	27	The Modification of Financial Analysis on Shibeishan Wind Farm P4
6	Construction period	Year	2	The Modification of Financial Analysis on Shibeishan Wind Farm P2
7	Operation time	Year	23	The Modification of Financial Analysis on Shibeishan Wind Farm P3
8	Depreciable life of fixed assets	Year	13	The Modification of Financial Analysis on Shibeishan Wind Farm P2

9	Amortization period of other assets	Year	15	The Modification of Financial Analysis on Shibeishan Wind Farm P2
10	fixed assets maintenance	10000Yuan/per Year	200	The Modification of Financial Analysis on Shibeishan Wind Farm P2
11	insurance premium of fixed assets	10000Yuan/per Year	110	The Modification of Financial Analysis on Shibeishan Wind Farm P2
12	Withholding fixed assets maintenance	10000Yuan/per Year	238	The Modification of Financial Analysis on Shibeishan Wind Farm P2
13	Employee population	Person	50	The Modification of Financial Analysis on Shibeishan Wind Farm P2
14	Annual salary per capita	10000Yuan	4.7	The Modification of Financial Analysis on Shibeishan Wind Farm P2
15	Rate of welfarism	%	50	The Modification of Financial Analysis on Shibeishan Wind Farm P2
16	Other costs	10000Yuan/per Year	76	The Modification of Financial Analysis on Shibeishan Wind Farm P2
17	Rate of VAT	%	8.5	The Modification of Financial Analysis on Shibeishan Wind Farm P2
18	Rate of city construction tax	%	5	The Modification of Financial Analysis on Shibeishan Wind Farm P2
19	Rate of additional education fee	%	3	The Modification of Financial Analysis on Shibeishan Wind Farm P3
20	Rate of income tax	%	33	The Modification of Financial Analysis on Shibeishan Wind Farm P2
21	Public welfare fund	%	5	The Modification of Financial Analysis on Shibeishan

				Wind Farm P3
22	Legal common reserve fund	%	10	The Modification of Financial Analysis on Shibeishan Wind Farm P3
23	CERs	Ton	175000	The Modification of Financial Analysis on Shibeishan Wind Farm P3
24	CERs Unit price	USD/Ton	10	The Modification of Financial Analysis on Shibeishan Wind Farm P3
25	Exchange rate	USD/RMB	8.28	The Modification of Financial Analysis on Shibeishan Wind Farm P3
26	CERs income(incl.VAT)	10000Yuan	1449	The Modification of Financial Analysis on Shibeishan Wind Farm P4

The below Cash Flow Table (total investment) is from the “Modification of Financial Analysis on Shibeishan Wind Farm”, Guangdong Electric Power Design Institute, July 2004, and IRR of the proposed project is 7.05% in the “Modification of Financial Analysis on Shibeishan Wind Farm”.

Cash Flow Table (total investment)

Unit: 10000 Yuan RMB

No	Item	Aggregate	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Cash inflow	177520			919	9190	9190	9190	9190	9190	9190	9190
1.1	Sales revenue	177385			919	9190	9190	9190	9190	9190	9190	9190
1.2	Fixed assets residual value											
1.3	Recovered liquid capital	135										
2	Cash outflow	113918	15966	42766	12761	1137	1137	1137	1137	1137	1137	1137
2.1	Construction investment	70930	15966	42700	12264							
2.2	Liquid capital	135		66	69							
2.3	Operating cost	24112			423	1077	1077	1077	1077	1077	1077	1077
2.4	Sales tax & extra charges	1148			6	60	60	60	60	60	60	60
2.5	Income tax	17593										
2.6	Public welfare fund											
3	Net cash flow without CERs income	63602	-15966	-42766	-11842	8053	8053	8053	8053	8053	8053	8053
4	Net cash flow with CERs income	73830	-15966	-42766	-11842	8053	9502	9502	9502	9142	9030	8931

No	Item	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
1	Cash inflow	9190	9190	9190	9190	9190	9190	9190	8828	5569	5569	5569
1.1	Sales revenue	9190	9190	9190	9190	9190	9190	9190	8828	5569	5569	5569
1.2	Fixed assets residual value											
1.3	Recovered liquid capital											
2	Cash outflow	1197	1294	1401	1518	1644	1972	3706	3666	2581	2581	2581
2.1	Construction investment											
2.2	Liquid capital											
2.3	Operating cost	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077	1077
2.4	Sales tax & extra charges	60	60	60	60	60	60	60	57	35	35	35
2.5	Income tax	60	158	264	381	508	836	2570	2532	1469	1469	1469
2.6	Public welfare fund											
3	Net cash flow without CERs income	7993	7895	7789	7672	7545	7218	5483	5162	2988	2988	2988
4	Net cash flow with CERs income	8823	8707	8603	8495	7411	7102	5397	5156	2988	2988	2988

No	Item	2025	2026	2027	2028
1	Cash inflow	5569	5569	5569	5704
1.1	Sales revenue	5569	5569	5569	5569
1.2	Fixed assets residual value				
1.3	Recovered liquid capital				135
2	Cash outflow	2581	2581	2581	2583
2.1	Construction investment				
2.2	Liquid capital				
2.3	Operating cost	1077	1077	1077	1077
2.4	Sales tax & extra charges	35	35	35	35
2.5	Income tax	1469	1469	1469	1471
2.6	Public welfare fund				
3	Net cash flow without CERs income	2988	2988	2988	3121
4	Net cash flow with CERs income	2988	2988	2988	3121

FIRR without CERs income	**7.05%**
FIRR with CERs income	**8.23%**